# TM 11-5826-215-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

FIELD AND DEPOT MAINTENANCE MANUAL

# RECEIVING SET, RADIO AN/ARN-30D

This reprint includes all changes in effect at the time of publication; changes 1 through 3 and 6.

*HEADQUARTERS, DEPARTMENT OF THE ARMY*
*November 1961*

# WARNING

## DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

## DON'T TAKE CHANCES!

## DANGEROUS VOLTAGES EXIST IN:

Power Supply PP-2792/ARN-30D; Receiver, Radio R-1021/ARN-30D; Converter, Signal Data CV-265A/ARN-30A, and associated interconnecting wiring when the VOL-OFF switch on Control Radio Set C-3436/ARN-30D is taken out of the OFF position.

TECHNICAL MANUAL

**Field and Depot Maintenance Manual**

# RECEIVING SETS, RADIO AN/ARN-30D AND AN/ARN-30E

TM 11-5826-215-35
CHANGES No. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *31 October 1962*

TM 11-5826-215-35, 6 November 1961, is changed as indicated so that the manual also applies to the following equipment:

| *Nomenclature* | *Order No.* |
|---|---|
| Receiving Set, Radio AN/ARN-30E | 4294-PP-61 |

Change the title of the manual to read as above.

*Page 2*, chapter 1. Below the title add:

*Note.* Receiving Set, Radio AN/ARN-30E is similar to Receiving Set, Radio AN/ARN-30D. Information in this manual applies to both sets unless otherwise specified.

After "twin-T filter" add: "or T-filter in the converter bearing Order No. 4294-PP-61" in the following places:

*Page 22*, paragraph 24*d*, lines 7 and 14. Paragraph 24*e*, line 9.

*Page 24*, figure 15. Blocks in "VOR REFERENCE CHANNEL" and "VOR VARIABLE CHANNEL."

*Page 28*, paragraph 32, last line.

*Page 29*, paragraph 34, line 4. Paragraph 35, right-hand column, line 8. Paragraph 35*b*, line 7. Paragraph 36, lines 1 and 8.

*Page 2*. Add paragraph 1.1 after paragraph 1.

## 1.1. Differences in Models

The components of Receiving Set, Radio AN/ARN-30E differ from the components of Receiving Set, Radio AN/ARN-30D in the following details:

*a*. In VHF navigation receiver bearing Order No. 4294-PP-61, resistor R46 is used in place of resistor R37 (fig. 12 and par. 16*e*).

*b*. In VHF navigation receiver bearing Order No. 4294-PP-61, Zener diode CR6 (fig. 14) is returned to ground through CR4 (fig. 12) rather than directly to ground (pars. 21*e* and 22*b*.1).

*c*. In converter bearing Order No. 4294-PP-61, a T-filter is used instead of a twin-T filter (pars. 24*d*.1 and 36).

*d*. In converter bearing Order No. 4294-PP-61, capacitors C213, C214, C215, C216, C227, C229 and C231 and resistors R229, R231, R247, and R249 are not used (figs. 16 and 17). Resistors R230 and R248 are changed to resistors R231 and R249, respectively. The value of capacitor C217 is changed, and capacitor C228 is changed to C232.

*e*. Control, Radio Set C-3436A/ARN-30E has three connectors on the rear of the unit (fig. 38.1). The C-3436A/ARN-30E simultaneously tunes the VHF navigation and glide slope receivers (pars. 44*b*, *c*, 46, and 47*c*).

*f*. In racks bearing Order No. 4294-PP-61, relay K302 and capacitor C304 (fig. 75.1) have been added (par. 50*b*.1).

*Page 8*, paragraph 6*a*. Add the following note after subparagraph *a*:

*Note.* In Receivers, Radio R-1021/ARN-30D procured on Order No. N383-66270A, the input signal received at ANT connector J1 is applied through radiofrequency (RF) inductor (L14) to the input tuning network. Inductor L14 has been added to eliminate interloading effects when two R-1021/ARN-30D's are connected to one antenna.

*Page 10*, figure 5. Change "NOTE" to read: NOTES.

Designate the existing note: 1.

Add the following:

2. FOR RECEIVERS, RADIO R-1021/ARN-30D PROCURED ON ORDER NO. N383-66270A, THE DIRECT CONNECTION BETWEEN ANT CONNECTOR J1 AND INDUCTOR L1 IS REPLACED BY INDUCTOR L14, .22UH.

*Page 18*, paragraph 16*e*. Add the following after last sentence:

In VHF navigation receiver bearing Order No. 4294–PP–61, resistor R46 is used in place of R37 (fig. 12). Resistor R46 is connected from the +100-volt source to the intersection of CR4 (fig. 12) and CR6 (fig. 14). The circuit function remains the same.

*Page 18*, figure 12. Add the following to the notes:

4. IN VHF NAVIGATION RECEIVER BEARING ORDER NO. 4294–PP–61, THE REFERENCE DESIGNATION OF RESISTOR R37 IS CHANGED TO R46 AND THE VALUE IS CHANGED TO 91K. RESISTOR R46 IS CONNECTED FROM THE +100V SOURCE TO THE INTERSECTION OF CR4 and R45.

*Page 20*, paragraph 21*d*. After subparagraph *d* add:

*e*. In the VHF navigation receiver bearing Order No. 4294–PP–61, Zener diode CR6 (fig. 14) is returned to ground through Zener diode CR4 rather than directly to ground. Diodes CR4 and CR6 regulate the 100-volt supply and form a voltage divider that provides a source of +68 volts at their intersection. The circuit functions as described in *d* above.

*Page 21*, figure 14. Add the following to the notes:

3. VHF NAVIGATION RECEIVER BEARING ORDER NO. 4294–PP–61 HAS RESISTOR R46, 91K, ADDED IN SHUNT WITH CR6. DIODE CR6 IS UNGROUNDED AND RETURNED TO THE +68V REGULATED SUPPLY.

Paragraph 22. After subparagraph *b* add:

*b*.1. In VHF navigation receiver bearing Order No. 4294–PP–61, the 100 volts obtained from the filtered 240-volt supply is applied across series-connected Zener diodes CR4 and CR6 (fig. 73②). The circuit functions the same as described in *b* above.

*Page 22*, paragraph 24. After subparagraph *d* add:

*d*.1. In the converter bearing Order No. 4294–PP–61, a 60-cps T-filter is substituted in place of the 60-cps, twin-T filter. The T-filter provides the same filtering action as the twin-T filter. The

*Figure 16.* (Superseded) *VOR reference channel circuit, partial schematic diagram.*

(Located in back of changes)

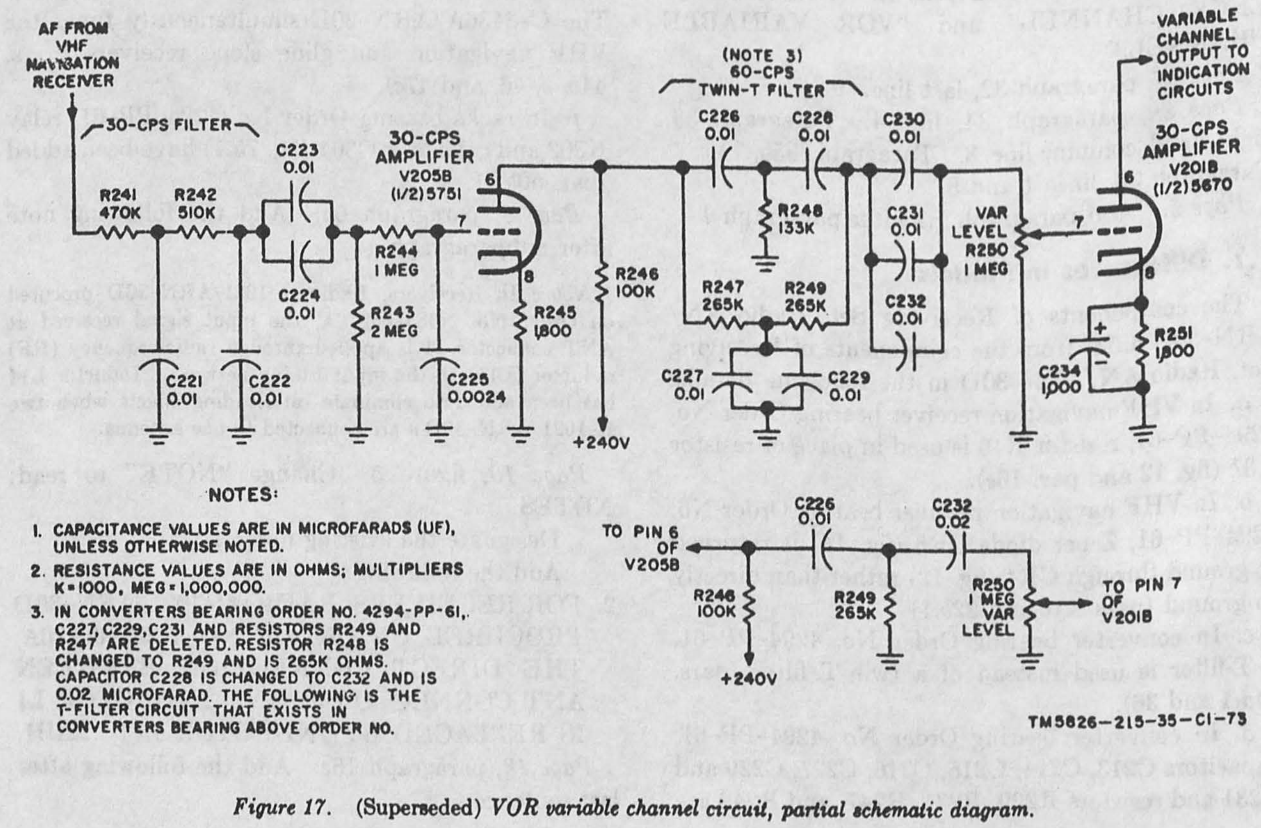



*Figure 17.* (Superseded) *VOR variable channel circuit, partial schematic diagram.*

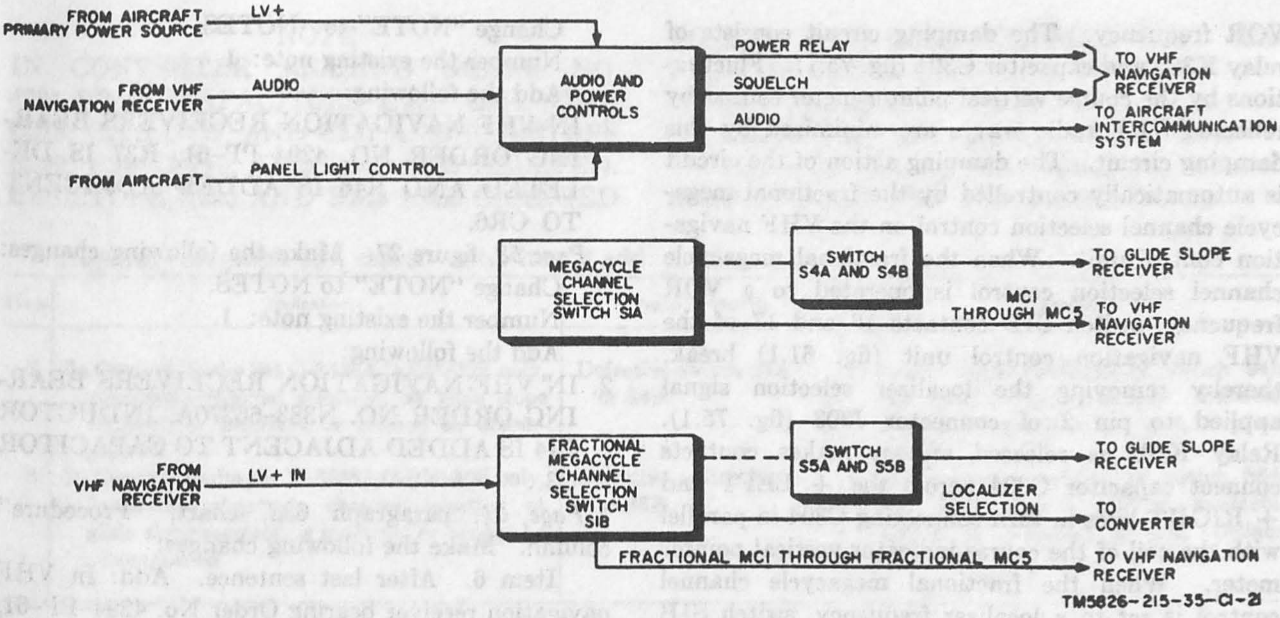



*Figure 20.1.* (Added) *Control, Radio Set C-3436A/ARN-30E, functional block diagram.*

60-cps T-filter consists of capacitors C212 and C217 and resistor R231.

*Page 29*, paragraph 36. After the fifth sentence add: In the converter bearing Order No. 4294–PP–61, the T-filters are similar. Capacitor C217 in the reference channel is 0.015 microfarad and capacitor C232 in the variable channel is 0.02 microfarad.

*Page 35*, paragraph 44. Make the following changes:

Subparagraph *b*. After the last sentence add: In Control, Radio Set C–3436A/ARN–30E, megacycle channel selection switch S1A is directly coupled to glide slope receiver selection switch S4A and S4B (fig. 20.1). When megacycle channel selection switch S1A is operated to the desired channel, switch S4A and S4B also operates and provides a ground to the glide slope receiver which simultaneously tunes the glide slope receiver.

Subparagraph *c*. After the last sentence add: In Control, Radio Set C–3436A/ARN–30E, fractional megacycle channel selection switch S1B is directly coupled to glide slope receiver selection switch S5A and S5B (fig. 20.1). When the fractional megacycle selection switch is operated to the desired channel, switch S5A and S5B also operates and connects the necessary ground for the glide slope receiver to simultaneously tune the glide slope receiver.

*Page 36*, figure 20. Delete the caption and substitute: *Control, Radio Set C-3436/ARN-30D, functional block diagram.*

*Page 37*, paragraph 46. Add the following after last sentence: In Control, Radio Set C–3436A/ARN–30E, glide slope receiver selection switch S4A and S4B operates simultaneously with megacycle channel selection switch S1A (fig. 61.1). When megacycle channel selection switch S1A is operated to a desired channel, glide slope receiver selection switch S4A and S4B also operates and establishes the correct ground connections that simultaneously tunes the glide slope receiver. The appropriate ground connections for the glide slope receiver are applied through pins A through H of connector J3.

Paragraph 47. After subparagraph *b* add:

*c*. In Control, Radio Set C–3436A/ARN–30E, fractional megacycle channel selection switch S1B (fig. 61.1) is coupled to glide slope receiver selection switch S5A and S5B. Therefore, when the fractional megacycle channel selection switch is operated, glide slope receiver channel selection switch S5A and S5B simultaneously and, at the desired channel, provides a ground that enables the glide slope receiver to simultaneously tune to the channel selected. The ground for the glide slope receiver at the selected channel is routed through pins A through H of connector J3.

*Page 38*, paragraph 50. After subparagraph *b* add:

*b*.1. In racks bearing Order No. 4294–PP–61, a damping circuit is provided for the course indicator vertical pointer meter. This circuit is used only when the VHF navigation receiver is tuned to a

VOR frequency. The damping circuit consists of relay K302 and capacitor C304 (fig. 75.1). Fluctuations by the course vertical pointer meter caused by reflected VHF radio waves are minimized by this damping circuit. The damping action of the circuit is automatically controlled by the fractional megacycle channel selection control on the VHF navigation control unit. When the fractional megacycle channel selection control is operated to a VOR frequency, switch S1B contacts 16 and 17 of the VHF navigation control unit (fig. 61.1) break, thereby removing the localizer selection signal applied to pin 2 of connector J303 (fig. 75.1). Relay K302 is released and it makes contacts connect capacitor C304 across the + LEFT and + RIGHT lines in turn connecting C304 in parallel with the coil of the course indicator vertical pointer meter. When the fractional megacycle channel control is set to a localizer frequency, switch S1B contacts 16 and 17 of the VHF navigation control unit (fig. 61.1) make and apply the localizer selection signal to pin 2 of J303 (fig. 75.1). Relay K302 operates and, by its open contacts, C304 is removed from the circuit.

*Page 55*, figure 24. Make the following changes:

Change "NOTE" to: NOTES.

Number the existing note: 1.

Add the following:

2. IN VHF NAVIGATION RECEIVERS BEARING ORDER NO. 4294-PP-61, R37 IS DELETED AND R46 IS ADDED ADJACENT TO CR6.

*Page 58*, figure 27. Make the following changes:

Change "NOTE" to NOTES.

Number the existing note: 1.

Add the following:

2. IN VHF NAVIGATION RECEIVERS BEARING ORDER NO. N383-66270A, INDUCTOR L14 IS ADDED ADJACENT TO CAPACITOR C3.

*Page 64*, paragraph 63*d*, chart, "Procedure" column. Make the following changes:

Item 6. After last sentence. Add: In VHF navigation receiver bearing Order No. 4294-PP-61, check for shorted crystal diode A2CR4 or A2CR6.

Item 10, second sentence. After A2R37 add: or A2R46 in VHF navigation receiver bearing Order No. 4292-PP-61.

*Page 70*, figure 34. Add the following note to figure 34:

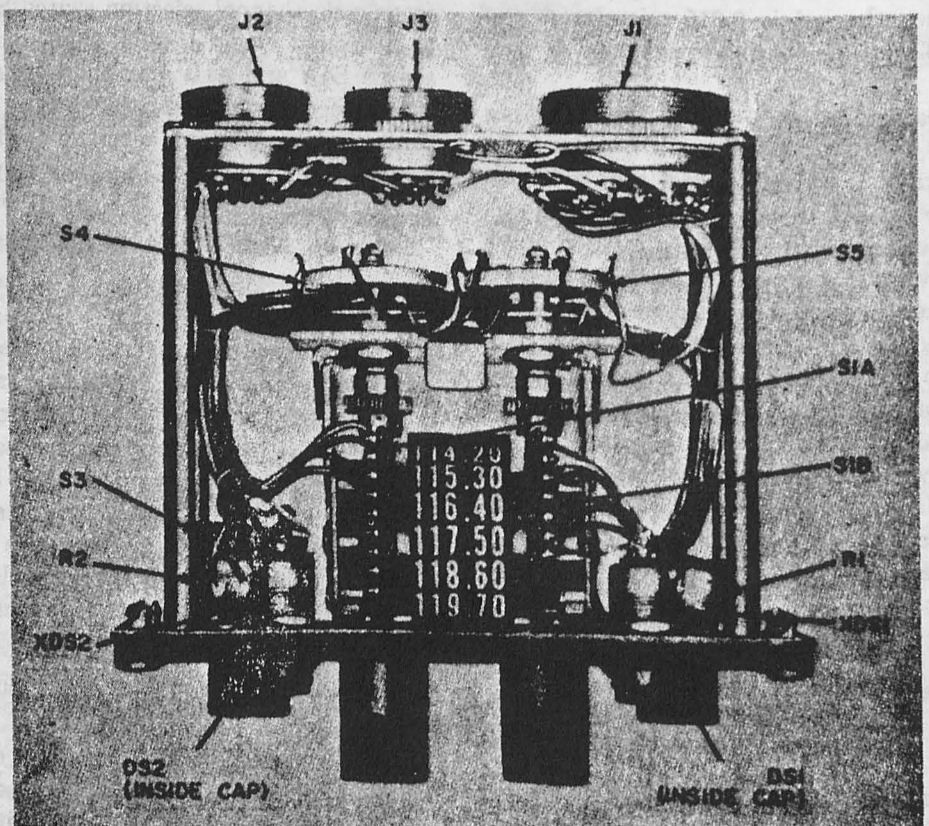



*Figure 38.1.* (Added) *Control, Radio Set C-3436A/ARN-30E, top interior view.*

NOTE

IN CONVERTER BEARING ORDER NO. 4294-PP-61, CAPACITORS C213, C214, C215, C216, C227, C229, AND C231 AND RESISTORS R229, R231, R249, AND R247 ARE DELETED. RESISTORS R230 AND R248 ARE CHANGED TO R231 AND R249, RESPECTIVELY. CAPACITOR C228 IS CHANGED TO C232.

*Page 77*, paragraph 74*c*, lines 3 and 5.

Change "(fig. 38)" to: (figs. 38 and 38.1).

Figure 38. Change the caption to: *Control, Radio Set C-3436/ARN-30D, top interior view.*

*Page 78*, paragraph 76*d*, chart. After item 6 add:

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| 7 | In Control, Radio Set C-3436A/ARN-30E only, megacycle channel selection, at glide slope receiver, is incorrect or cannot be accomplished. | Defective switch S4A or S4B. | Visually check condition of switch S4A and S4B wipers and/or contacts. Adjust if possible; if not, replace switch. |
| 8 | In Control, Radio Set C-3436A/ARN-30E only, fractional megacycle channel selection at glide slope receiver, is incorrect or cannot be accomplished. | Defective switch S5A or S5B. | Visually check condition of switch S5A and S5B wipers and/or contacts. Adjust if possible; if not, replace switch. |

*Page 79*, paragraph 77. Make the following changes:

Subparagraph *b*, last line. Change "(fig. 39)". to: (figs. 39 and 39.1).

Subparagraph *c*, chart. After the last item add:

| Point of measurement | Normal indication | Isolating procedure |
|---|---|---|
| From terminal H to terminal D of connector J304 (in Control, Radio Set C-3436A/ARN-30E only). | 300 ohms--- | If resistance is zero, check for shorted relay K302 coil or short-circuited wiring between terminal H of connector J304 and the relay coil. |

Figure 39. Change caption to: *Back rear view of interconnecting box (except racks bearing Order No. 4294-PP-61).*

Paragraph 78, last line. Change "(fig. 39)" to: (figs. 39 and 39.1).

*Page 80*, paragraph 79. Make the following changes:

Subparagraph *b*, last sentence. After "figure 39" add: and 39.1.

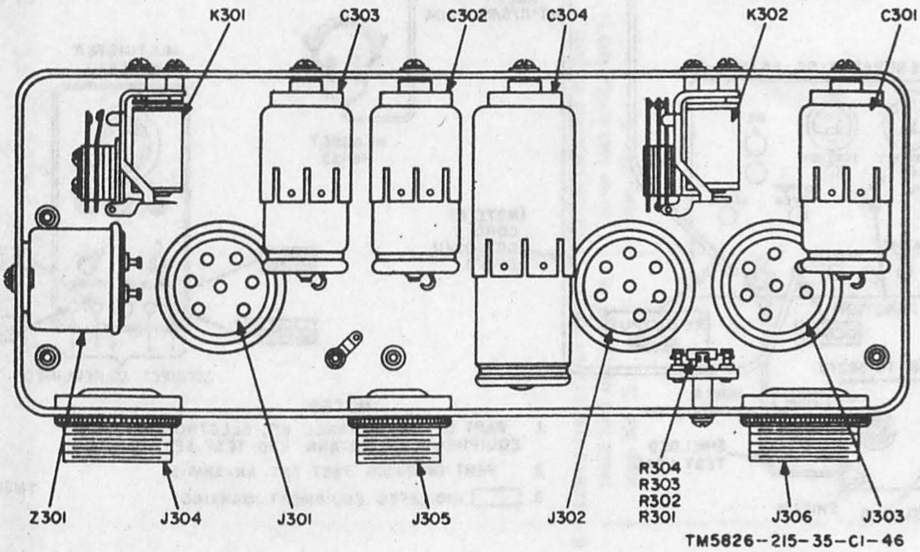



*Figure 39.1.* (Added) *Back rear view of interconnecting box (racks bearing Order No. 4294-PP-61).*

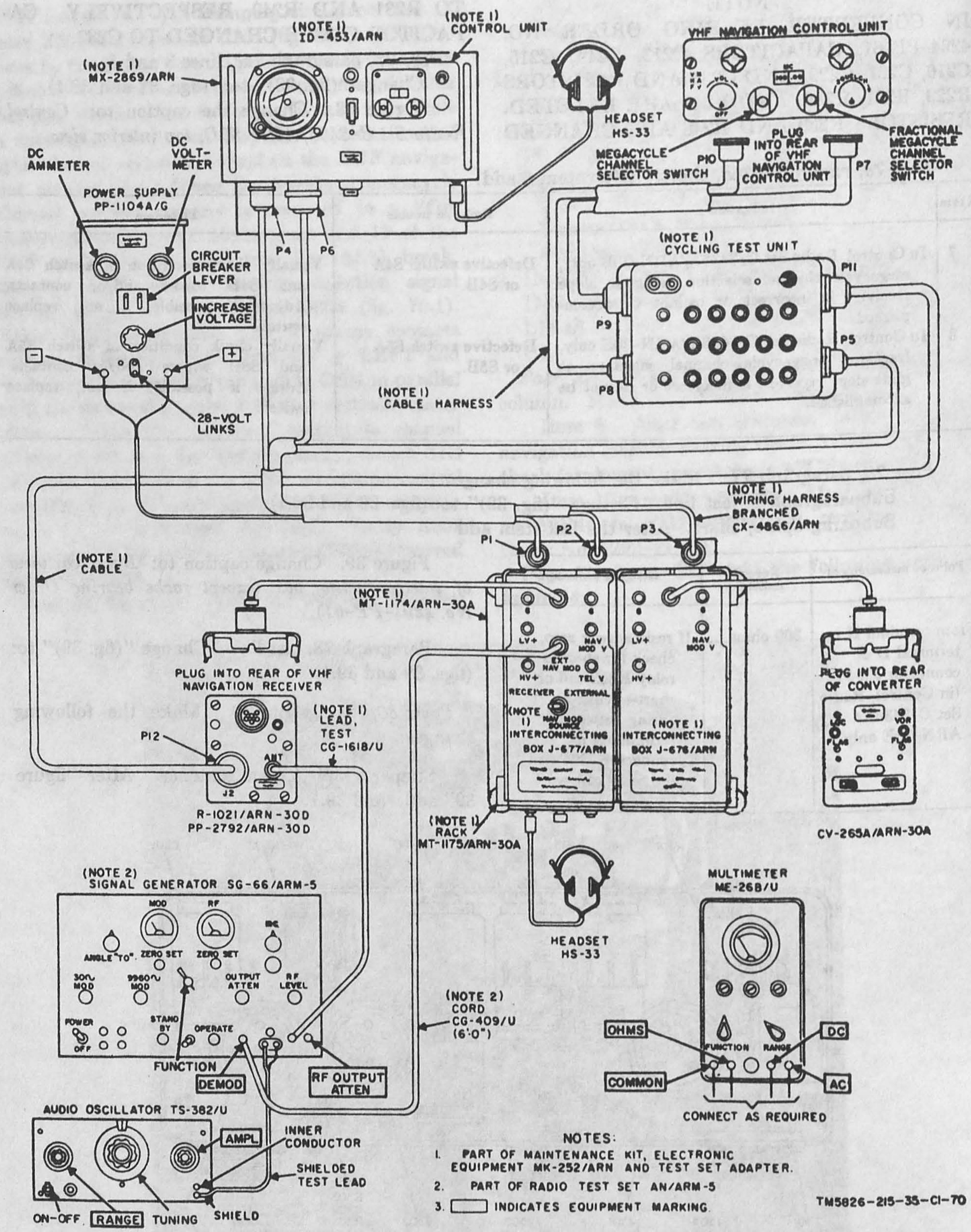



*Figure 57.1.* (Added) *VHF navigation receiver and control unit tests using cycling test unit.*

## 117.1 Vhf Navigation Receiver and Control Unit Tests Using Cycling Test Set

*a. Test Equipment and Materials.*

Power Supply PP–1104A/G

Maintenance Kit, Electronic Equipment MK–252/ARN (with cycling unit)

Test Set, Radio AN/ARM–5 (with additional 108.00-mc and 126.9-mc crystals)

Audio Oscillator TS–382/U (models A, B, D, E, F)

Multimeter ME–26B/U

Headset HS–33

*b. Test Connections and Conditions.* Connect the equipment as shown in figure 57.1.

*c. Procedure.*

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| 1 | *PP–1104A/G:* Circuit breaker lever: OFF. Links: Both connected vertically for 28-volt operation. INCREASE VOLTAGE: 1. *SG–66/ARM–5:* POWER-OFF: OFF *J–677/ARN:* NAV MOD SOURCE: RECEIVER *ME–26B/U:* FUNCTION: OFF RANGE: 1000V *TS–382/U:* ON-OFF: OFF | VOL-OFF: OFF SQUELCH: counter-clockwise. | *a.* Connect ME–26B/U DC probe to J–677/ARN LV+ terminal. Connect ME–26B/U COMMON clip to G terminal. (Insert paper clip in G terminal test jack and connect COMMON clip to paper clip, if necessary.) | *a.* None. |
| | | | *b.* Place PP–1104A/G circuit breaker lever to ON. Place ME–26B/U FUNCTION switch to +. Allow 5-minute warmup before proceeding. | *b.* None. |
| | | | *c.* Turn VHF navigation control unit VOL-OFF knob to on (slightly clockw Place PP–1104A/G INCREASE VOLTAGE switch to 4. | *c.* VHF navigation receiver tube filaments light. |
| | | | *d.* Place ME–26B/U RANGE switch to 100V | *d.* Meter reads 28 volts. |
| | | | *e.* Place ME–26B/U RANGE switch to 1000V. Disconnect dc probe from J–677/ARN LV+ terminal and connect to HV+ terminal. | *e.* None. |
| | | | *f.* Adjust PP–1104A/G INCREASE VOLTAGE knob for 240 volts on ME–26B/U. | *f.* None. |
| 2 | Leave controls in positions last indicated in step No. 1. | Leave controls in positions last indicated in step No. 1. | *a.* Connect 50-ohm termination cap on SG–66/ARM–5 to RF OUTPUT 1 VOLT. | *a.* None. |
| | | | *b.* Place 108.00-mc crystal in SG–66/ARM–5 crystal socket A. Place 114.9-mc crystal in SG–66/ARM–5 crystal socket B. | *b.* None. |
| | | | *c.* Place SG–66/ARM–5 STAND-BY-OPERATE switch to STAND-BY and POWER-OFF switch to POWER. Allow 5-minute warmup before proceeding. | *c.* None. |
| | | | *d.* Place SG–66/ARM–5 STAND-BY-OPERATE switch to OPERATE. | *d.* None. |
| | | | *e.* Press SG–66/ARM–5 MOD ZERO SET knob and rotate knob to zero MOD meter. Press SG–66/ARM–5 RF ZERO SET knob to zero RF meter. | *e.* None. |
| | | | *f.* Set SG–66/ARM–5 FUNCTION switch to RF MC switch to A. Set RF LEVEL to counter range. | *f.* None. |
| | | | *g.* Insert insulated screwdriver in SG–66/ARM–5 A hole and adjust for maximum on RF meter. | *g.* None. |
| | | | *h.* Set SG–66/ARM–5 MC switch to B and with insulated screwdriver in B hole, adjust for maximum on RF meter. | *h.* None. |
| | | | *i.* Adjust SG–66/ARM–5 RF LEVEL control to align RF meter needle with LEVEL SET line. | *i.* None. |
| | | | *j.* Set SG–66/ARM–5 FUNCTION switch to 9960∼MOD. Adjust 9960∼MOD control to align MOD meter needle with LEVEL SET line. | *j.* None. |
| | | | *k.* Set SG–66/ARM–5 FUNCTION switch to 30∼MOD. Adjust 30∼MOD control to align MOD meter needle with LEVEL SET line. | *k.* None. |
| 3 | Leave controls in positions last indicated in step No. 1. | Leave controls in positions last indicated in step No. 2. | *a.* Place TS–382/U ON-OFF switch to ON. Allow 15-minute warmup. | *a.* None. |
| | | | *b.* Tune VHF navigation control unit channel selector switches to 114.9 mc. | *b.* On cycling test unit, REC CYCLING lamp J and FRACT CYCLING lamps O and P light. |
| | | | *c.* Place TS–382/U RANGE switch to X10 and tuning control to 100. | *c.* None. |
| | | | *d.* Place SG–66/ARM–5 FUNCTION switch to RF | *d.* None. |
| | | | *e.* Adjust VHF navigation control unit VOL-OFF knob clockwise and counterclockwise. | *e.* 1,000-cps tone is heard on headset. Volume increases with clockwise rotation of VOL-OFF knob; decreases with counterclockwise rotation. |
| | | | *f.* Tune VHF navigation control unit channel selector switches to frequency other than 114.9 mc. Adjust VHF navigation control unit SQUELCH control clockwise. | *f.* Noise on headset is quieted. Cycling test unit REC CYCLING lamp J and FRACT CYCLING lamps O and P light. |
| | | | *g.* Adjust VHF navigation control unit to desired level of quieting. | *g.* Noise level on headset is adjustable. |
| | | | *h.* Tune VHF navigation control unit channel selector switches to 114.9 mc again. | *h.* 1,000-cps tone is heard on headset again and REC CYCLING J lamp and FRACT CYCLING lamps O and P light again. |
| 4 | Leave controls in positions last indicated in step No. 3. | Leave controls in positions last indicated in step No. 3. | *a.* Turn VHF navigation control unit megacycle channel selector switch through all positions, one at a time. | *a.* Cycling test unit REC CYCLING lamps listed below light for each of the selected megacycle channels. |

| Megacycle channel (mc) | REC CYCLING lamps |
|---|---|
| 108 | H, I |
| 109 | H, I, J |
| 110 | H, L |
| 111 | H, I, J, K |
| 112 | K |
| 113 | I, J, K, L |
| 114 | J |
| 115 | H, J, K, L |
| 116 | I |
| 117 | I, K, L |
| 118 | H |
| 119 | H, I, J |
| 120 | L |
| 12. | I, K |
| 122 | K, L |
| 123 | L |
| 124 | J, K |
| 125 | H, K |
| 126 | I, J |

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| | | | *b.* Turn VHF navigation control unit fractional megacycle channel selector switch through all positions, one at a time. | *b.* Cycling test unit FRACT CYCLING lamps listed below light for each of the selected frequencies. |

| Fractional megacycle channel (mc) | FRACT CYCLING lamps |
|---|---|
| .00 | N, O, P |
| .10 | N, R |
| .20 | Q |
| .30 | P |
| .40 | O |
| .50 | N |
| .60 | R |
| .70 | Q, R |
| .80 | P, Q |
| .90 | O, P |

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| | | | *c.* Place PP–1104A/G INCREASE VOLTAGE knob to 1 and repeat *a* and *b* above. | *c.* Same as *a* and *b* above, except VHF navigation receiver crystal drums take longer to switch to new position tune' VHF navigation control unit. |
| | | | *d.* Place PP–1104A/G INCREASE VOLTAGE knob to position established in step 1*f*. | *d.* None. |
| 5 | Leave controls in positions last indicated in step No. 4. | Leave controls in positions last indicated in step No. 4. | *a.* Disconnect ME–26B/U DC probe from J–677/ARN HV+ terminal and connect to TEL V terminal. | *a.* None. |
| | | | *b.* Tune VHF navigation control unit channel selector switches to produce reading of 108.00 mc. Turn VHF navigation control unit SQUELCH control completely counterclockwise. | *b.* Cycling test unit REC CYCLING lamps H and I and FRACT CYCLING lamps N, O, and P light. |
| | | | *c.* Place SG–66/ARM–5 MC control to A mc and ATTENUATOR control to 1.5 microvolts (3 hard (no-load condition) microvolts). | *c.* None. |
| | | | *d.* Adjust VHF navigation control unit VOL-OFF knob to produce 5-volt reading on ME–26B/U. | *d.* None. |
| | | | *e.* Adjust TS–382/U AMPL control to 0 and reduce setting of SG–66/ARM–5 ATTENUATOR control until ME–26B/U reading drops to 2 volts. | *e.* Drop to 2 volts (corresponding to 6-db signal plus noise-to-noise ratio) occurs at value below 1.5 microvolts (3 hard microvolts) on SG–66/ARM–66 ATTENUATOR dial. |
| | | | *f.* Adjust TS–382/U AMPL control to produce 30-percent modulation on SG–66/ARM–5 MOD meter. | *f.* None. |
| | | | *g.* Replace 114.9-mc crystal in SG–66/ARM–5 crystal socket B with 126.9-mc crystal. Set SG–66/ARM–5 MC switch to B and, with insulated screwdriver in B hole, adjust for maximum on RF meter. | *g.* None. |
| | | | *h.* Tune VHF navigation control unit channel selector switches to 126.9 mc and repeat *d* and *e* above. | *h.* Same as *e* above. In addition, cycling test unit REC CYCLING lamps I and J and FRACT CYCLING lamps O and P light. |
| 6 | Leave controls in positions last indicated in step No. 5. | Leave controls in positions last indicated in step No. 5. | *a.* Set SG–66/ARM–5 ATTENUATOR control to 15 microvolts (3 hard microvolts). | *a.* None. |
| | | | *b.* Adjust VHF navigation control unit VOL-OFF control to produce 5-volt reading on ME–26B/U. | *b.* None. |
| | | | *c.* Set SG–66/ARM–5 ATTENUATOR control to 50,000 microvolts (100,000 hard microvolts). | *c.* ME–26B/U reads between 7.8 and 10 volts for 4- to 6-db rise in agc operation. |
| | | | *d.* Set SG–66/ARM–5 MICROVOLTS control to 100,000 microvolts (200,000 hard microvolts). | *d.* ME–26B/U reads between 10 and 12.5 volts for 6- to 8-db rise in agc operation. |
| | | | *e.* Place SG–66/ARM–5 MC control to A and VHF navigation control unit channel selector switches to 108.00 mc. | *e.* Cycling test unit REC CYCLING lamps H and I and FRACT CYCLING lamps N, O, and P light. |
| | | | *f.* Set SG–66/ARM–5 ATTENUATOR control to 1.5 microvolts (3 hard microvolts). | *f.* None. |
| | | | *g.* Adjust VHF navigation control unit VOL-OFF control for 5-volt reading on ME–26B/U. | *g.* None. |
| | N/A | N/A | *a.* Repeat *c* and *d* above | *a.* Same as *c* and *d* above. |
| | | | *b.* Deenergize and disconnect equipment | *b.* None. |

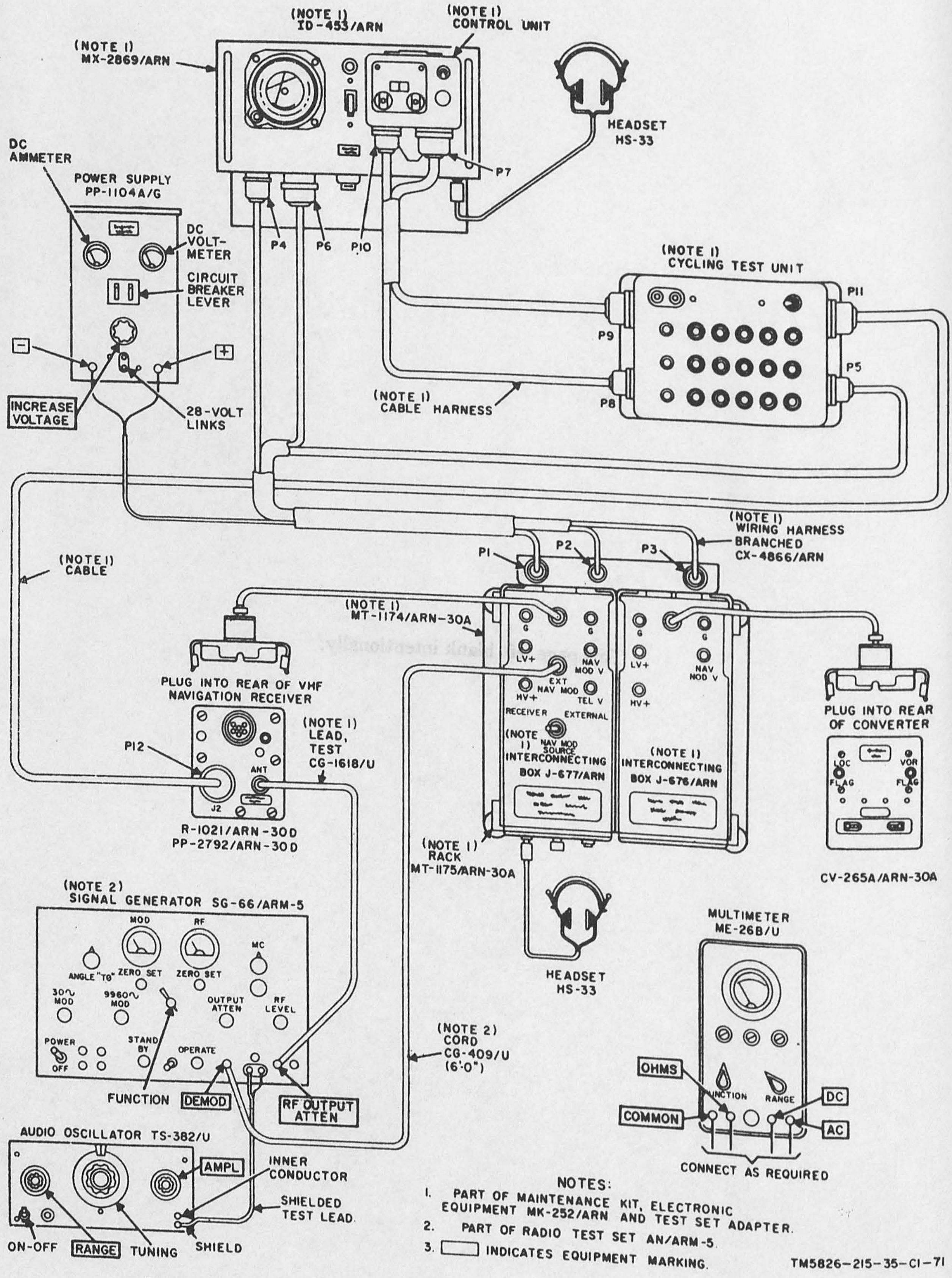



*Figure 58.1.* (Added) *Converter and course indicator tests using cycling test unit.*

**118.1. Converter and Course Indicator Tests Using Cycling Test Unit.**

*a. Test Equipment and Materials.*

Audio Oscillator TS-382/U
Power Supply PP-1104A/G
Maintenance Kit, Electronic Equipment MK-252/ARN
Multimeter ME-26B/U
Test Set, Radio AN/ARM-5
Tool Kits TK-87/U and TK-88/U

*b. Test Connections and Conditions.* Connect the equipment as shown in figure 58.1.

*c. Procedure.*

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| 1 | *PP-1104A/G:* Circuit breaker lever: OFF. Links: Both connected vertically for 28-volt operation. INCREASE VOLTAGE: 1. *SG-66/ARM-5:* POWER-OFF: OFF *J-677/ARM:* NAV MOD SOURCE: RECEIVER. *ME-26B/U:* FUNCTION: OFF RANGE: 1000V *TS-382/U:* ON-OFF: OFF | *VHF navigation control unit:* VOL-OFF: OFF SQUELCH: counter-clockwise. | *a.* Connect ME-26B/U dc probe to J-677/ARN LV+ terminal. Connect ME-26B/U COMMON clip to G terminal. (Insert paper clip in G terminal test jack and connect COMMON clip to paper clip, if necessary.) | *a.* None. |
| | | | *b.* Place P-1104A/G circuit breaker lever to ON. Place ME-26B/U FUNCTION switch to +. Allow 5-minute warmup before proceeding. | *b.* None. |
| | | | *c.* Turn VHF navigation control unit VOL-OFF knob to on (slightly clockwise). Place PP-1104A/G INCREASE VOLTAGE switch to 4. | *c.* VHF converter tube filament lights. |
| | | | *d.* Place ME-26B/U RANGE switch to 100V. Meter should read 28 volts. | *d.* None. |
| | | | *e.* Place ME-26B/U RANGE switch to 1000V. Disconnect dc probe from J-677/ARN LV+ terminal and connect to HV+ terminal. | *e.* None. |
| | | | *f.* Adjust PP-1104A/G INCREASE VOLTAGE knob for 240 volts on ME-26B/U. | *f.* None. |
| 2 | Leave controls in positions last indicated in step No. 1. | Leave controls in positions last indicated in step No. 1. | *a.* Connect 50-ohm termination cap on SG-66/ARM-5 to RF OUTPUT 1 VOLT. | *a.* None |
| | | | *b.* Place 110.9-mc crystal in SG-66/ARM-5 crystal socket A. Place 114.9-mc crystal in crystal socket B. | *b.* None. |
| | | | *c.* Place SG-66/ARM-5 STAND-BY-OPERATE switch to STAND-BY and POWER-OFF to POWER. Allow 5-minute warmup before proceeding. | *c.* None. |
| | | | *d.* Place SG-66/ARM-5 STAND-BY-OPERATE switch to OPERATE. | *d.* None. |
| | | | *e.* Press in SG-66/ARM-5 MOD ZERO SET knob and rotate knob to zero MOD. Press in SG-66/ARM-5 RF ZERO SET knob and rotate knob to zero RF meter. | *e.* None. |
| | | | *f.* Set SG-66/ARM-5 FUNCTION switch to RF and MC switch to A. Set RF LEVEL to center range. | *f.* None. |
| | | | *g.* Insert insulated screwdriver in SG-66/ARM-5 A hole and adjust for maximum on RF meter. | *g.* None. |
| | | | *h.* Set SG-66/ARM-5 MC switch to B and, with insulated screwdriver in B hole, adjust for maximum on RF meter. | *h.* None. |
| | | | *i.* Adjust SG-66/ARM-5 RF LEVEL control to align RF meter needle with LEVEL SET line. | *i.* None. |
| | | | *j.* Set SG-66/ARM-5 FUNCTION switch to 9960~MOD. Adjust 9960~MOD control to align MOD meter needle with LEVEL SET line. | *j.* None. |
| | | | *k.* Set SG-66/ARM-5 FUNCTION switch to 30~MOD. Adjust 30~MOD control to align MOD meter needle with LEVEL SET line. | *k.* None. |
| 3 | Leave controls in positions last indicated in step No. 2. | Leave controls in positions last indicated in step No. 1, except: *VHF navigation control unit:* Channel selector switches to produce 114.90 reading on MC dials. | *a.* Disconnect ME-26B/U DC probe from J-677/ARN HV+ terminal and connect to NAV MOD V terminal. | *a.* Cycling test unit REC CYCLING lamp J and FRACT CYCLING lamps O and P light. |
| | | | *b.* Place J-677/ARN NAV MOD SOURCE switch to EXTERNAL. | *b.* None. |
| | | | *c.* Place ME-26B/U RANGE switch to 3V and adjust SG-66/ARM-5 MOD 30~control to produce 1.8-volt reading on ME-26B/U. | *c.* None. |
| | | | *d.* Place SG-66/ARM-5 FUNCTION switch to OMNI | *d.* None. |
| | | | *e.* Rotate SG-66/ARM-5 OMNI TRACK "ANGLE TO" switch through each of its positions and rotate course indicator course selector knob to position course pointer to corresponding course dial reading. | *e.* On-course indicator: the vertical pointer centers, the OFF vertical flag is out of sight, and the TO-FROM meter reads TO for each setting of OMNI TRACK "ANGLE TO" switch on SG-66/ARM-5. |
| | | | *f.* Place SG-66/ARM-5 FUNCTION switch to 30~MOD | *f.* OFF vertical flag on-course indicator is in full view. |
| | | | *g.* Place SG-66/ARM-5 FUNCTION switch to 9960~MOD. | *g.* OFF vertical flag on-course indicator is in full view. |
| | | | *h.* Place SG-66/ARM-5 FUNCTION switch to OMNI | *h.* Same as *e* above. |
| 4 | Leave controls in position last indicated in step No. 3, except: *SG-66/ARM-5:* MC: A FUNCTION: 30~MOD | Leave controls in position last indicated in step No. 3, except: *VHF navigation control unit:* Channel selector switches to produce 110.90 reading on MC dials. | *a.* Adjust SG-66/ARM-5 30~MOD control to produce 1.8-volt reading on ME-26B/U. | *a.* Cycling test unit REC CYCLING lamps G and L and FRACT CYCLING lamps O and P light. |
| | | | *b.* Set SG-66/ARM-5 FUNCTION switch to AMP LOC (pointer centered). | *b.* On-course indicator: the vertical pointer centers and the OFF vertical flag is out of sight. |
| | | | *c.* Set SG-66/ARM-5 FUNCTION switch to AMP LOC (pointer left). | *c.* On-course indicator: the vertical pointer swings left to outer edge of blue sector and the OFF vertical flag is out of sight. |
| | | | *d.* Set SG-66/ARM-5 FUNCTION switch to AMP LOC (pointer right). | *d.* On-course indicator: the vertical pointer swings right to width of outer edge of yellow sector and the OFF vertical flag is out of sight. |
| | | | *e.* Place TS-382/U ON-OFF switch to ON. Allow 15-minute warmup before proceeding. | *e.* None. |
| | | | *f.* Place TS-382/U RANGE switch to XI and tuning control to 150. | *f.* None. |
| | | | *g.* Set SG-66/ARM-5 FUNCTION switch to RF. Adjust TS-382/U AMPL control to produce 30-percent modulation on SG-66/ARM-5 MOD meter. | *g.* OFF vertical flag on-course indicator is fully visible. |
| | | | *h.* Place TS-382/U tuning control to 90 and adjust AMPL control to produce 30-percent modulation on SG-66/ARM-5 MOD meter. | *h.* Same as *g* above. |
| | | | *i.* Deenergize and disconnect equipment | *i.* None. |

*Figure 61.1.* (Added) *Control, Radio Set C-3436A/ARN-30E, schematic diagram.*

**(Located in back of changes)**

*Figure 65.1.* (Added) *Control, Radio Set C-3436A/ARN-30E, wiring diagram.*

**(Located in back of changes)**

Subparagraph *d*, chart. After item 7 add:

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| 8 | On rack bearing Order No. 4294-PP-61 only, excessive vertical fluctuation on the course indicator. | Defective capacitor C304 or defective relay K302. | Check capacitor C304 (fig. 39.1) for open condition.<br>Check continuity of relay K302.<br>Check contacts of relay K302 for pitted or corroded condition. |

*Page 86*, paragraph 85, line 1. After "C303" add: (and C304 in rack bearing Order No. 4294-PP-61 (fig. 39.1)).

*Page 102*, paragraph 95, line 6. After the first sentence add: Rack bearing Order No. 4294-PP-61 contains two relays (K301 and K302 (fig. 39.1)).

*Page 123*, paragraph 121, last line. Delete last line and substitute: (pars. 59, 65, 117, 117.1, 118, and 118.1).

*Page 140*, figure 66. Delete the caption and substitute: *Mounting MT-1175/ARN-30A, (except those bearing Order No. 4294-PP-61) wiring diagram.*

*Page 145*, figure 69. Add the following to the notes:

3. IN ORDER NO. 4294-PP-61, CR6 IS CONNECTED TO +68 VOLTS DC INSTEAD OF GROUND.

*Page 149*, figure 71. Change 'J302" on the right side of the rack to: J305.

*Pages 153 and 155*, figure 73① and ②. Make the following changes:

Part 1, left-hand side. Above the line connecting J1 and L1 add: (NOTE 6).

Part 2. Adjacent to R37 and CR6 add: (NOTE 7).

Add the following to the notes:

6. IN ORDER NO. N383-66270A, INDUCTOR L14, .22UH, REPLACES THE DIRECT CONNECTION BETWEEN L1 AND J1.
7. IN ORDER NO. 4294-PP-61, RESISTOR R37 IS DELETED. THE GROUND IS REMOVED FROM CR6, AND RESISTOR R46, 91K, IS ADDED IN SHUNT WITH CR6 AND THE ANODE OF CR6 IS CONNECTED TO THE JUNCTION OF C29 AND R30.

*Page 157*, figure 74. Add the following to the notes:

5. IN ORDER NO. 4294-PP-61, THE FILTER CIRCUITS INTERCONNECTING V205A AND V204B AND V205B AND V201B ARE AS SHOWN IN FIGURE 74.1.

*Page 159*, figure 75, caption. After MT-1175/ARN-30A add: *(except those bearing Order No. 4294-PP-61)*.

*Page 163*, figure 77. Make the following changes:

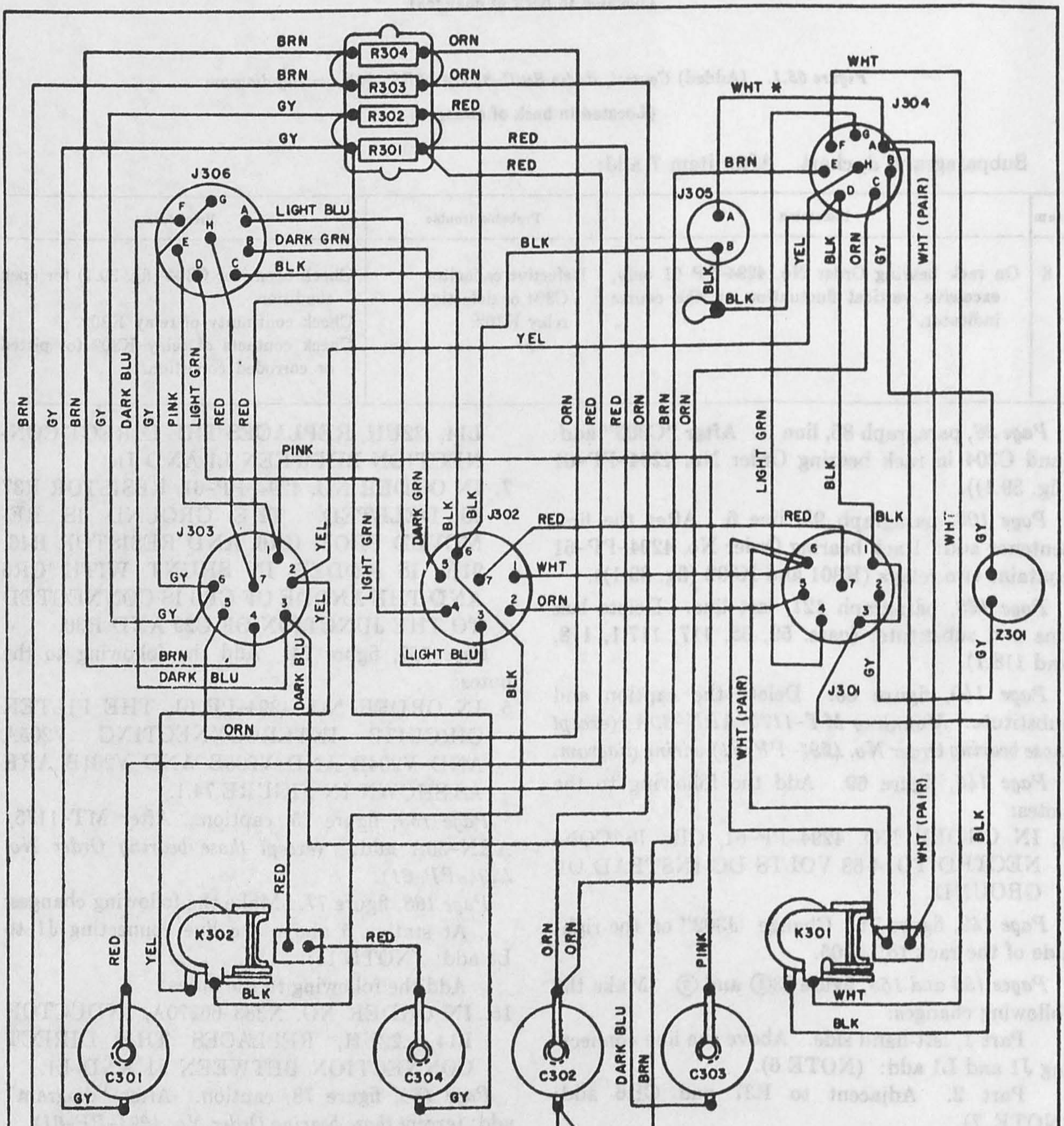
At station 5 above the line connecting J1 to L1 add: (NOTE 15).

Add the following to the notes:

15. IN ORDER NO. N383-66270A, INDUCTOR L14, .22UH, REPLACES THE DIRECT CONNECTION BETWEEN J1 AND L1.

*Page 165*, figure 78, caption. After "diagram" add: *(except those bearing Order No. 4294-PP-61)*.

*Page 167*, figure 79, caption. After "diagram" add: *(except those bearing Order No. 4294-PP-61)*.




**NOTES:**

1. WIRES MARKED WITH COLOR NOTE ARE NO. 22 SOLID COPPER, VINYLITE INSULATED.
2. WIRE MARKED WITH COLOR NOTE AND AN ASTERISK IS NO. 18 STRANDED COPPER, VINYLITE, INSULATED.

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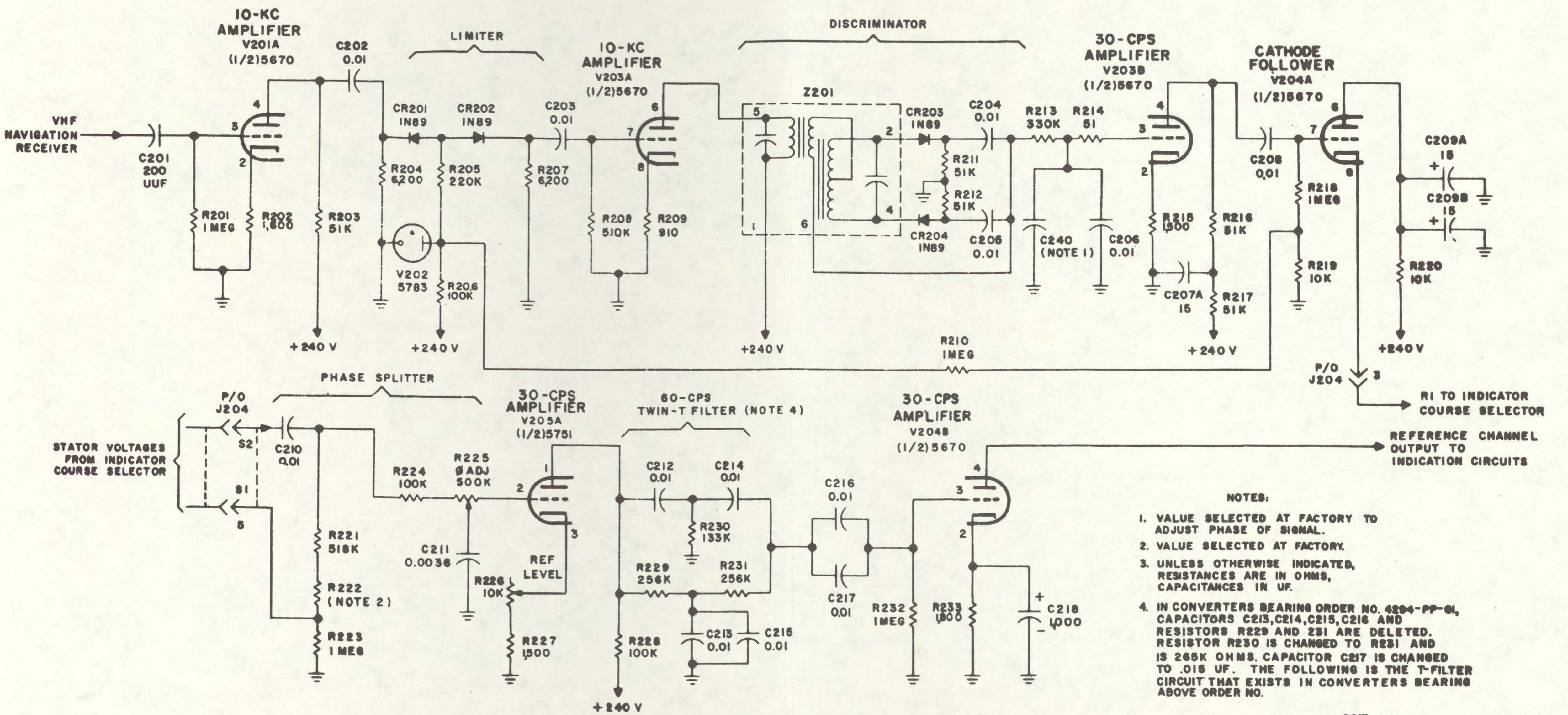
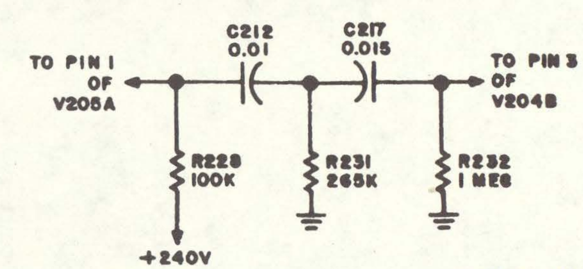
*Figure 66.1.* (Added) *Mounting MT-1175/ARN-30A bearing Order No. 4294-PP-61, wiring diagram.*




NOTES:

1. VALUE SELECTED AT FACTORY TO ADJUST PHASE OF SIGNAL.
2. VALUE SELECTED AT FACTORY.
3. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES IN UF.
4. IN CONVERTERS BEARING ORDER NO. 4294-PP-61, CAPACITORS C213, C214, C215, C216 AND RESISTORS R229 AND 231 ARE DELETED. RESISTOR R230 IS CHANGED TO R231 AND IS 265K OHMS. CAPACITOR C217 IS CHANGED TO .015 UF. THE FOLLOWING IS THE T-FILTER CIRCUIT THAT EXISTS IN CONVERTERS BEARING ABOVE ORDER NO.




TM5826-215-35-C1-72

*Figure 16.* (Superseded) *VOR reference channel circuit, partial schematic diagram.*

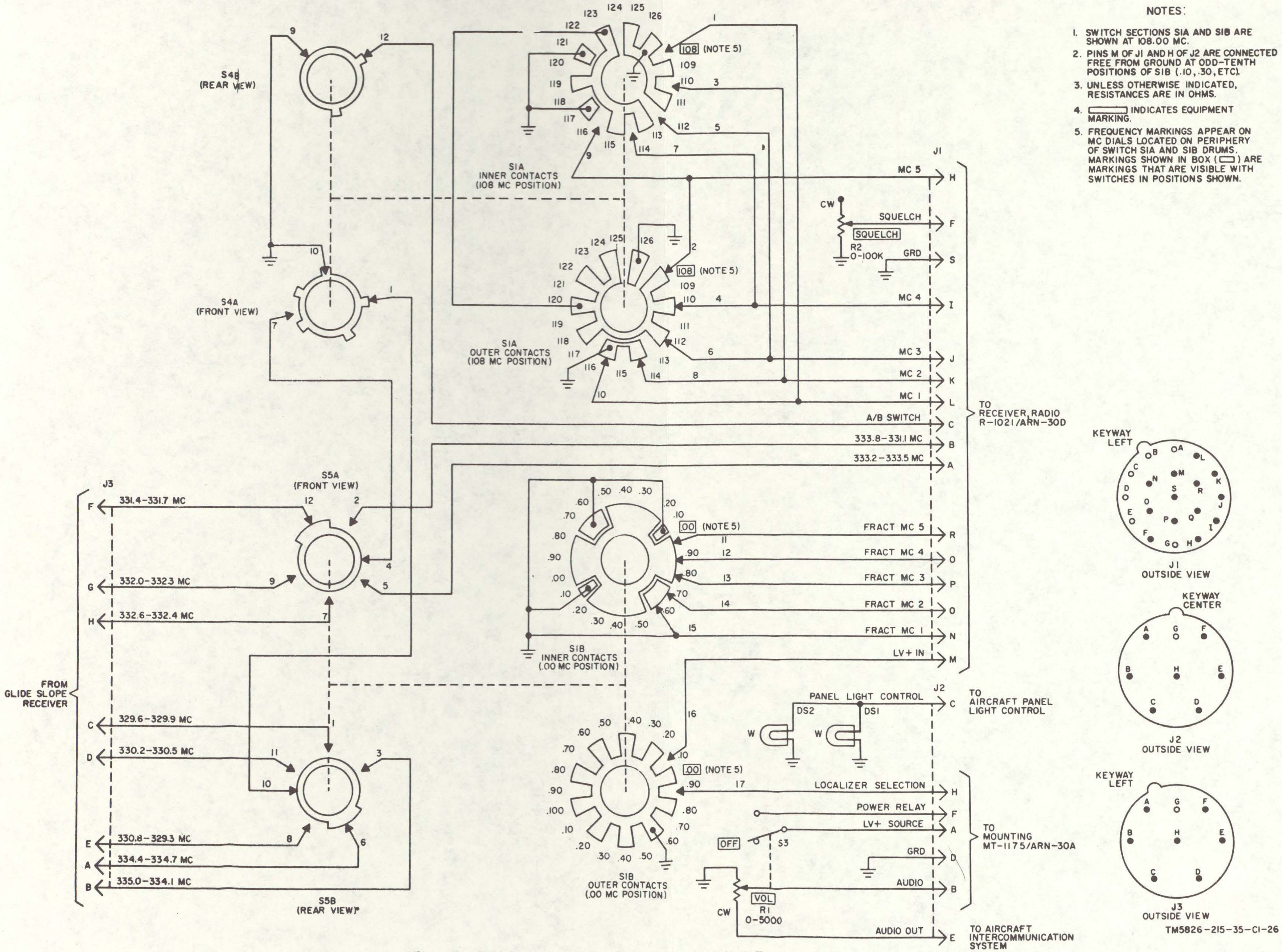
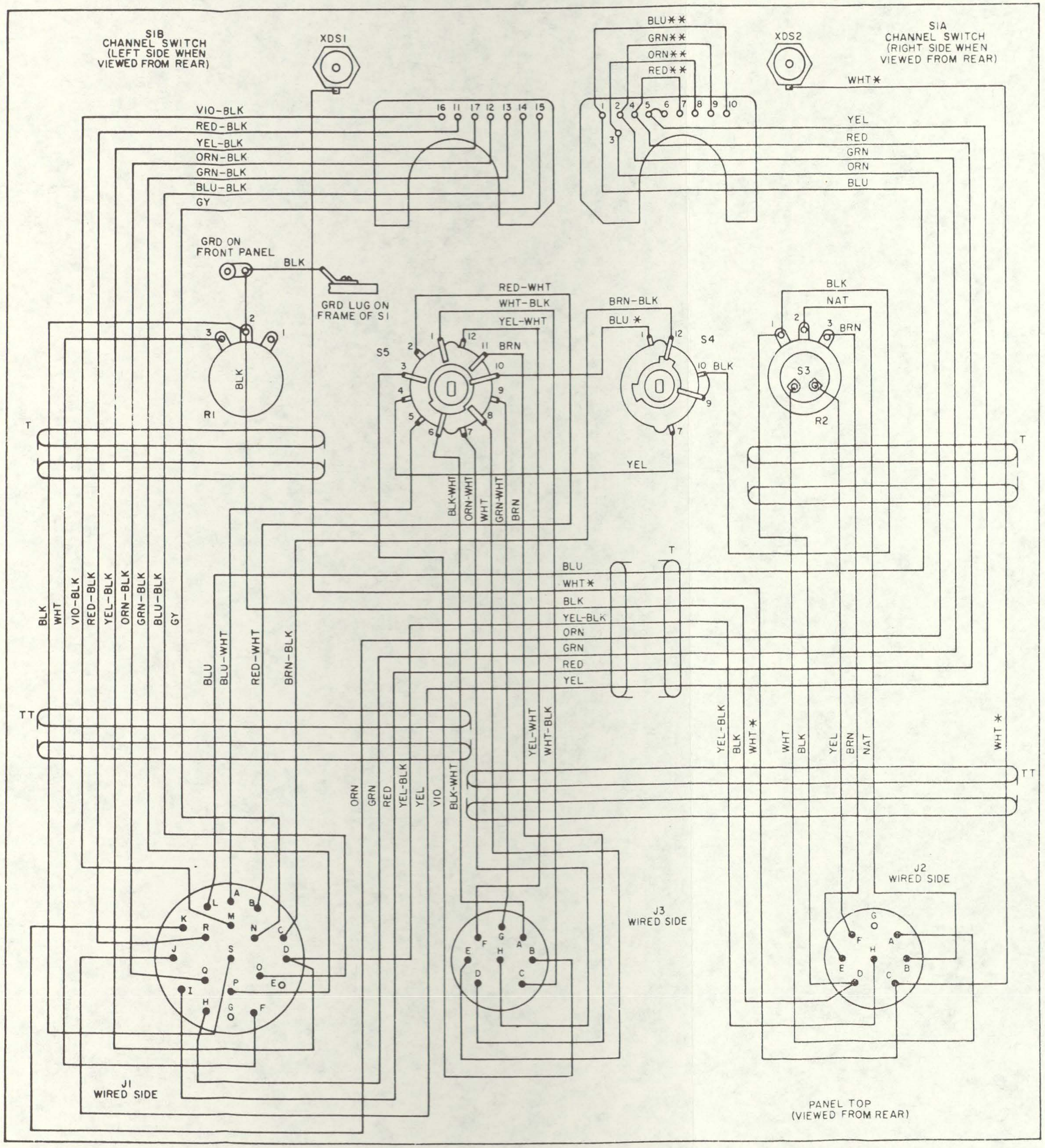



*Figure 61.1.* (Added) Control, Radio Set C-3436A/ARN-30E, schematic diagram.

*Figure 61.1.*




NOTES.

1. WIRE MARKED WITH A COLOR NOTE ARE NO.24 STRANDED COPPER, TEFLON INSULATED.
2. WIRES MARKED WITH A COLOR NOTE AND AN ASTERISK ARE NO.22 SOLID COPPER, TEFLON INSULATED.
3. WIRES MARKED WITH A COLOR NOTE AND A DOUBLE ASTERISK ARE NO.24 SOLID COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO.24 BARE, SOLID, TINNED COPPER.
5. TRANSPARENT VINYLITE TUBING (0.258 I.D.) IS INSTALLED OVER GROUPS OF WIRES MARKED "T". TRANSPARENT VINYLITE TUBING (0.313 I.D.) IS INSTALLED OVER GROUPS OF WIRES MARKED "TT".

TM5826-215-35-C1-41

*Figure 65.1.* (Added) *Control, Radio Set C-3436A/ARN-30E, wiring diagram.*

*Figure 65.1.*

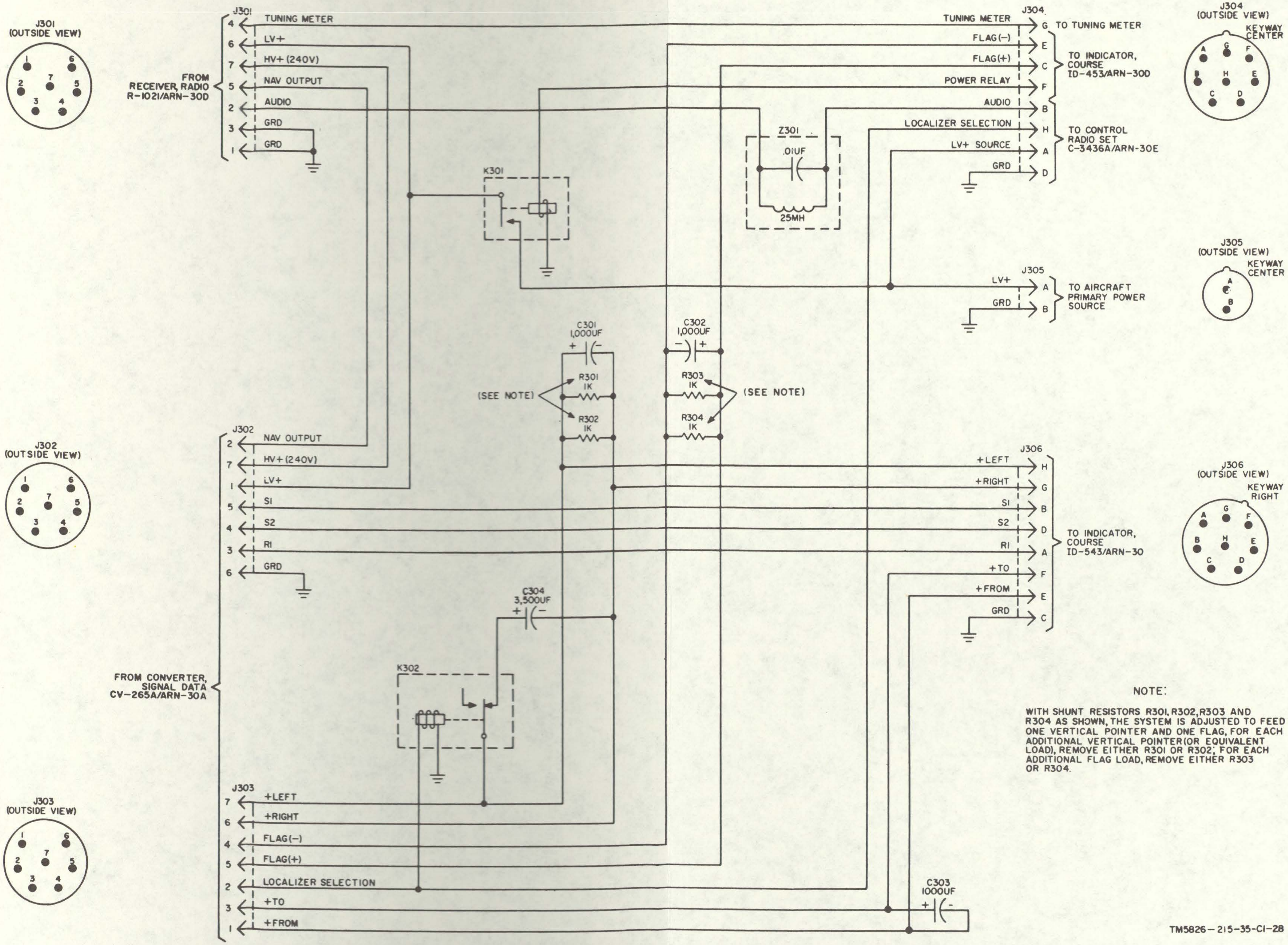



*Figure 75.1.* (Added) *Mounting MT-1175/ARN-30A, Order No. 4294-PP-61 only, schematic diagram.*

*Figure 75.1.*

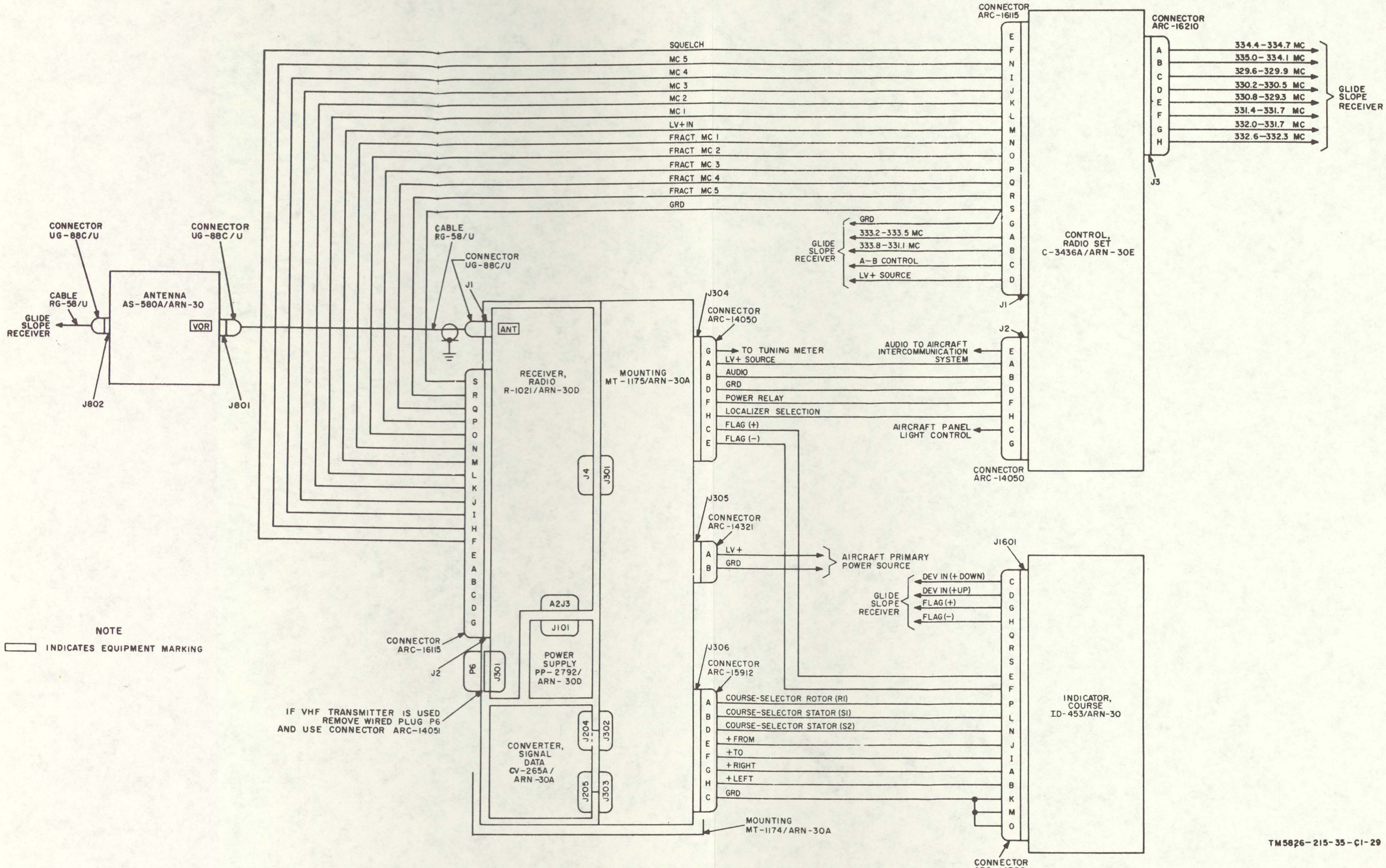
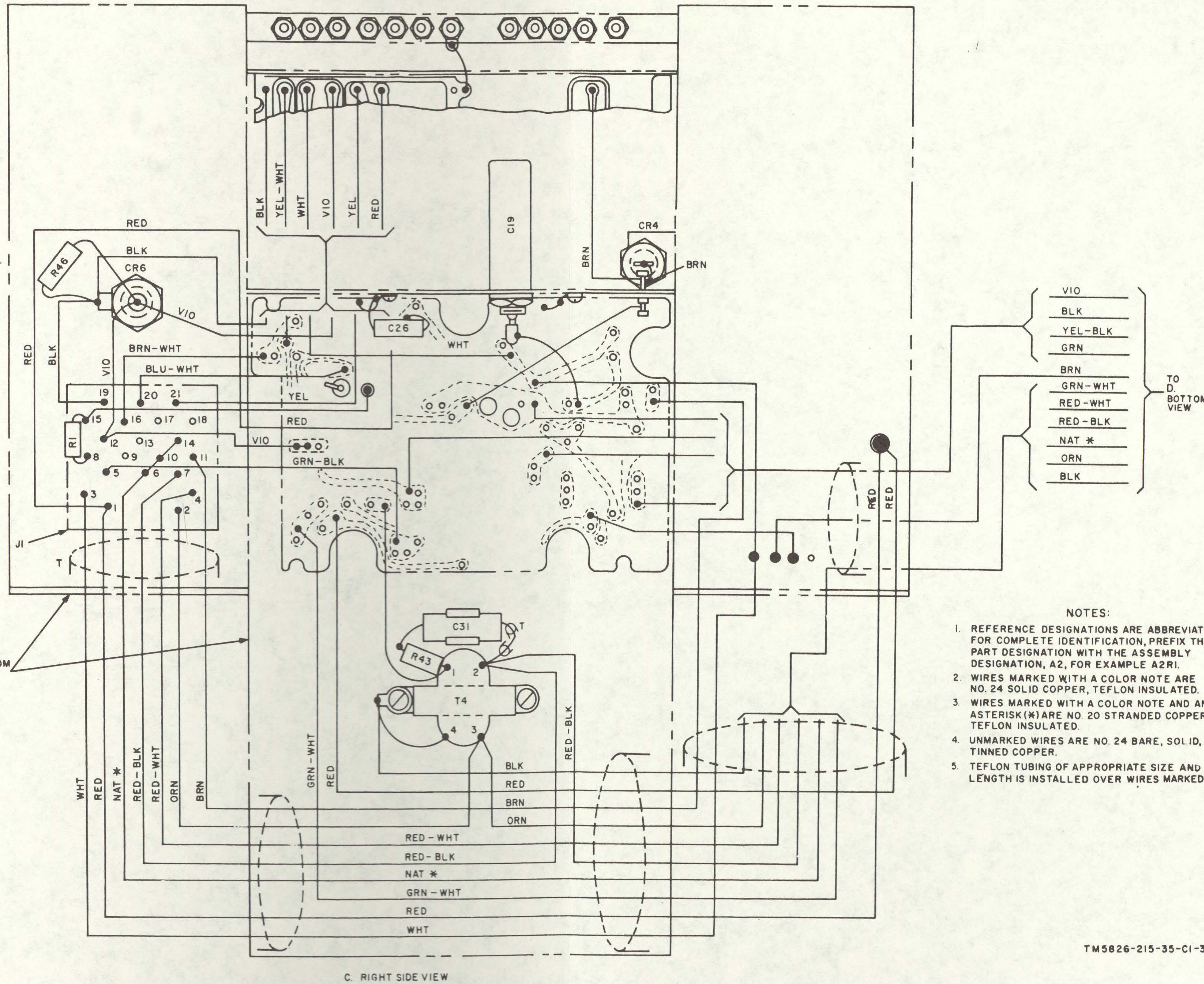



*Figure 76.1.* (Added) *Receiving Set, Radio AN/ARN-30E, interconnection diagram.*

*Figure 76.1.*




NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION, A2, FOR EXAMPLE A2R1.
2. WIRES MARKED WITH A COLOR NOTE ARE NO. 24 SOLID COPPER, TEFLON INSULATED.
3. WIRES MARKED WITH A COLOR NOTE AND AN ASTERISK (*) ARE NO. 20 STRANDED COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 BARE, SOLID, TINNED COPPER.
5. TEFLON TUBING OF APPROPRIATE SIZE AND LENGTH IS INSTALLED OVER WIRES MARKED "T."

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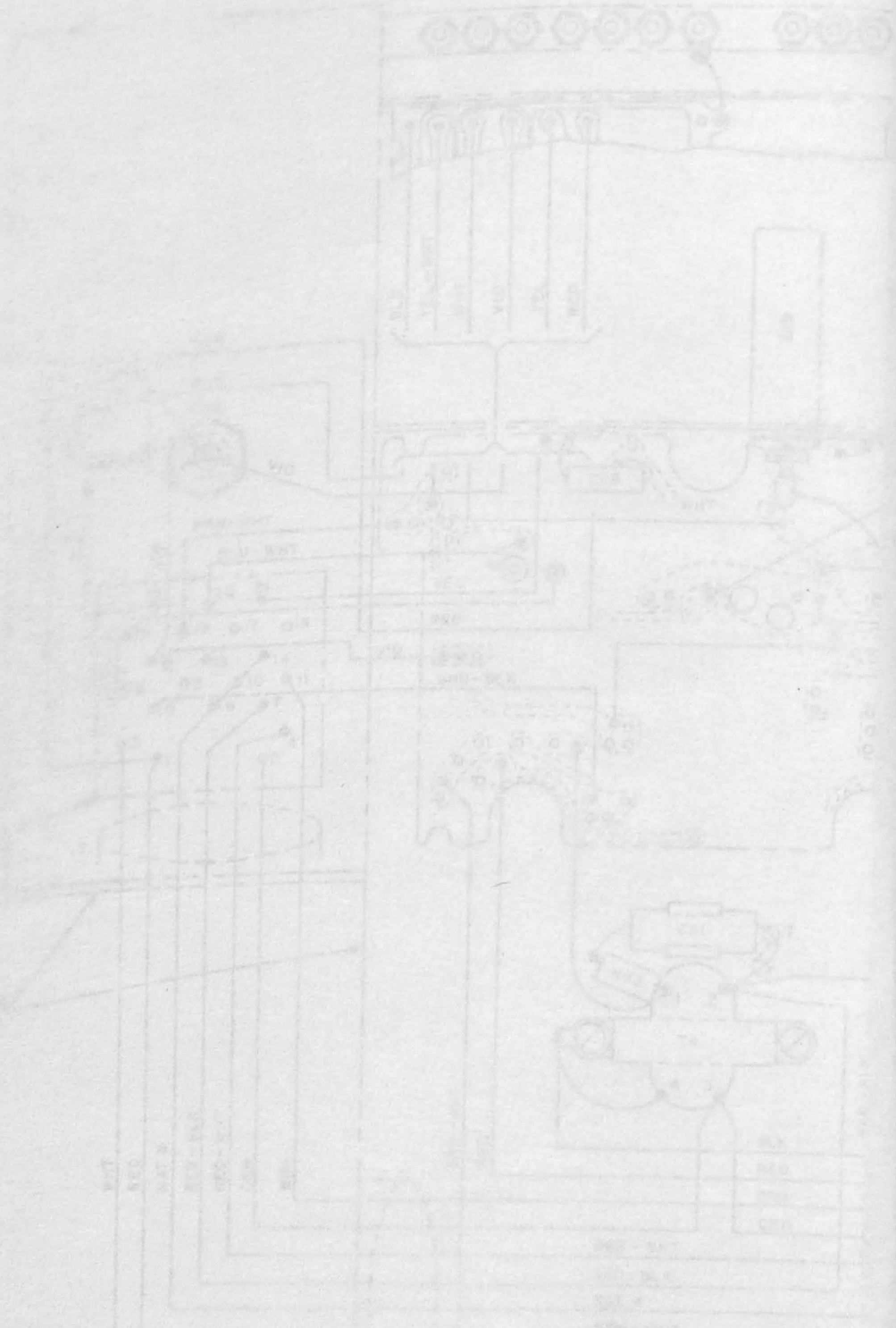
*Figure 78.1.* (Added) *Right side of Receiver, Radio R-1021/ARN-30D, IF/AF assembly A2, wiring diagram (Order No. 4294-PP-61 only).*



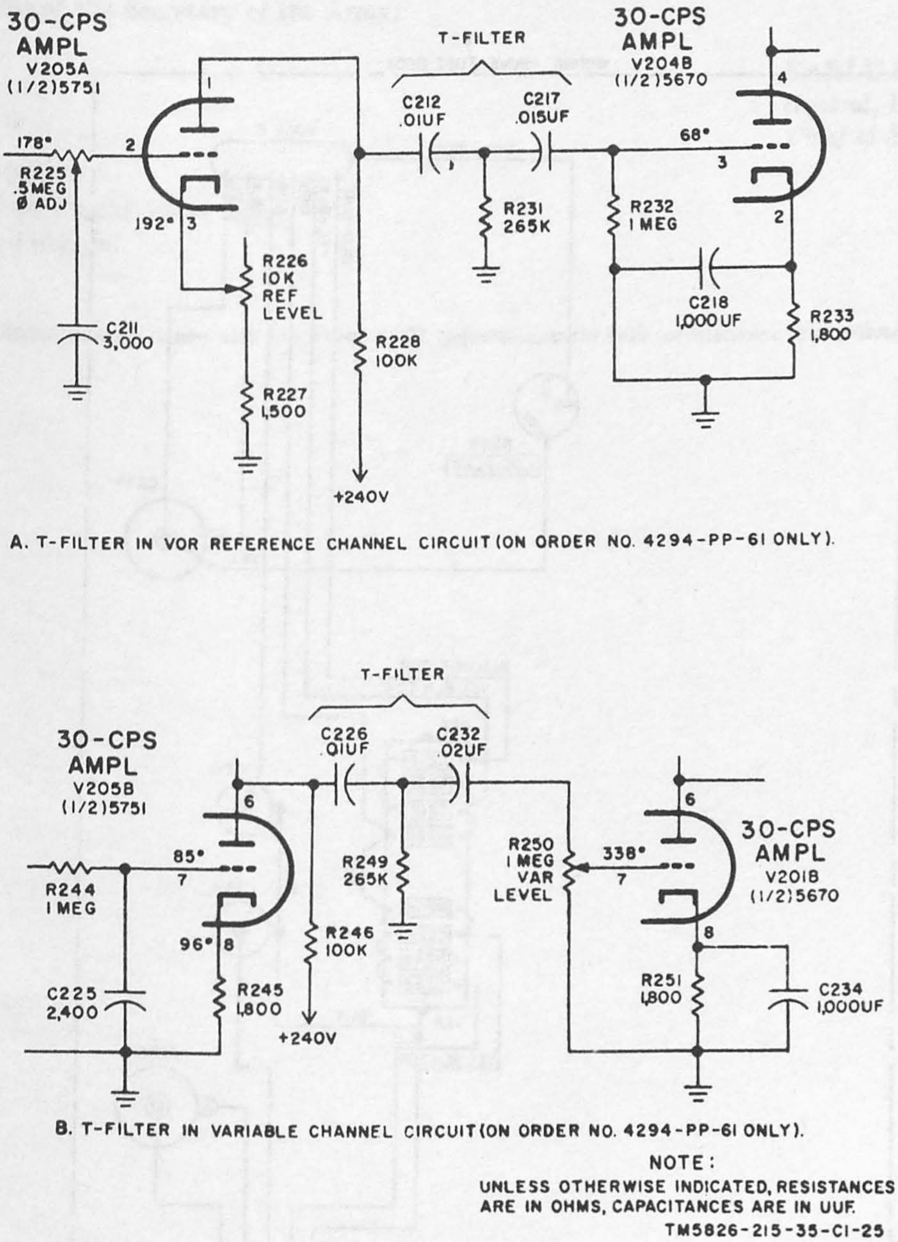
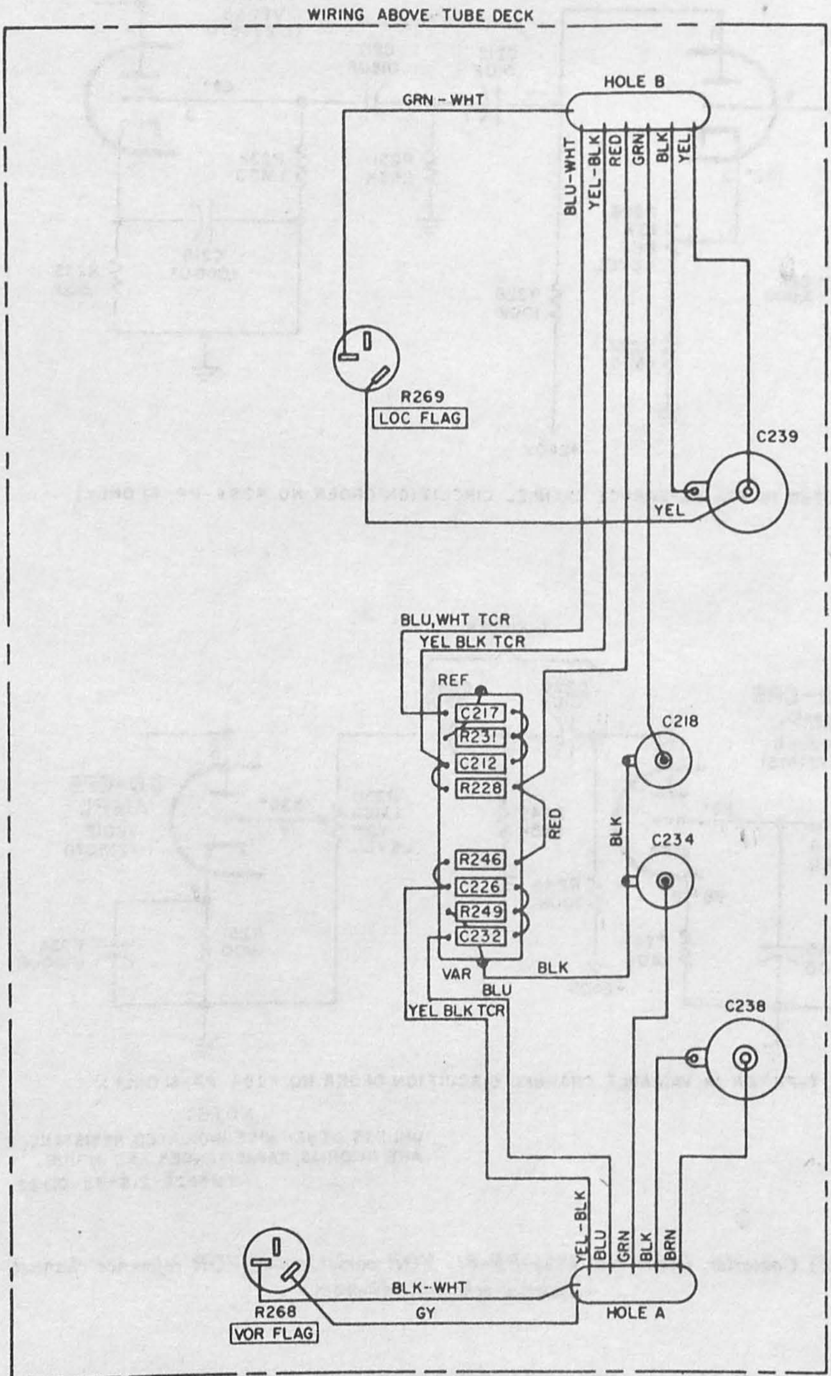



*Figure 74.1.* (Added) *Converter, Order No. 4294-PP-61, VOR variable and VOR reference channel, 30-cps amplifier, partial schematic diagram.*

*Figure 75.1.* (Added) *Mounting MT-1175/ARN-30A, Order No. 4294-PP-61 only, schematic diagram.*
**(Located in back of changes)**

*Figure 76.1.* (Added) *Receiving Set, Radio AN/ARN-30E, interconnection diagram.*
**(Located in back of changes)**

*Figure 78.1.* (Added) *Right side of Receiver, Radio R-1021/ARN-30D, IF/AF assembly A2, wiring diagram (Order No. 4294-PP-61 only).*
**(Located in back of changes)**




NOTES:

1. WIRES MARKED WITH A COLOR NOTE ARE NO. 24 SOLID COPPER, TEFLON INSULATED.
2. UNMARKED WIRES ARE NO. 24 BARE, SOLID, TINNED COPPER.
3. ▭ INDICATES EQUIPMENT MARKING.
4. SOLDERED DIRECTLY TO MOUNTING PLATE.

TM5826-215-35-C1-40

*igure 79.1.* (Added) *Converter, Signal Data CV-265A/ARN-30A (Order No. 4294-PP-61 only), wiring diagram above tube deck.*

By Order of the Secretary of the Army:

EARLE G. WHEELER,
*General, United States Army,*
*Chief of Staff.*

Official:

J. C. LAMBERT,
*Major General, United States Army,*
*The Adjutant General.*

Distribution:

**To be distributed in accordance with DA Form 12-31 requirements for field maintenance instructions for all fixed and rotor wing aircraft.**

**Field and Depot Maintenance Manual**

# RECEIVING SETS, RADIO AN/ARN-30D AND AN/ARN-30E

CHANGE
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *15 October 1964*

TM 11-5826-215-35, 6 November 1961, is changed as indicated so that the manual also applies to Receivers, Radio R-1021/ARN-30D (part of Receiving Sets, Radio AN/ARN-30D and AN/ARN-30E) the front panel of which bears a label marked MWO 11-5826-215-35/2.

*Note.* The parenthetical reference to previous changes (example: "page of C 1") indicates that pertinent material was published in that change.

After "4294-PP-61" add and N383-66270A, serial Nos. 744 through 1250 in the following places:

*Page 2,* paragraph 1.1*a* (page 1 of C 1), line 2.

Paragraph 1.1*b* (page 1 of C 1), line 2.

*Page 18,* paragraph 16*e* (page 2 of C 1), last sentence line 2.

*Page 20,* paragraph 21*e* (page 2 of C 1), line 2.

*Page 21,* paragraph 22*b*.1 (page 2 of C 1), line 2.

*Page 55,* figure 24 note 2 (page 4 of C 1), line 2.

*Page 64,* paragraph 63*d* chart, "Procedure" column (page 4 of C 1), items 6 and 10.

After "N383-66270A" add bearing MWO 11-5826-215-35/1 in the following places:

*Page 8,* paragraph 6*a*, note (page 1 of C 1), line 2.

*Page 10,* figure 5, note 2 (page 1 of C 1), line 2.

Add Signal Generator AN/USM-44 in the following places:

*Page 117,* paragraph 117*a*. After the last line.

Paragraph 117.1*a* (page 7 of C 1). After the last line.

Add the following in the four places indicated directly below the note:

*Note.* Procedure for obtaining 30 percent modulation on SG-66/ARM-5 is as follows:

(1) Set SG-66/ARM-5 FUNCTION switch to 30 ∿ MOD and rotate 30 ∿ MOD control knob fully counterclockwise (zero meter indication).

(2) Set TS-382/U RANGE switch and tuning dial in position for desired frequency.

(3) Rotate TS-382/U output level (INCREASE) control knob in a clockwise direction until SG-66/ARM-5 MOD meter pointer is redlined (midscale).

(4) Set SG-66/ARM-5 FUNCTION switch to RF and mark position of MOD meter pointer. Meter pointer now represents 30 percent modulation.

*Page 117,* paragraph 117*c* chart, "Test procedure" column, step 5*f*. After last line.

Paragraph 117.1*c* (page 7 of C 1), chart, "Test procedure" column, step 5*f*. After last line.

*Page 121,* paragraph 118*c* chart, "Test procedure" column, step 4*g*. After last line.

Paragraph 118.1*c* (page 11 of C 1), chart, "Test procedure" column, step 4*g*. After last line.

Delete "T-filter" and substitute double-L filter in the following places:

*Page 22,* paragraph 24*d*, lines 7 and 14 (page 2 of C 1).

*Page 28,* paragraph 32, last line (page 2 of C 1).

*Page 29,* paragraph 34, line 4 (page 3 of C 1).

Paragraph 36, line 8 (page 3 of C 1).

*Page 2,* paragraph 1*c*. Delete paragraph 1*c* and substitute:

*c*. The direct reporting by the individual user, of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended changes to DA Publications) will be used for reporting these improvements. This form will be completed in triplicate by use of pencil, pen or typewriter. The original and one copy will be forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-MR-MAN, Fort Monmouth, N. J. 07703. One information copy will be furnished to the individual's immediate supervisor (officer, noncommissioned officer, supervisor, etc.).

Paragraph 1.1*d* (page 1 of C 1). Delete subparagraph *d* and substitute:

*d*. In converters bearing Order No. 4294-PP-61 or 15043-PP-62, capacitors C212, C214, C215, C216, and resistor R230 are not used (fig. 16). The values of resistor R229 and capacitor C217 are changed and resistor R231 is changed to R230 and given a new value. Capacitor C214 has been relocated and changed in value.

*Page 18*, figure 12, note 4 (page 2 of C 1), line 5. Change "91K" to: 9,100 ohms.

*Page 19*, figure 13. Between CR5 and the junction of CR5 and C24, add: resistor R48, 100K.

*Page 20*, paragraph 19*g*. After the last sentence, add: Resistor R48 reduces the amplitude of the transient voltages and prevents damage to diode CR5.

Paragraph 21*d*. After the first sentence, add: Resistor R47 in the cathode circuit protects the tube from damage by reducing current through the stage.

*Page 21*, figure 14 (page 2 of C 1). Delete figure 14 and substitute new figure 14:

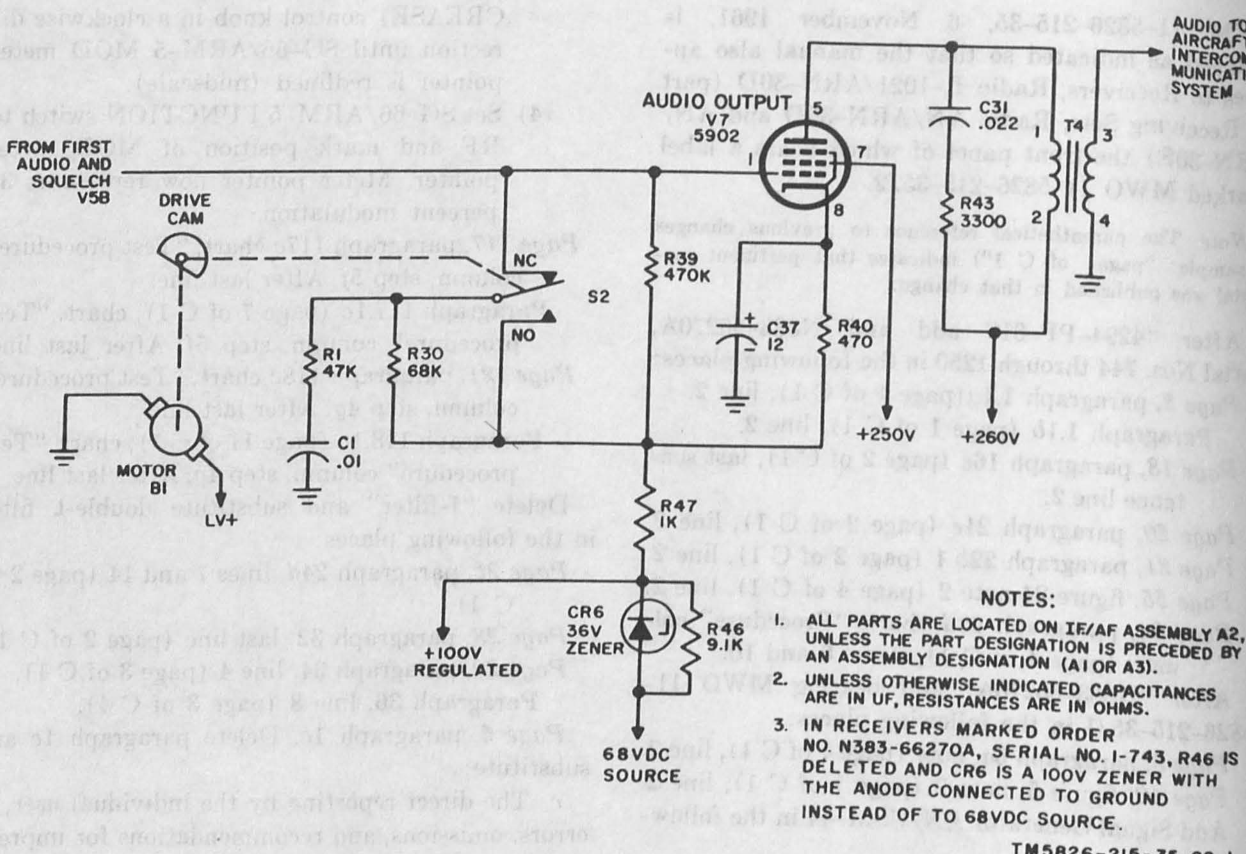



*Figure 14. Audio output V7, partial schematic diagram.*

*Page 22*, paragraph 24*d*.1 (pages 2 and 3 of C 1). Delete subparagraph *d.1* and substitute:

*d.1.* In the converter bearing Order No. 4294–PP–61, a 60-cps double-L filter is substituted in place of the 60-cps, twin-T filter. The double-L filter provides the same filtering action as the twin-T filter. The 60-cps double-L filter consists of capacitors C213 and C214, and resistors R229 and R230.

*Page 25*, figure 16 (page 2 of C 1). Delete figure 16 and substitute new figure 16:

*Page 29*, paragraph 33. Make the following changes:

Heading. After "Twin-T Filter," add: and Double-L Filter.

Line 1. After the word "filter," add: or double-L filter (fig. 16, note 4) in the converter bearing Order No. 4294–PP–61.

Line 8. After the word "network," add: and double-L filter R229, R230, C213, and C214 is a double-L type filter.

Last line. After "C217," add: or C217 in the converter bearing Order No. 4294–PP–61.

Paragraph 36, after fifth sentence (page 3 of C 1). Delete information added by Changes 1.

*Page 30,* figure 17 (page 2 of C 1), Note 3. Make the following changes:

Line 2. After "C229" and "C231," add: C230, AND C232 RESPECTIVELY.

Line 6. Change "0.02" to: 0.0051.

Schematic diagram. Change the value of capacitor C232 to: 0.0051 UF.

*Page 56,* figure 25. Change "NOTE" to: NOTES; designate the existing note as: 1. Add the following after note 1:

2. RESISTOR R20 AND DIODE CR5 (AS SHOWN) ARE IN RECEIVERS MARKED "ORDER NO. N383-66270A" ONLY. RESISTORS R47 AND R48 (NOT SHOWN) HAVE BEEN ADDED TO SUBSEQUENT MODELS.

*Page 65,* paragraph 64*a* chart, "Probable trouble" column, line 8. After "A2R39," add: A2R47 (fig. 63),.

*Page 70,* figure 34. Make the following changes:

*NOTE* (page 4 of C 1). Delete the note.

*Caption.* Beneath the caption, add: (Order No. N383-66270A only).

*Page 81,* section VII. Below the title, add:

*Note.* Depot maintenance instructions for the course indicator are contained in TM 11-5826-207-50.

*Page 114,* paragraph 113*a*. Add the following test equipment to the chart:

| Nomenclature | Federal stock No. | Technical manual |
|---|---|---|
| Signal Generator AN/USM-44 | 6625-669-4031 | TM 11-6625-508-10 |

*Page 116.* Delete figure 57 and substitute new figure 57:

Figure 57.1 (page 6 of C 1). Delete figure 57.1 and substitute new figure 57.1:

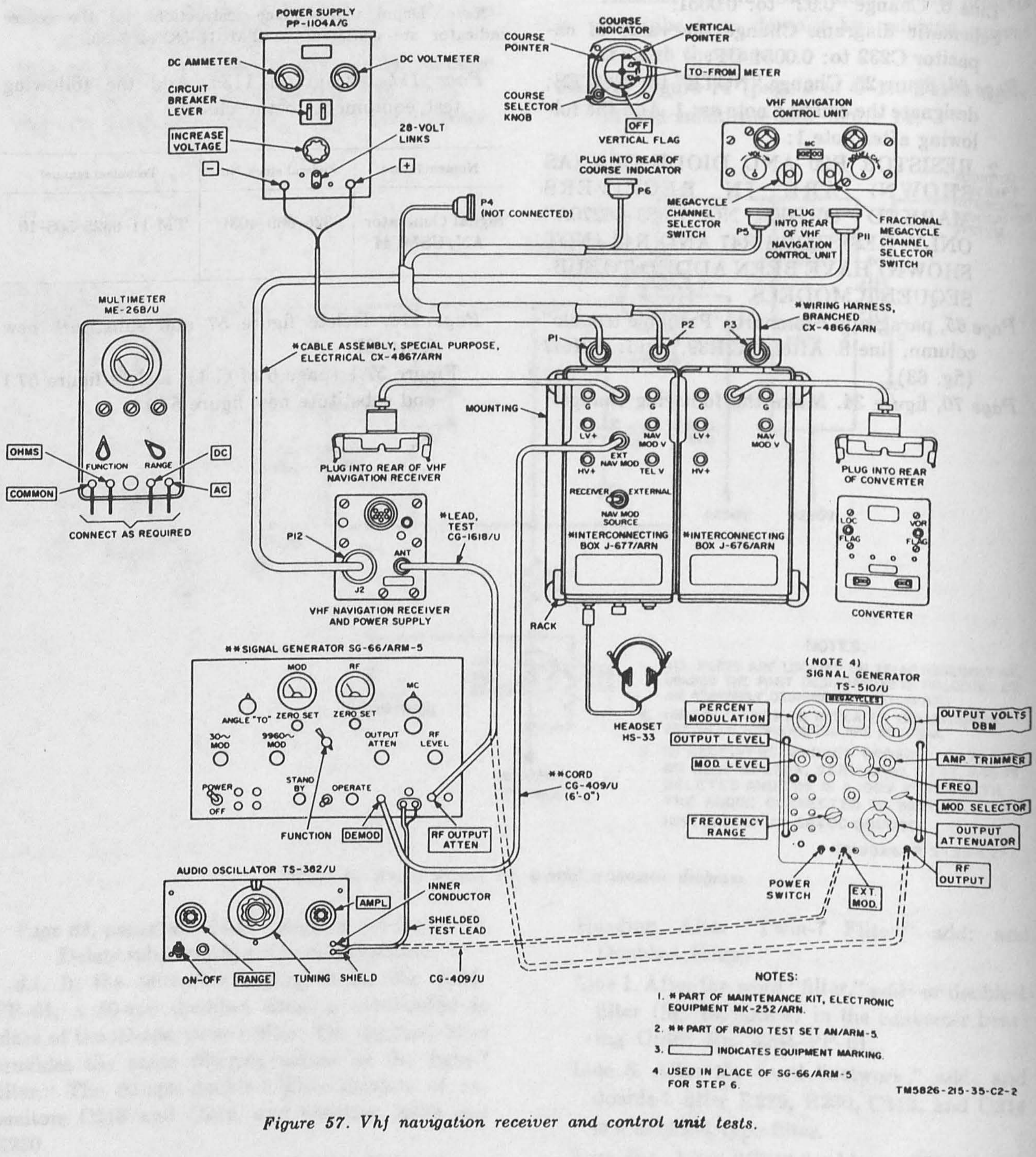



*Figure 57. Vhf navigation receiver and control unit tests.*

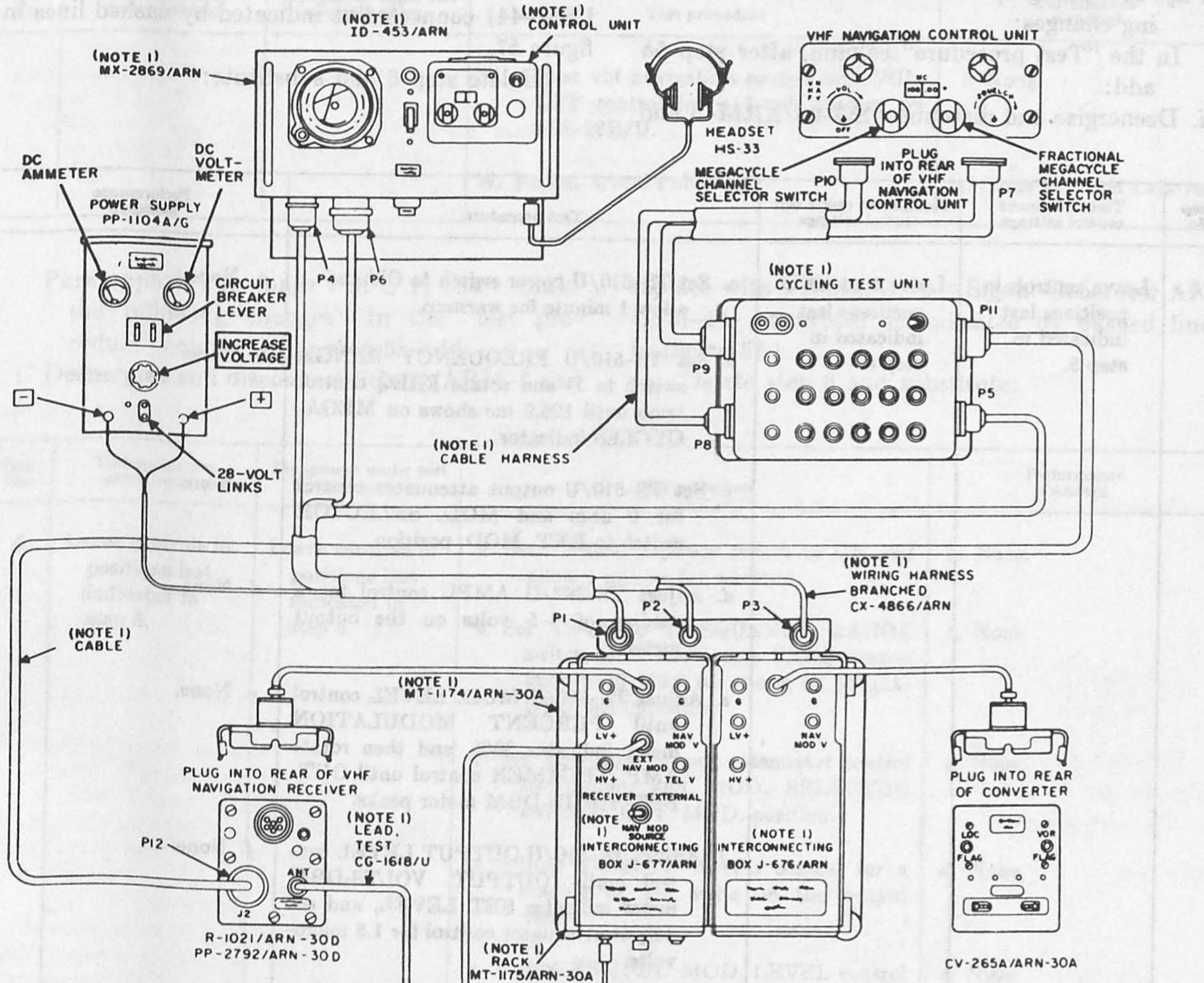



*Figure 57.1. Vhf navigation receiver and control unit tests using cycling test unit.*

*Page 117*, paragraph 117*c* chart. Make the following changes:

In the "Test procedure" column, after step 5*h* add:

*i.* Deenergize and disconnect SG–66/ARM–5 and replace with TS–510/U (p/o Signal Generator AN/USM–44) connected as indicated by dashed lines in figure 57.

Delete step 6 and substitute:

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| 6 | Leave controls in positions last indicated in step 5. | Leave controls in positions last indicated in step 5. | *a.* Set TS–510/U power switch to ON and allow 1 minute for warmup. | *a.* None. |
| | | | *b.* Set TS–510/U FREQUENCY RANGE switch to D and rotate FREQ control knob until 126.9 mc shows on MEGACYCLES indicator. | *b.* None. |
| | | | *c.* Set TS–510/U output attenuator control for 0 dbm and MOD. SELECTOR switch to EXT. MOD. position. | *c.* None. |
| | | | *d.* Adjust TS–382/U AMPL control for a reading of 4–5 volts on the output meter. | *d.* None. |
| | | | *e.* Adjust TS–510/U MOD. LEVEL control until PERCENT MODULATION meter indicates 30%, and then rotate AMP. TRIMMER control until OUTPUT VOLTS-DBM meter peaks. | *e.* None. |
| | | | *f.* Adjust TS–510/U OUTPUT LEVEL control until OUTPUT VOLTS-DBM meter indicates SET LEVEL, and set output attenuator control for 1.5 microvolts. | *f.* None. |
| | | | *g.* Adjust vhf navigation control unit VOL-OFF control to produce 5-volt reading on ME–26B/U. | *g.* None. |
| | | | *h.* Set TS–510/U output attenuator control to 50,000 microvolts. | *h.* ME–26B/U reads between 7.8 and 10 volts for 4- to 6-db rise in agc operation. |
| | | | *i.* Set TS–510/U output attenuator control to 100,000 microvolts. | *i.* ME–26B/U reads between 10 and 12.5 volts for 6- to 8-db rise in agc operation. |
| | | | *j.* Rotate TS–510/U FREQ control knob until 108.00 mc shows on MEGACYCLES indicator, and set vhf navigation control unit channel selector switches to the same frequency. | *j.* None. |
| | | | *k.* Set TS–510/U output attenuator control to 1.5 microvolts. | *k.* None. |

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| | | | *l.* Adjust vhf navigation control unit VOL-OFF control for a 5-volt reading on ME-26B/U. | *l.* None. |
| | | | *m.* Repeat *h*, and *i* above. | *m.* Same as *h* and *i* above. |

Paragraph 117.1*c* (page 7 of C 1) chart. Make the following changes: In the "test procedure" column, after step 5*h* add:

*i.* Deenergize and disconnect SG-66/ARM-5 and replace with TS-510/U (p/o Signal Generator AN/USM-44) connected as indicated by dashed lines in figure 57.1.

Delete step 6 and substitute:

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| 6 | Leave controls in positions last indicated in step 5. | Leave controls in positions last indicated in step 5. | *a.* Set TS-510/U power switch to ON and allow 1 minute for warmup. | *a.* None. |
| | | | *b.* Set TS-510/U FREQUENCY RANGE switch to D and rotate FREQ control knob until 126.9 mc shows on MEGACYCLES indicator. | *b.* None. |
| | | | *c.* Set TS-510/U output attenuator control for 0-dbm, and MOD. SELECTOR switch to EXT. MOD. position. | *c.* None. |
| | | | *d.* Adjust TS-382/U AMPL control for a reading of 4-5 volts on the output meter. | *d.* None. |
| | | | *e.* Adjust TS-510/U MOD. LEVEL control until PERCENT MODULATION meter indicates 30%, and then rotate AMP. TRIMMER control until OUTPUT VOLTS-DBM meter peaks. | *e.* None. |
| | | | *f.* Adjust TS-510/U OUTPUT LEVEL control until OUTPUT VOLTS-DBM meter indicates SET LEVEL, and set output attenuator control for 1.5 microvolts. | *f.* None. |
| | | | *g.* Adjust vhf navigation control unit VOL-OFF control to produce 5-volt reading on ME-26B/U. | *g.* None. |
| | | | *h.* Set TS-510/U output attenuator control to 50,000 microvolts. | *h.* ME-26B/U reads between 7.8 and 10 volts for 4- to 6-db rise in agc operation. |
| | | | *i.* Set TS-510/U output attenuator control to 100,000 microvolts. | *i.* ME-26B/U reads between 10 and 12.5 volts for 6- to 8-db rise in agc operation. |

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| | | | *j.* Rotate TS-510/U FREQ control knob until 108.00 mc shows on MEGACYCLES indicator, and set vhf navigation control unit channel selector switches to the same frequency. | *j.* Cycling test unit REC CYCLING lamps H and I and FRAC CYCLING lamps N, O, and P light. |
| | | | *k.* Set TS-510/U output attenuator control to 1.5 microvolts. | *k.* None. |
| | | | *l.* Adjust vhf navigation control unit VOL-OFF control for a 5-volt reading on ME-26B/U. | *l.* None. |
| | | | *m.* Repeat *h* and *i* above. | *m.* Same as *h* and *i* above. |

*Page 126*. Delete the appendix and substitute:

# APPENDIX
## REFERENCES

Following is a list of applicable references available to the field and depot maintenance repairman of the vhf navigation set.

| | |
|---|---|
| TM 11-518 | Operator's Manual: Radio test set AN/ARM-5, and Converter Frequency, Electronic AN/ARM-69(V) (ARC Type H-23A Glide Slope Test Unit). |
| TM 11-5120 | Frequency Meters AN/URM-32 and AN/URM-32A and Power Supply PP-1243/U. |
| TM 11-5126 | Power Supplies PP-1104A/G and PP-1104B/G. |
| TM 11-5551 | Instruction Book for R-f Signal Generator Set AN/URM-25. |
| TM 11-5556 | Signal Generator SG-13/ARN. |
| TM 11-5826-207-50 | Depot Maintenance: Radio Receiving Sets AN/ARN-30A, AN/ARN-30B AN/ARN-30C. |
| TM 11-5826-210-12 | Operator's and organizational maintenance Manual: Maintenance kit, electronic equipment MK-252/ARN and Test Set Adapter. |
| TM 11-5826-215-12 | Operator and Organizational Maintenance Manual: Receiving Sets, Radio AN/ARN-30D and AN/ARN-30E. |
| TM 11-5826-220-35 | Field and Depot Maintenance Manual: Power Supply PP-2792/ARN-30D. |
| TM 11-6625-200-12 | Operator and Organizational Maintenance Manual: Multimeters ME-26A/U and ME-26B/U. |
| TM 11-6625-261-12 | Operator's and Organizational Maintenance Manual: Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, TS-382E/U, and TS-382F/U. |
| TM 11-6625-274-12 | Operator's and Organizational Maintenance Manual: Test Sets, Electron Tubes TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U. |
| TM 11-6625-320-12 | Operator's and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeter Electronic ME-30B/U and ME-30C/U. |
| TM 11-6625-508-10 | Operator's Manual: Signal Generators AN/USM-44 and AN/USM-44A. |

*Page 137*, Delete figure 63 and substitute new figure 63:

*Page 138*, figure 64. Make the following changes:

Replace "BLU" (solid line) lead connected to relay K2 with a resistor symbol and mark it R1 (NOTE 6).

After note 5, add:

6. INSTALLED IN SOME MODELS.

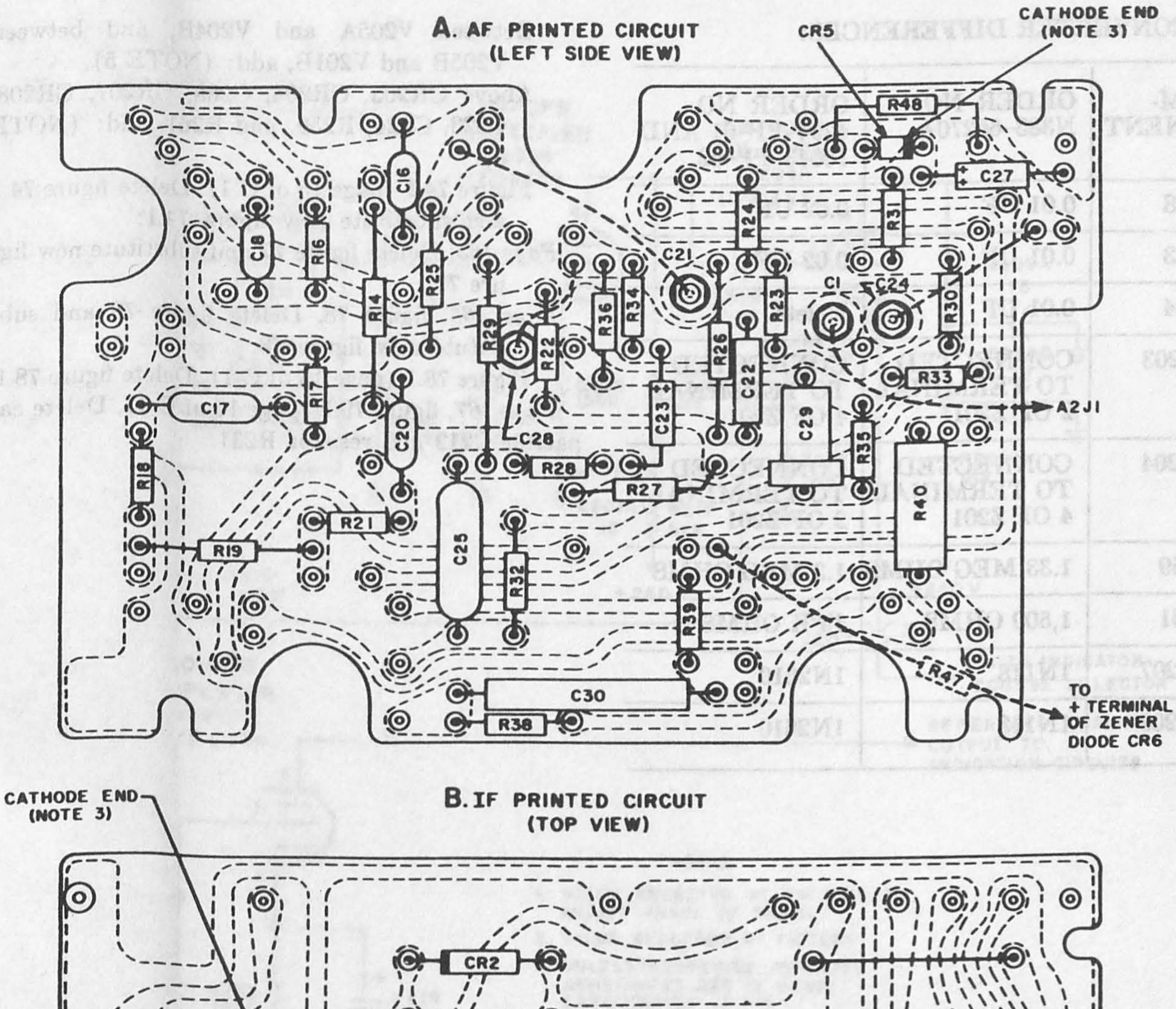
*Page 145*. Delete figures 69 (page 13 of C 1) and substitute new figure 69:

*Page 153*. Delete figure 73(1) (page 13 of C 1) and substitute new figure 73(1).

*Page 155*. Delete figure 73(2) (page 13 of C 1) and substitute new figure 73(2):

*Page 157*, figure 74 (page 13 of C 1). Make the following changes:

After "NOTES 5" add the following:




**NOTES:**

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION, A2; FOR EXAMPLE, A2C16.
2. BARE LEADS OF C1, C21, C24, AND C28 ARE COVERED WITH TEFLON TUBING (0.036 I.D.) OF SUFFICIENT LENGTH TO INSULATE THE LEADS FROM THE TOP RIMS OF THE CAPACITORS.
3. DARK BAND ON CRYSTAL DIODE INDICATES END NEAREST COLOR CODING BANDS.
4. — PARTS AND PIGTAILS ON FRONT OF BOARDS.
5. -- WIRING AND PARTS ON BACK OF BOARDS.

TM5826-215-35-C2-4

*Figure 63. Receiver, Radio R-1021/ARN-30D AF and IF printed circuits, wiring diagram.*

6. CONVERTER DIFFERENCES:

| COMPONENT | ORDER NO. N383-66270A | ORDER NO. 4294-PP-61 AND 15043-PP-62 |
|---|---|---|
| C208 | 0.01 UF | 0.02 UF |
| C223 | 0.01 UF | 0.02 UF |
| C224 | 0.01 UF | Delete |
| CR203 | CONNECTED TO TERMINAL 2 OF Z201 | CONNECTED TO TERMINAL 4 OF Z201 |
| CR204 | CONNECTED TO TERMINAL 4 OF Z201 | CONNECTED TO TERMINAL 2 OF Z201 |
| R259 | 1.33 MEG OHMS | 1.3 MEG OHMS |
| R261 | 1,500 OHMS | 15 K OHMS |
| CR207 | 1N118 | 1N2610 |
| CR208 | 1N118 | 1N2610 |

Between V205A and V204B, and between V205B and V201B, add: (NOTE 5).

Above CR203, CR204, C208, CR207, CR208, C223, C224, R259, and R261, add: (NOTE 6).

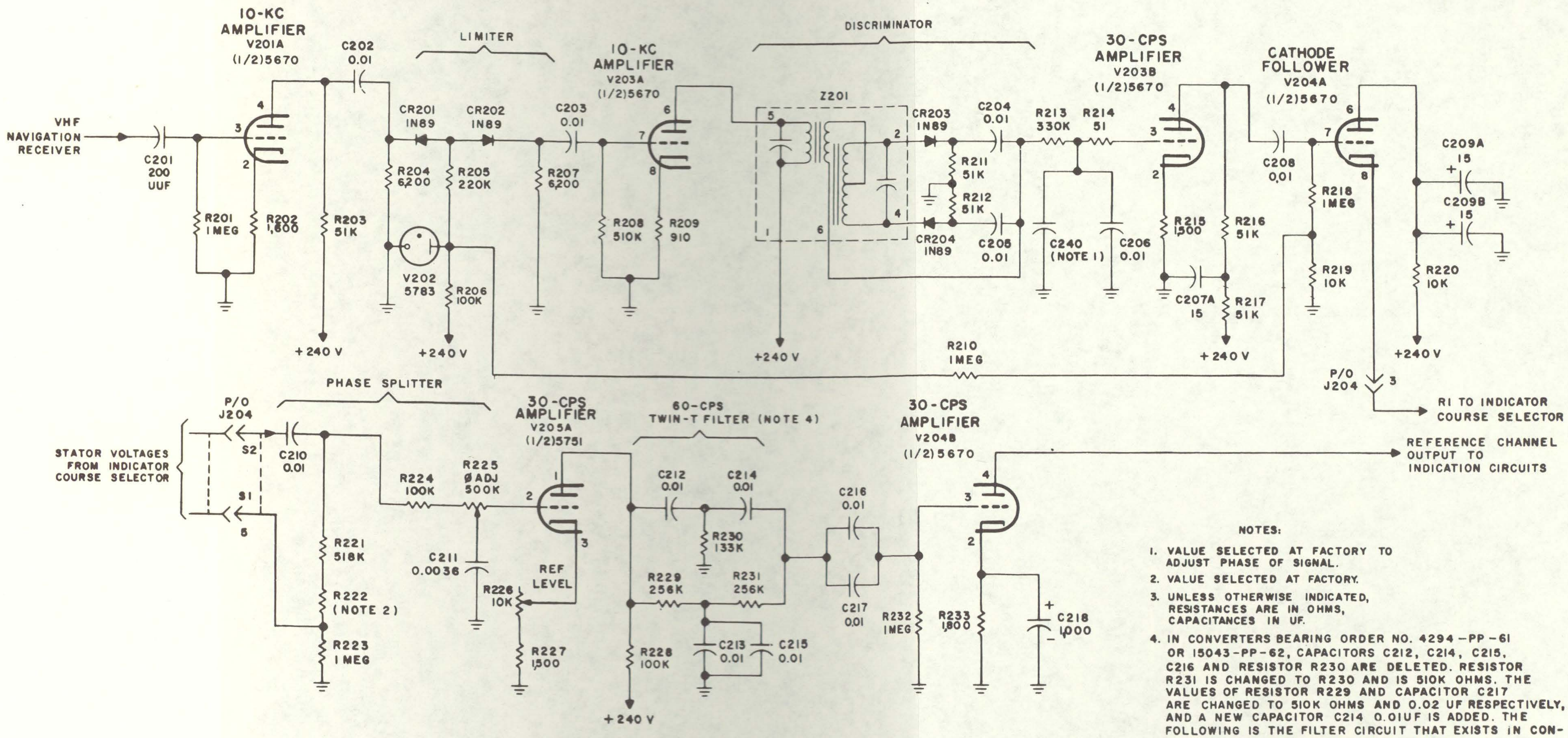
Figure 74.1 (page 15 of C 1). Delete figure 74.1 and substitute new figure 74.1:

*Page 163*. Delete figure 77 and substitute new figure 77.

*Page 165*, figure 78. Delete figure 78 and substitute new figure 78:

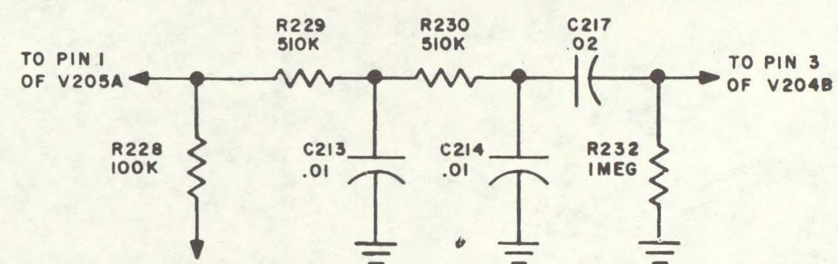
Figure 78.1 (page 15 of C 1). Delete figure 78.1.

*Page 167*, figure 79.1 (page 16 of C 1). Delete capacitor C212 and resistor R231.




NOTES:

1. VALUE SELECTED AT FACTORY TO ADJUST PHASE OF SIGNAL.
2. VALUE SELECTED AT FACTORY.
3. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES IN UF.
4. IN CONVERTERS BEARING ORDER NO. 4294-PP-61 OR 15043-PP-62, CAPACITORS C212, C214, C215, C216 AND RESISTOR R230 ARE DELETED. RESISTOR R231 IS CHANGED TO R230 AND IS 510K OHMS. THE VALUES OF RESISTOR R229 AND CAPACITOR C217 ARE CHANGED TO 510K OHMS AND 0.02 UF RESPECTIVELY, AND A NEW CAPACITOR C214 0.01UF IS ADDED. THE FOLLOWING IS THE FILTER CIRCUIT THAT EXISTS IN CONVERTERS BEARING ABOVE ORDER NUMBERS.




TM5826-215-35-C2-10

*Figure 16. VOR reference channel circuit, partial schematic diagram.*

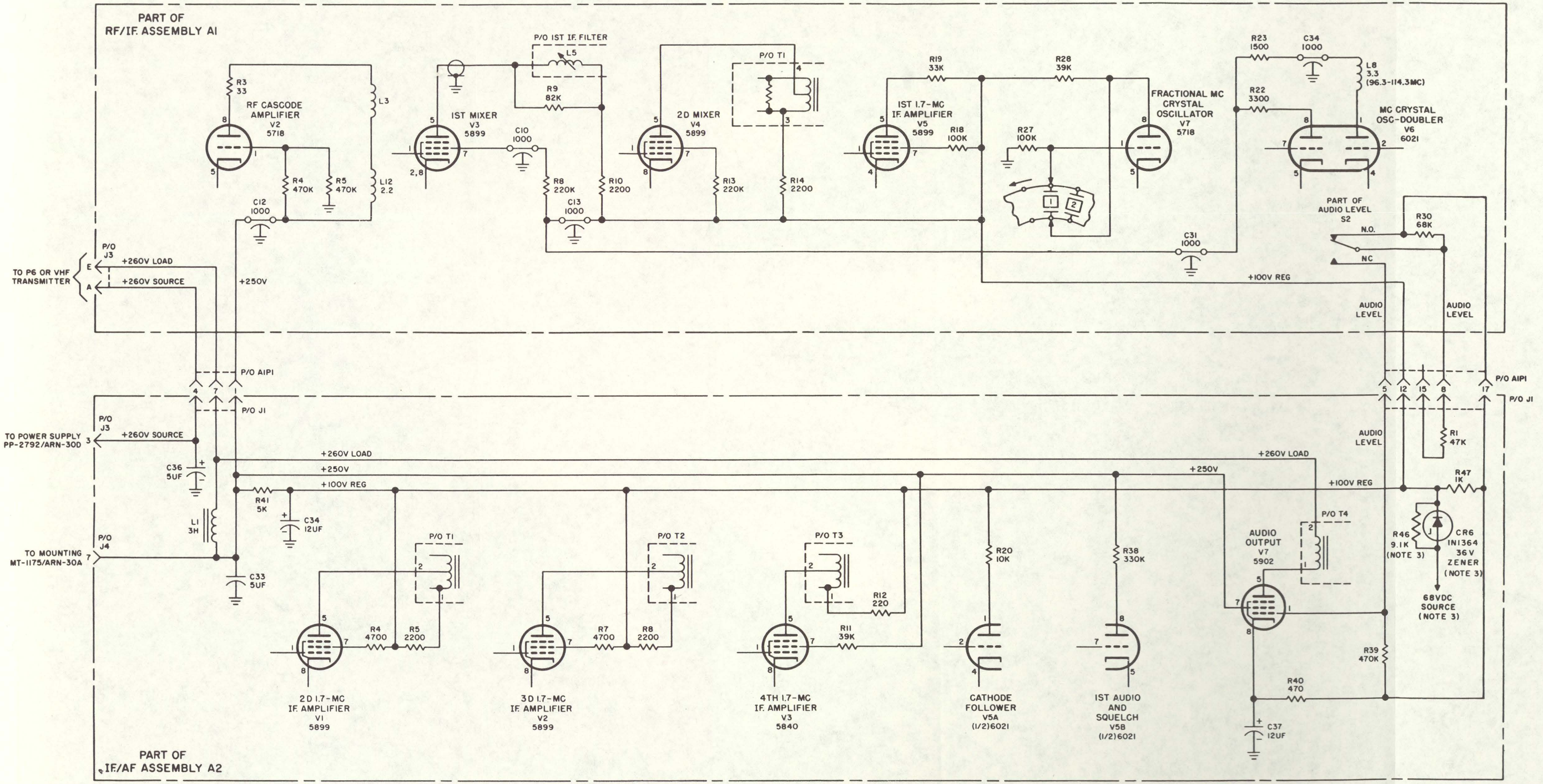
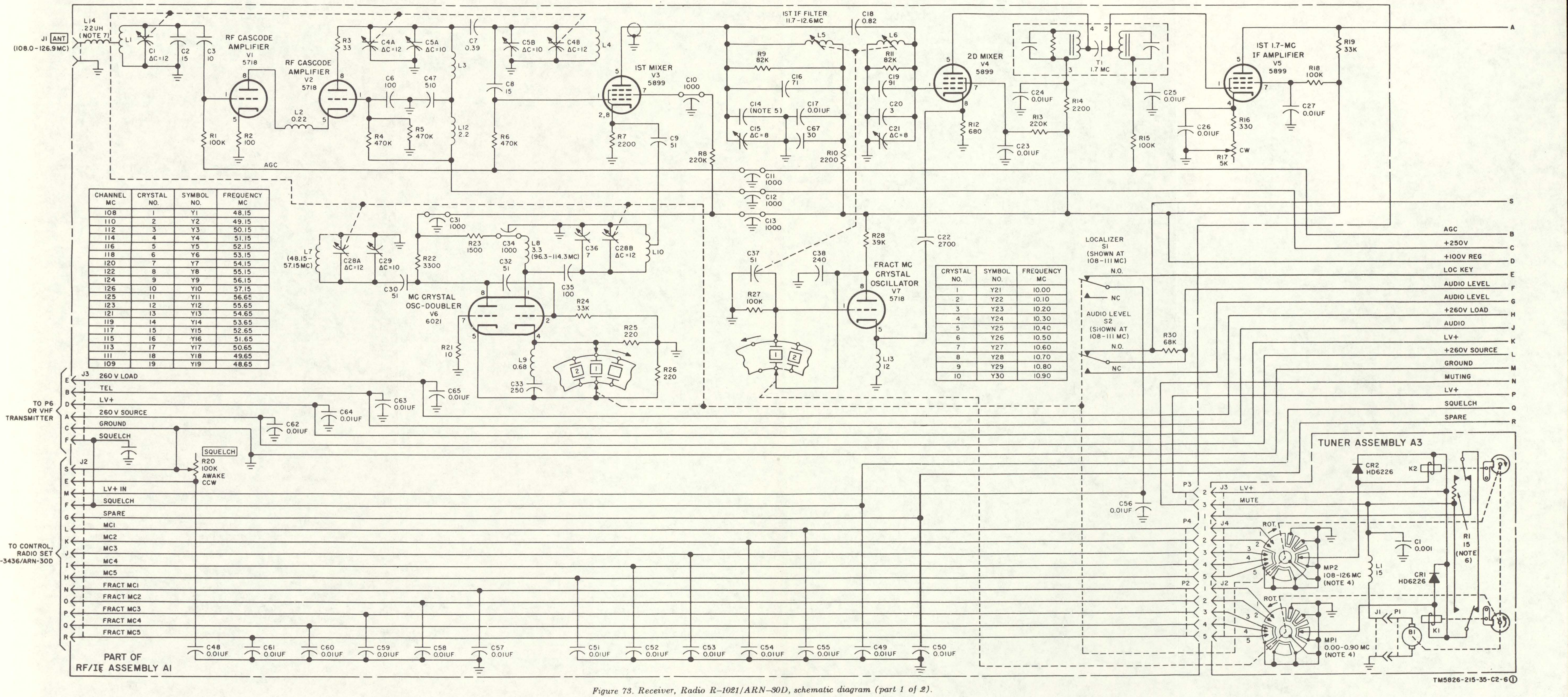



*Figure 69. Vhf navigation receiver high voltage (HV+) distribution diagram.*

NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION A1 OR A2, WHICHEVER APPLIES; FOR EXAMPLE, A1J3.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, INDUCTANCES ARE IN MICROHENRIES.
3. IN RECEIVERS MARKED ORDER NO. N383-66270A, SERIAL NO. 1-743, R46 IS DELETED AND CR6 IS A 100V ZENER WITH THE ANODE CONNECTED TO GROUND INSTEAD OF TO 68VDC SOURCE.

TM5826-215-35-C2-5

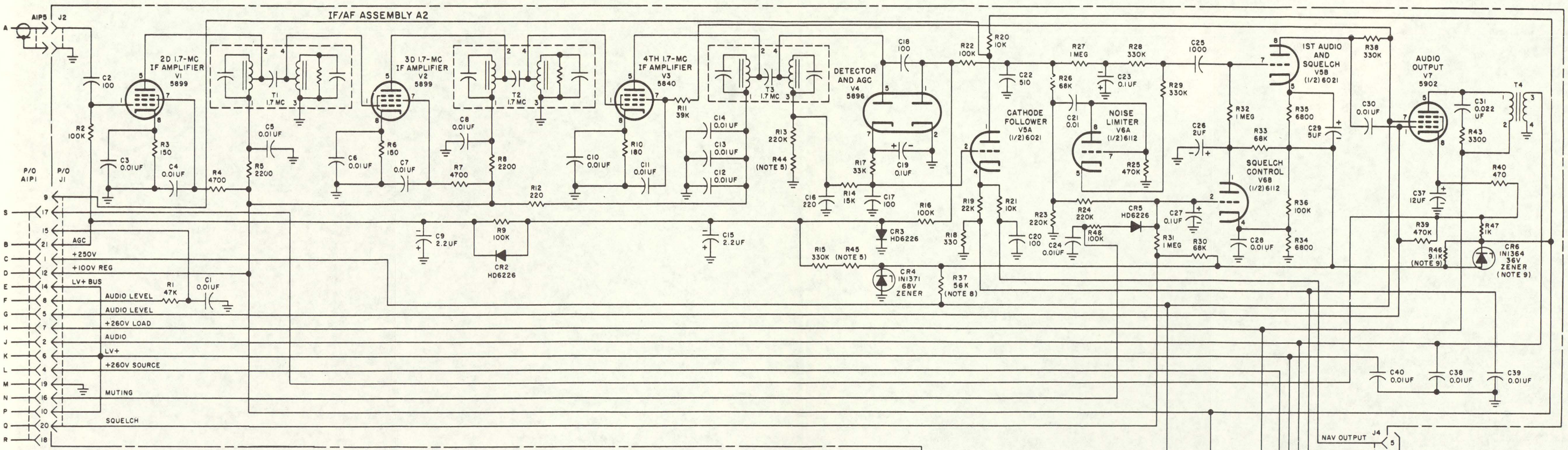


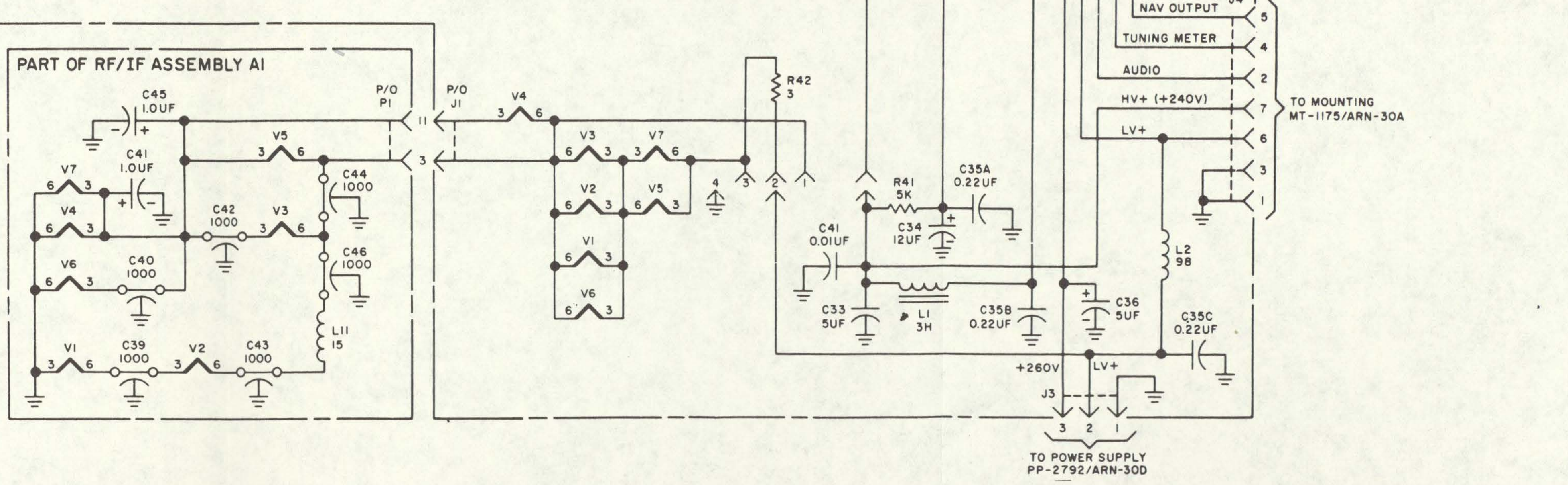

| CHANNEL MC | CRYSTAL NO. | SYMBOL NO. | FREQUENCY MC |
|---|---|---|---|
| 108 | 1 | Y1 | 48.15 |
| 110 | 2 | Y2 | 49.15 |
| 112 | 3 | Y3 | 50.15 |
| 114 | 4 | Y4 | 51.15 |
| 116 | 5 | Y5 | 52.15 |
| 118 | 6 | Y6 | 53.15 |
| 120 | 7 | Y7 | 54.15 |
| 122 | 8 | Y8 | 55.15 |
| 124 | 9 | Y9 | 56.15 |
| 126 | 10 | Y10 | 57.15 |
| 125 | 11 | Y11 | 56.65 |
| 123 | 12 | Y12 | 55.65 |
| 121 | 13 | Y13 | 54.65 |
| 119 | 14 | Y14 | 53.65 |
| 117 | 15 | Y15 | 52.65 |
| 115 | 16 | Y16 | 51.65 |
| 113 | 17 | Y17 | 50.65 |
| 111 | 18 | Y18 | 49.65 |
| 109 | 19 | Y19 | 48.65 |

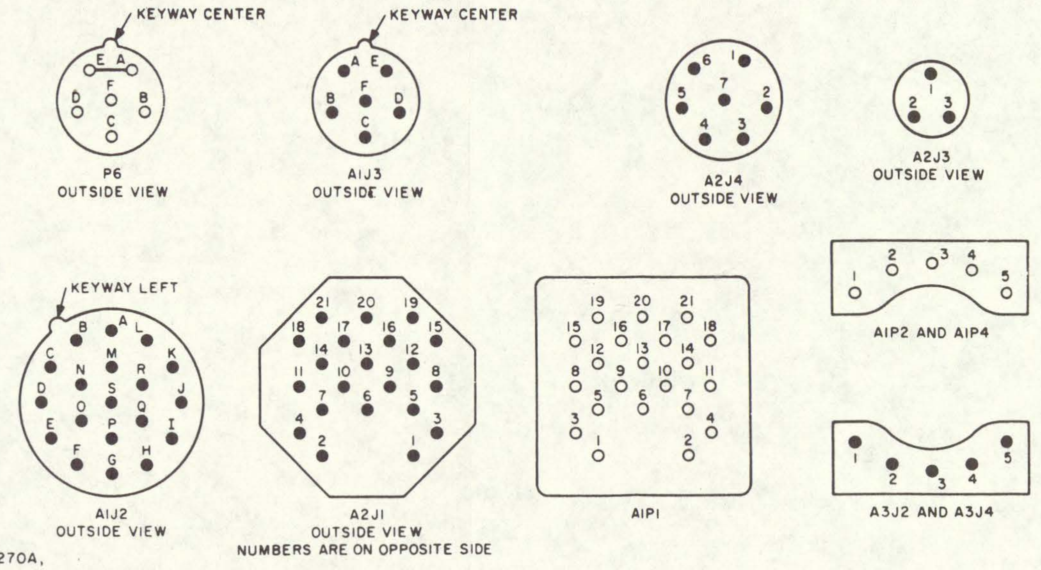
| CRYSTAL NO. | SYMBOL NO. | FREQUENCY MC |
|---|---|---|
| 1 | Y21 | 10.00 |
| 2 | Y22 | 10.10 |
| 3 | Y23 | 10.20 |
| 4 | Y24 | 10.30 |
| 5 | Y25 | 10.40 |
| 6 | Y26 | 10.50 |
| 7 | Y27 | 10.60 |
| 8 | Y28 | 10.70 |
| 9 | Y29 | 10.80 |
| 10 | Y30 | 10.90 |

TM5826-215-35-C2-6(1)

*Figure 73. Receiver, Radio R-1021/ARN-30D, schematic diagram (part 1 of 2).*



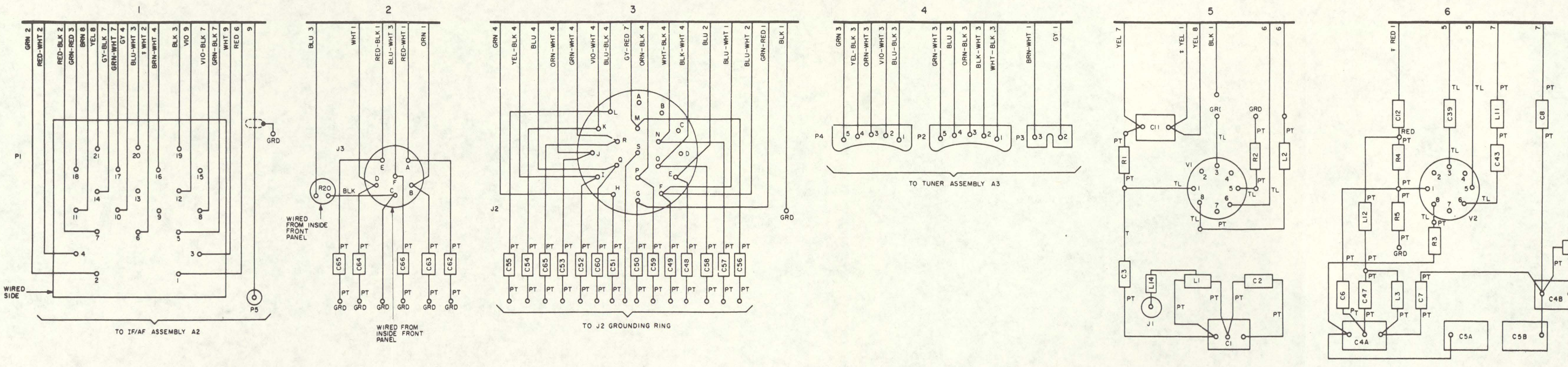



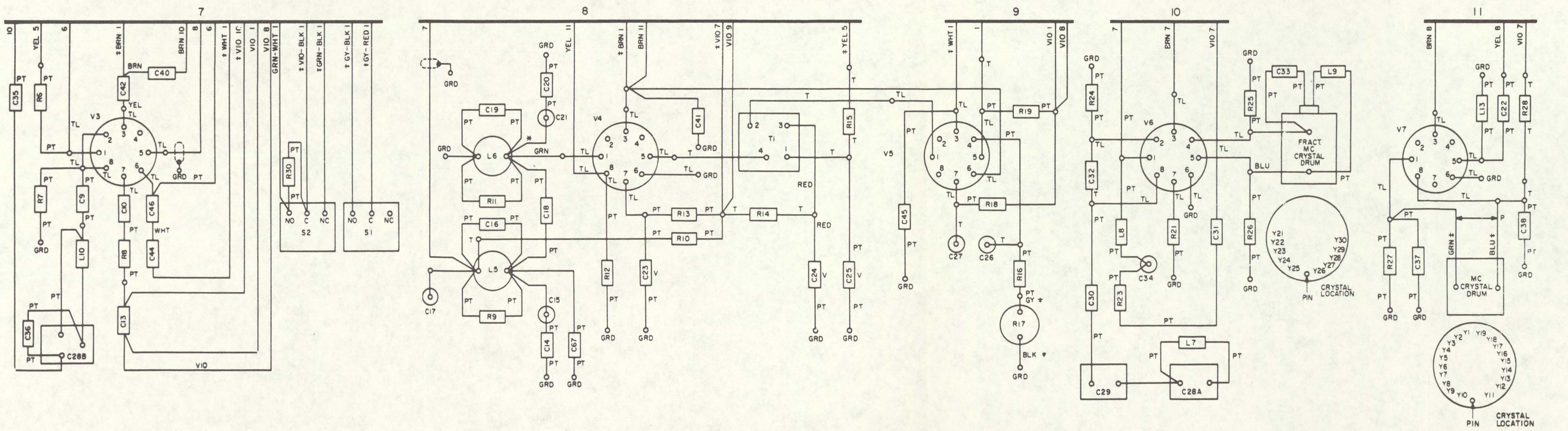

NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION A1, A2, OR A3, WHICHEVER APPLIES; FOR EXAMPLE, A1J2.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, INDUCTANCES ARE IN MICROHENRIES.
3. ▭ INDICATES EQUIPMENT MARKING.
4. TOP PLATES A3MP1 AND A3MP2 ARE SHOWN IN THE 0.00-MC AND 108-MC POSITIONS, RESPECTIVELY.
5. VALUES OF THE FOLLOWING PARTS ARE SELECTED AND INSTALLED DURING FINAL FACTORY ADJUSTMENT:
   A2R44 47K TO 470K
   A2R45 47K TO 470K
   A1C14 3 TO 15
6. INCLUDED IN SOME EARLY MODELS
7. ADDED BY MWO 11-5826-215-35/1
8. INCLUDED IN RECEIVERS MARKED N383-66270A, SERIAL NO. 1-743 ONLY.
9. IN RECEIVERS MARKED N383-66270A, SERIAL NO. 1-743, R46 IS DELETED AND CR6 (1N1375) IS A 100V ZENER WITH THE ANODE CONNECTED TO GROUND INSTEAD OF THE 68V DC SOURCE (AS SHOWN).

TM5826-215-35-C2-6 (2)

*Figure 73. Receiver, Radio R–1021/ARN–30D, schematic diagram (part 2 of 2).*



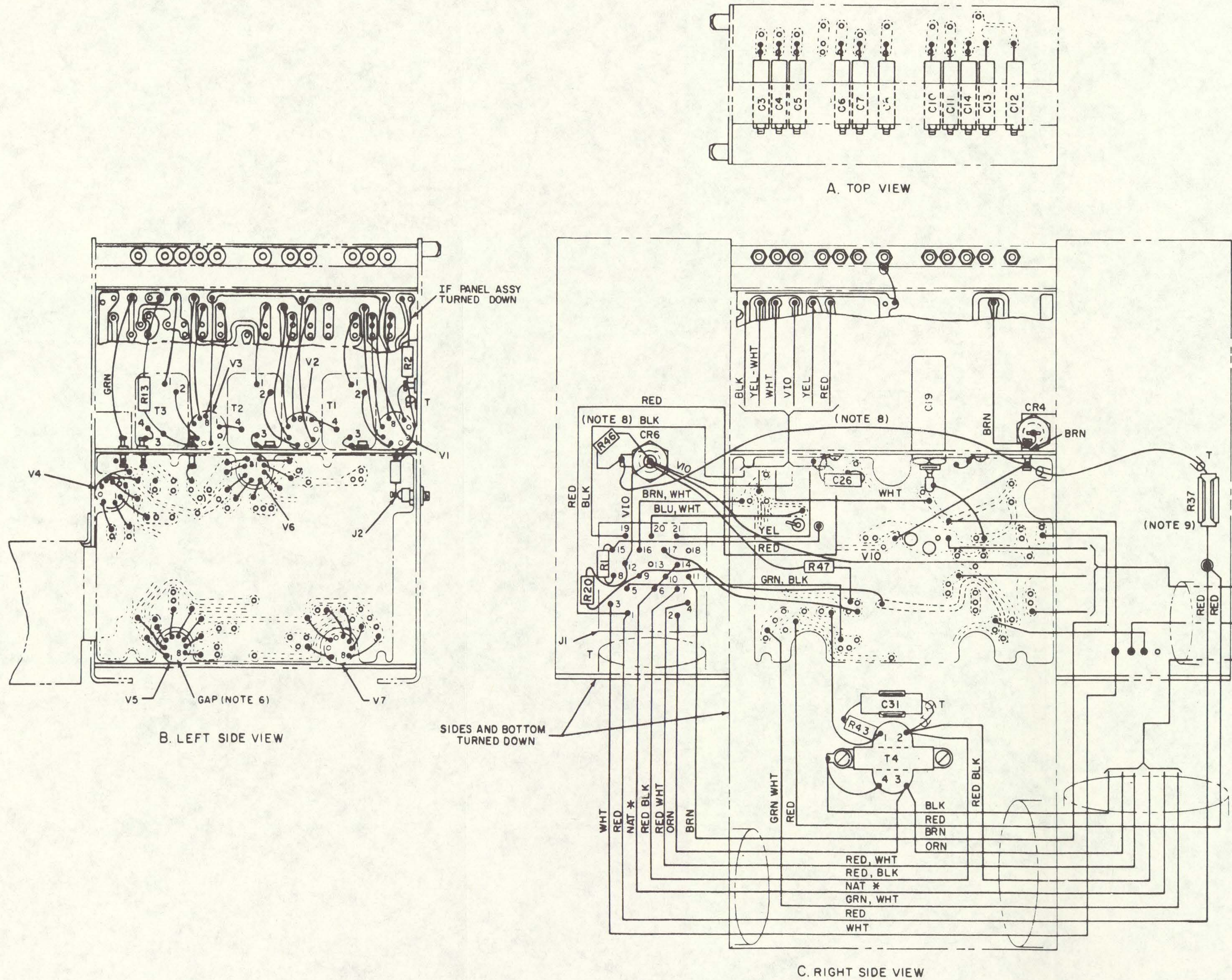



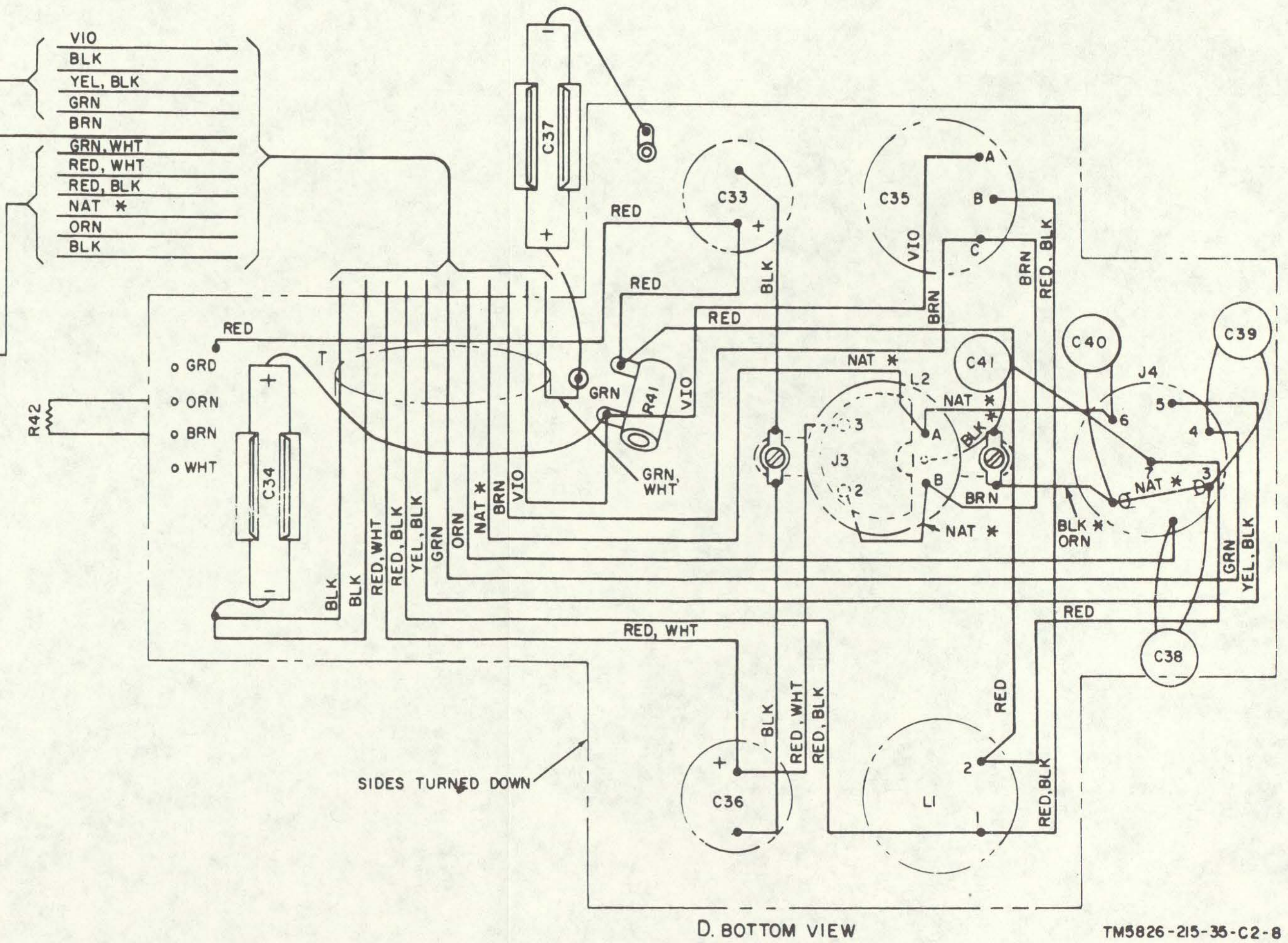

NOTES:

1. THE SMALL NUMBER ON EACH WIRE (ADJACENT TO THE COMMON OR BASE LINE) CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS.
2. WIRES NOT OTHERWISE SPECIFIED ARE NO. 24 BARE SOLID COPPER.
3. PT DENOTES PIGTAIL LEAD.
4. TL DENOTES MICROMINIATURE TUBE LEAD.
5. (⊂⊃)-- DENOTES SHIELDED CONNECTION.
6. T DENOTES TEFLON TUBING OVER WIRE.
7. MICROMINIATURE TUBE LEADS DRESSED BARE WITH 1/16 IN. MINIMUM CLEARANCE.
8. UNUSED MICROMINIATURE TUBE LEADS CUT OFF APPROXIMATELY 1/32 IN. FROM GLASS.
9. * DENOTES NO.22 BARE TINNED COPPER.
10. V DENOTES VINYLITE TUBING AROUND ASSOCIATED COMPONENT.
11. P DENOTES TWISTED PAIR.
12. WIRES MARKED WITH A COLOR NOTE ARE NO. 24 SOLID COPPER, TEFLON INSULATED.
13. WIRES MARKED WITH A COLOR NOTE AND A DAGGER (†) ARE NO. 22 STRANDED COPPER, TEFLON INSULATED.
14. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX PARTS DESIGNATION WITH ASSEMBLY DESIGNATION A1; FOR EXAMPLE A1C11.

TM5826-215-35-C8-7

*Figure 77. Receiver, Radio R-1021/ARN-30D, RF/IF assembly A1, wiring diagram.*



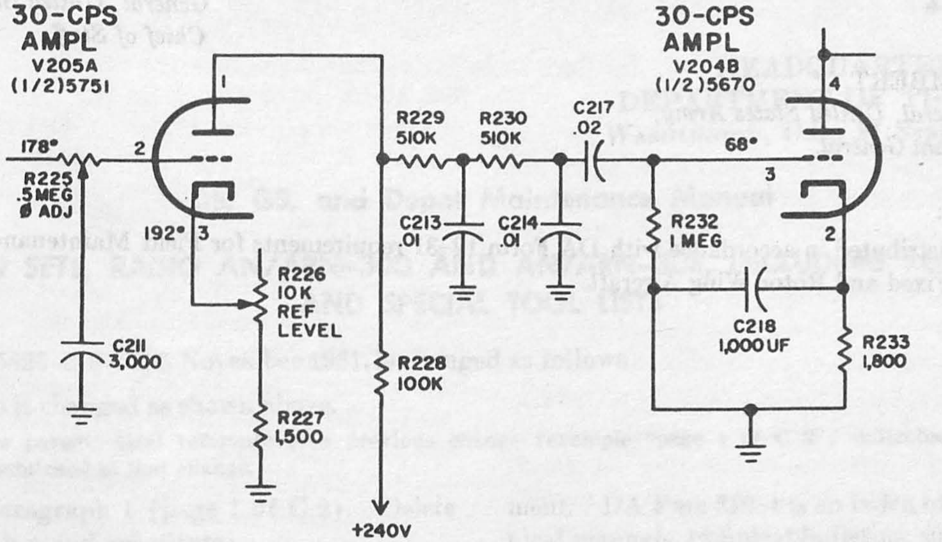




NOTES:

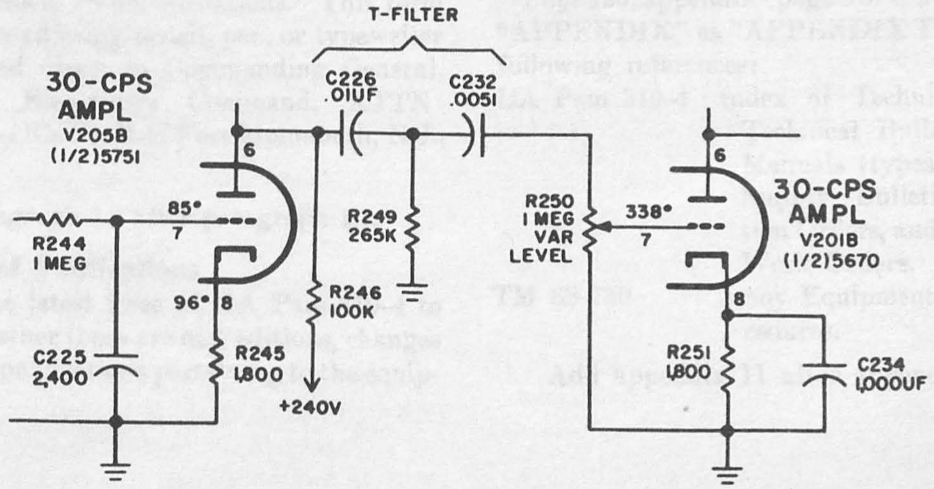
1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION, A2; FOR EXAMPLE, A2C1.
2. WIRES MARKED WITH A COLOR NOTE ARE NO. 24 SOLID COPPER, TEFLON INSULATED.
3. WIRES MARKED WITH A COLOR NOTE AND AN ASTERISK (*) ARE NO. 20 STRANDED COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 BARE, SOLID, TINNED COPPER.
5. TEFLON TUBING OF APPROPRIATE SIZE AND LENGTH IS INSTALLED OVER WIRES MARKED "T".
6. VACUUM TUBES ARE VIEWED TOWARD BASE IN LEFT SIDE VIEW. ORIENT TUBES IN CLIP AS SHOWN. DRESS BARE TUBE LEADS WITH 1/16 IN. MINIMUM CLEARANCE. CUT OFF UNUSED LEADS APPROXIMATELY 1/32 IN. FROM GLASS.
7. TEFLON TUBING IS INSTALLED OVER LEADS OF V1, V2, AND V3.
8. IN RECEIVERS MARKED ORDER NO. N383-66270A, SERIAL NO. 1-743, R46 AND CONNECTION BETWEEN CR6 AND CR4 IS DELETED, AND ANODE OF CR6 IS GROUNDED.
9. INSTALLED IN RECEIVERS MARKED ORDER NO. N383-66270A SERIAL NO. 1-743 ONLY.

TM5826-215-35-C2-8

*Figure 78. Receiver, Radio R-1021/ARN-30D, IF/AF assembly, A2, wiring diagram.*




A. FILTER IN VOR REFERENCE CHANNEL CIRCUIT (ON ORDER NO. 4294-PP-61 ONLY).




B. T-FILTER IN VARIABLE CHANNEL CIRCUIT (ON ORDER NO. 4294-PP-61 ONLY).

NOTE:
UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.

TM5826-215-35-C2-9

*Figure 741. Converter, Order No. 4294–PP–61 and 15043–PP–62, VOR variable and VOR reference channel, 30-cps amplifier, partial schematic diagram.*

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
*General, United States Army,*
*Chief of Staff.*

Official:

J. C. LAMBERT,
*Major General, United States Army,*
*The Adjutant General.*

Distribution:

To be distributed in accordance with DA Form 12-31 requirements for Field Maintenance Instructions for All Fixed and Rotor Wing Aircraft.

CHANGE No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *21 September 1965*

**DS, GS, and Depot Maintenance Manual**

# RECEIVING SETS, RADIO AN/ARN-30D AND AN/ARN-30E, INCLUDING REPAIR PARTS AND SPECIAL TOOL LISTS

TM 11-5826-215-35, 6 November 1961, is changed as follows:

The title is changed as shown above.

*Note.* **The parenthetical reference to a previous change (example "page 1 of C 2") indicates that pertinent material was published in that change.**

*Page 2*, Paragraph 1 (page 1 of C 2). Delete subparagraph *c* and substitute:

*c. Reporting of Equipment Manual Improvements.* The direct reporting by the individual user of errors, omissions, and recommendations for improving this manual is authorized and encouraged. DA Form 2028 (Recommended Changes to DA Publications) will be used for reporting these improvement recommendations. This form will be completed using pencil, pen, or typewriter and forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-MP-(NMP)-MA, Fort Monmouth, N.J., 07703.

Add paragraph 1.2 after paragraph 1.1.

## 1.2. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes or additional publications pertaining to the equipment. DA Pam 310-4 is an index of current technical manuals, technical bulletins, supply manuals (types 7, 8, and 9), supply bulletins, lubrication orders, and modification work orders that are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc.) and the latest changes and revisions of each equipment publication.

*Page 126*, appendix (page 8 of C 2). Designate "APPENDIX" as "APPENDIX I" and add the following references:

| | |
|---|---|
| DA Pam 310-4 | Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders. |
| TM 38-750 | Army Equipment Record Procedures. |

Add appendix II after appendix I.

*This change supersedes TM 11-5826-215-35P, 1 March 1962, including C 1, 6 August 1963.

# APPENDIX II

# DIRECT AND GENERAL SUPPORT AND DEPOT REPAIR PARTS LIST

## Section I. Introduction

### 1. General

*a.* This manual lists the quantities of repair parts for direct support, general support and depot maintenance and is a basis for requisitioning authorized parts. It is also a guide for depot maintenance in establishing initial levels of spare parts.

*b.* Columns are as follows:

(1) *Source, maintenance, and recoverability code.* Source, maintenance, and recoverability codes indicate the technical service responsible for supply, the maintenance category at which an item is stocked, categories at which an item is installed or repaired, and whether an item is repairable or salvageable. The source code column is divided into four parts.

(*a*) *Column A.* This column indicates the materiel code and designates the area of responsibility for supply. AR 310–1 defines the basic numbers used to identify the materiel code. If the part is Signal materiel responsibility, the column is left blank.

(*b*) *Column B.* Not used.

(*c*) *Column C.* This column indicates the lowest maintenance categories authorized to install the part.

"O"—Organizational maintenance (operator and organizational).
"F"—Direct support maintenance.
"H"—General support maintenance.

(*d*) *Column D.* Not used.

(2) *Federal stock number.* This column lists the 11-digit Federal stock number.

(3) *Designation by model.* The dagger (†) indicates model in which the part is used.

(4) *Description.* Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

(5) *Unit of issue.* The unit of issue is each unless otherwise indicated and is the supply term by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes.

(6) *Expendability.* Nonexpendable items are indicated by NX. Expendable items are not annotated.

(7) *Quantity incorporated in unit.* This column lists the quantity of each part found in a given assembly, component, or equipment.

(8) *Direct support.* This column indicates quantities of repair parts authorized for initial stockage for use in the direct support maintenance and in supply support to organization. The quantities are based on 100 equipments to be maintained for a 15-day period.

(9) *General support.* The numbers in this column indicate quantities of repair parts authorized for initial stockage for use in general support maintenance. The quantities are based on 100 equipments to be maintained for a 15-day period.

(10) *Depot.* The numbers in this column indicate quantities of repair parts authorized for depot maintenance and for initial stockage for maintenance, and for supply support to lower categories. The entries are based on the quantity required for rebuild of 100 equipments.

(11) *Illustration.* The "Item No." column lists the reference designations that appear on the part in the equipment. These same designations are also used on any illustrations of the equipment. The numbers in the "Figure No." column refer to the illustrations where the part is shown.

### 2. Parts for Maintenance

When this equipment is used by signal service organizations organic to theater headquarters or communication zones to provide theater communications, those repair parts authorized up to and including general support are authorized for stockage by the organization operating this equipment.

### 3. Electron Tubes

The consumption rates given for tubes are conservative theoretical estimates and are provided for use only when more complete information, such as data based on operating experience, is not available. These figures are based on levels and requirements for equipment actually in use, not on authorizations or equipment stored in depots.

### 4. Maintenance Allowances

If a maintenance part is listed more than once, the total allowance factors and authorized quantities for the item will be shown the first time it appears in the list. Each subsequent time that the part is listed a "Z" sign will be used in the maintenance allowance columns to indicate the allowance factors and quantities have been previously shown in the list. Allowance is based on the total quantity of the item used in the installation.

### 5. Group Arrangement

This list is arranged in the following group order:

Group I—Receiving Set, Radio AN/ARN-30D and AN/ARN-30E

II—Antenna AS-580A/ARN-30

III—Control, Radio Set C-3436/ARN-30D, C-3436A/ARN-30D

IV—Converter, Signal Data CV-265A/ARN-30A, CV-265B/ARN-30A

V—Indicator ID-453/ARN-30

VI—Mounting MT-1174/ARN-30A

VII—Mounting MT-1175/ARN-30A, MT-1175A/ARN-30A

VIII—Receiver, Radio R-1021/ARN-30D

VIIIa—Cover Assembly (ARC P/N 21779)

VIIIb—Frame Assembly (ARC P/N 22297)

VIIIb1—Printed Circuit Assembly (ARC P/N 22244)

VIIIb2—Printed Circuit Assembly (ARC P/N 22285)

VIIIb3—Plate Assembly (ARC P/N 21848)

VIIIb4—Plate Assembly (ARC P/N 22102)

VIIIb5—Intercon Box (ARC P/N 22312)

VIIIc—Tuner Assembly (ARC P/N 22203-0028)

### 6. Requisitioning Information

*a.* The allowance factors are based on 100 equipments. In order to determine the number of parts authorized for initial stockage for the specific number of equipments supported, the following formula will be used and carried out to two decimal places.

$$\text{Specific number of equipments supported} \times \frac{\text{allowance factor}}{100} = \text{Number of parts authorized for initial stockage.}$$

*b.* Fractional values obtained from above computation will be rounded to whole numbers as follows:

(1) When the total number of parts authorized is less than 0.5, the quantity authorized will be zero.

(2) When the total number of parts authorized is between 0.5 and 1.0, the quantity authorized will be one.

(3) For all values above one, fractional values below 0.5 will revert to the next lower whole number and fractional value 0.5 and above will advance to the next higher whole number.

(4) Parenthesis ( ) around the allowance factor listed in the direct support column indicates that the item is combat essential and that a minimum quantity of one is authorized for initial stockage even though the computed quantity is less than 0.5.

*c.* The quantities determined in accordance with the above computation represent the initial stockage for a 15-day period.

SECTION: II. DIRECT AND GENERAL SUPPORT AND DEPOT FUNCTIONAL PARTS LIST

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | GROUP I<br>RECEIVING SET, RADIO AN/ARN-30D, AN/ARN-30E | | | | | | | | |
| | | | | 5826-752-5814 | | RECEIVING SET RADIO AN/ARN-30D: 1 band, 108-126.90 mc freq range, 190 channels, 28 v dc, rack mts, ARC type 15F | | NX | 1 | | | | | |
| | | | | 5826-892-1056 | | RECEIVING SET RADIO AN/ARN-30E: 1 band, 108-126.90 mc freq range, 190 channels ±28 vdc, rack mts, ARC type 15F | | NX | 1 | | | | | |
| | | F | | 5935-195-4066 | | CONNECTOR, PLUG, ELECTRICAL UG-88C: single rd female cont | | | 2 | 0.3 | 0.1 | 10 | | P1301 |
| | | F | | 5935-258-5828 | | CONNECTOR, PLUG, ELECTRICAL: 2 rd female cont, banana type, ARC part/dwg No. 14321 | | | 1 | 0.2 | 0.1 | 5 | | P1304 |
| | | F | | 5935-549-7486 | | CONNECTOR, PLUG, ELECTRICAL: 6 female cont, banana type ARC part/dwg No. 15911 | | | 1 | 0.2 | 0.1 | 5 | | P1307 |
| | | F | | 5935-549-7487 | | CONNECTOR, PLUG, ELECTRICAL: 8 female cont, banana type, ARC part/dwg No. 15912 | | | 1 | 0.2 | 0.1 | 5 | | P1305 |
| | | F | | 5935-295-5438 | | CONNECTOR, PLUG, ELECTRICAL: 8 rd female cont, straight ARC part/dwg No. 14050 | | | 2 | 0.3 | 0.1 | 10 | | P1303<br>P1306 |
| | | F | | 5935-678-8491 | | CONNECTOR, PLUG, ELECTRICAL: 8 rd female cont straight ARC part/dwg No. 16210 | | | 1 | 0.2 | 0.1 | 5 | | |
| | | F | | 5935-257-8311 | | CONNECTOR, PLUG, ELECTRICAL: 19 rd female cont, locking type, ARC part/dwg No.14320 | | | 1 | 0.2 | 0.1 | 5 | | |
| | | F | | 5935-549-4212 | | CONNECTOR, PLUG, ELECTRICAL: 19 cont, straight, ARC part/dwg No. 16115 | | | 1 | 0.2 | 0.1 | 5 | | |
| | | F | | 6145-542-6092 | | RADIO FREQUENCY CABLE RG-58C/U:(Aughorized quanity will be a minimum of or a multiple of 20 ft) | ft | | 20 | 1.7 | 0.6 | 20 | | |
| | | | | | | GROUP II<br>ANTENNA AS-580A/ARN-30 | | | | | | | | |
| | | F | | 5910-667-9693 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 mmf ±2%, 600 vdcw, Centralab type TU30101GUZJ | | | 1 | 0.3 | 0.1 | 5 | | C801 |
| | | F | | 5910-667-9700 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 12 mmf ±5%, 600 vdcw, Centralab type TV20120JSIG | | | 1 | 0.3 | 0.1 | 5 | | C802 |

| SOURCE CODE (A/B/C/D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL 1 | 2 | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5935-577-8779 | | | CONNECTOR, RECEPTACLE, ELECTRICAL: Jack UG-291/U; female coax cont | | | 2 | 0.5 | 0.2 | 10 | | J801<br>J802 |
| | | | | GROUP III<br>CONTROL, RADIO SET C-3436/ARN-30D<br>CONTROL, RADIO SET C-3436A/ARN-30D | | | | | | | | |
| | | | | NOTE: Model Column 1 refers to C-3436/ARN-30D<br>Column 2 refers to C-3436A/ARN-30D | | | | | | | | |
| O | 5820-502-9376 | / | / | CAP, ELECTRICAL: Plastic, 25/32 in lg by 47/64 in dia Grimes part No. A-5181 | | | 2 | 0.3 | 0.1 | 10 | 38 | |
| F | 5935-258-3010 | / | / | CONNECTOR, RECEPTACLE, ELECTRICAL: 8 cont, 0.750 in lg by 1.312 in dia o/a, ARC part No. 12097 | | | 1 | 0.3 | 0.1 | 5 | 38 | J2 |
| F | 5935-511-8105 | / | / | CONNECTOR, RECEPTACLE, ELECTRICAL: 19 cont 0.938 in lg x 1.812 in dia o/a, ARC part No. 12357 | | | 1 | 0.3 | 0.1 | 5 | 38 | J1 |
| F | 5935-882-5257 | | / | CONNECTOR, RECEPTACLE, ELECTRICAL: 8 cont, 23/32 in h by 1-5/16 in dia o/a, ARC part No. 12355 | | | 1 | 0.3 | 0.1 | 5 | 38 | J3 |
| F | 5826-882-4037 | | / | GEAR, SPUR: 24 teeth, ARC part No. 23589 | | | 4 | 0.5 | 0.2 | 20 | 38 | |
| O | 5355-524-0053 | / | / | KNOB: Setscrew type, rd shape, 0.687 in max od by 0.500 in thk o/a, ARC part No. 16331 | | | 2 | 0.3 | 0.1 | 10 | 38 | |
| O | 5355-863-3783 | / | / | KNOB: Setscrew type, bar shape, 0.750 in max od by 1.063 in thk o/a, ARC part No. 20403 | | | 2 | 0.3 | 0.1 | 10 | 38 | |
| O | 6240-155-7836 | / | / | LAMP, INDANDESCENT: 28 v dc, T-1-3/4 bulb, GE type 327 | | | 2 | 1.7 | 0.6 | 100 | 38 | DS1,DS2 |
| F | 6250-542-6103 | / | | RETAINER, INDICATOR: Grimes part No. A-4996 | | | 2 | 0.5 | 0.2 | 10 | 38 | |
| F | 5905-503-9429 | / | / | RESISTOR, VARIABLE: 5000 ohm ±10%, 2 w, AB type USU5021FS2032 | | | 1 | 0.4 | 0.2 | 6 | 38 | R1 |
| F | 5905-892-6674 | / | / | RESISTOR, VARIABLE: 100,000 ohm ±10%, 2 w, AB type No. UU1041FS2032 | | | 1 | 0.4 | 0.2 | 6 | 38 | R2 |
| F | 5930-823-0856 | | / | SWITCH, ROTARY: 12 cont, Oak mfg part No. 101300-FIC | | | 1 | 0.4 | 0.1 | 6 | 38 | S5 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL 1 | 2 | 3 | 4 | 5 | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5930-823-0857 | | / | | | | SWITCH, ROTARY: 6 cont, Oak Mfg part No. 101301-FIC | | | 1 | 0.4 | 0.2 | 6 | 38 | S4 |
| | | F | | 5930-855-8980 | / | | | | | SWITCH, ASSEMBLY: Manually operated, approx 1-15/16 in x 2-5/16 in by 2-1/2 in o/a, ARC part/dwg No. 21714 | | | 1 | 0.4 | 0.2 | 6 | 38 | S1A/S1B |
| | | F | | 6210-508-3285 | / | | | | | LIGHT, PANEL: Grimes part No. A5890 | | | 2 | 0.6 | 0.2 | 6.0 | 38 | XDS1 XDS2 |
| | | O | | 6250-542-8507 | / | | | | | CAP, ELECTRICAL: Alum black, incl, red filter and rubber seal | | | 2 | 0.3 | 0.1 | 10 | 38 | |
| | | F | | 5826-875-6446 | | / | | | | SWITCH FREQUENCY SELECTOR: Approx 1-15/16 in by 2-5/16 in by 2-3/4 in o/a, ARC part/dwg No. 23727 | | | 1 | 0.4 | 0.1 | 6 | | S1 |
| | | | | | | | | | | GROUP IV<br>CONVERTER, SIGNAL DATA CV-265A/ARN-30A<br>CONVERTER, SIGNAL DATA CV-265B/ARN-30A | | | | | | | | |
| | | | | | | | | | | NOTE: Model Column 1 refers to CV-265A/ARN-30A; Column 2 refers to CV-265B/ARN-30A | | | | | | | | |
| | | F | | 5910-101-5571 | / | | | | | CAPACITOR, FIXED, MICA DIELECTRIC: 200 mmf ±2%, 500 vdc; MIL type CM20E102G | | | 1 | 0.3 | 0.1 | 5.0 | 35 | C201 |
| | | F | | 5910-894-4315 | / | / | | | | CAPACITOR, FIXED, MICA DIELECTRIC: 200 mmf, Aircraft Radio Corp p/n 8966-0201 | | | 1 | 0.4 | 0.1 | 5.0 | 35 | C201 |
| | | F | | 5910-872-7512 | / | | | | | CAPACITOR, FIXED, MICA DIELECTRIC: 200 mmf, ±2%, 100 vdc; Electro Motive type No. DM-19,<br>NOTE: Used on order 4294-PP-61 | | | 1 | 0.3 | 0.1 | 5.0 | 35 | C201 |
| | | F | | 5910-856-3474 | / | | | | | CAPACITOR, FIXED, MICA DIELECTRIC: 200 vdc, Elmenco style DM-30 (mmf)<br>NOTE: Capacitor selected and installed at time for final adjustment zero or best 10 pct EIA value between 470 and 2000 mmf, used on order 4294-PP-61 | | | 1 | 0.3 | 0.1 | 5.0 | 36 | C240 |
| | | F | | 5910-668-0796 | / | | | | | CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 mmf ±2%, 500 vdc; MIL type CM35E102G | | | 1 | 0.3 | 0.1 | 5.0 | 36 | C240 |

| SOURCE CODE (A/B/C/D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5910-892-7514 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 2,400 mmf ±10%, 200 vdc; Electro Motive type No. DM-20 (Note: Used on order 4294-PP-61) | | | 1 | 0.3 | 0.1 | 5.0 | 35 | C225 |
| F | 5910-892-7513 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 3,600 mmf ±1%, 100 vdc w; Aircraft Radio Corp. p/n 28500-242 | | | 2 | 0.4 | 0.1 | 5.0 | 35<br>34 | C225<br>C213 |
| F | 5910-892-7513 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 3,600 mmf ±2%, 500 vdcw; MIL type CM35E102G | | | 2 | 0.5 | 0.2 | 10.0 | 35 | C211 |
| F | 5910-892-7513 | / / | CAPACITOR, FIXED, MICA DIELECTRIC: 3,600 mmf, ±2%, 500 vdc; Electro Motive part No. DM-30 3,600 mmf (Note: Used on order 4294-PP-61) | | | 1 | 0.3 | 0.1 | 5.0 | 35 | C211 |
| F | 5910-892-7517 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 5,100 mmf ±1%, 100 vdcw; Aircraft Radio Corp. p/n 28500-0512 | | | 1 | 0.4 | 0.1 | 5.0 | 34 | C232 |
| F | 5910-892-7517 | / | CAPACITOR, FIXED, MICA DIELECTIRC: 5,100 mmf, ±1%, 100 vdc; Electro Motive part No. DM-30 5,100 mmf (Note: Used on order 4294-PP-61) | | | 1 | 0.3 | 0.1 | 5.0 | 34 | C232 |
| F | 5910-889-4578 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 6800 mmf 500 vdcw Electro Motive part no. DM30F682J<br>NOTE: Capacitor selected and installed at final test or best 10 pct EIA value between 6800 and 10,000 mmf | | | 1 | 0.4 | 0.1 | 5.0 | 36 | C206 |
| F | 5910-668-0032 | / | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 mmf ±10%; Aircraft Radio Corp. p/n 8577 (Item nos. C202 thru C206, C208, C210, C212 thru C217, C221 thru C232, C236, C237) | | | 26 | 4.6 | 2.0 | 100.0 | 36 | See desc column |
| F | 5910-892-7516 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 mmf ±1%, 100 vdc w; Aircraft Radio Corp. p/n 28500-0103 (Item nos. C203,C204,C205, C206,C210,C222,C236) | | | 7 | 1.6 | 0.8 | 20.0 | 36 | See desc column |

| SOURCE CODE (A \| B \| C \| D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5910-880-1902 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 mmf ±1%; 300 vdc; Aircraft Radio Corp. p/n 27155-0103 | | | 4 | 1.2 | 0.5 | 15.0 | 36 | C202<br>C214<br>C226<br>C237 |
| F | 5910-892-7516 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 mmf ±1%, 100 vdc; Electro Motive DM-30, 10 10,000 mmf (Note: Used on order 4294-PP-61) (Item nos. C203 thru C206, C210, C221, C222, C236) | | | 8 | 1.3 | 0.5 | 40.0 | 36 | See desc column |
| F | 5910-892-7510 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 mmf, ±10%, 100 vdc; Aircraft Radio Corp. p/n 27155-0103 (Note: Used on order 4294-PP-61) (Item nos. C202, C213, C214, C226,C237) | | | 5 | 1.0 | 0.3 | 25.0 | 36 | See desc column |
| F | 5910-892-7515 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 20,000 mmf, ±1%, 100 vdc w; Aircraft Radio Corp. p/n 28500-0203 | | | 1 | 0.4 | 0.1 | 5.0 | 35 | C223 |
| F | 5910-880-2595 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 20,000 mmf ±1%; Aircraft Radio Corp. p/n 27155-0203 | | | 2 | 0.6 | 0.2 | 10.0 | 36 | C208<br>C217 |
| F | 5910-892-7511 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 20,000 mmf ±1%, 300 vdc; Aircraft Radio Corp. p/n 27155-0203 (Note: Used on order 4294-PP-61) | | | 2 | 0.5 | 0.2 | 10.0 | 36 | C208<br>C217 |
| F | 5910-892-7515 | / | CAPACITOR, FIXED, MICA DIELECTRIC: 20,000 mmf ±1%, 100 vdc; Electro Motive type DM-30, 20,000 mmf (Note: Used on order 4294-PP-61) | | | 1 | 0.3 | 0.1 | 5.0 | 35 | C223 |
| F | 5910-823-1242 | / | CAPACITOR, FIXED, PAPER DIELECTRIC: 22,000 mmf, ±20%, 400 vdc; Sprague Electric Co. p/n 118P22304S4 | | | 2 | 1.0 | 0.7 | 10.0 | 36 | C242<br>C244 |
| F | 5910-284-4703 | / / | CAPACITOR, FIXED, PAPER DIELECTRIC: 250,000 mmf ±5%, 350 vdc; Aircraft Radio Corp. p/n 15763 | | | 2 | 0.5 | 0.2 | 10.0 | 35 | C220<br>C233 |
| F | 5910-755-9291 | | CAPACITOR, FIXED, ELECTROLYTIC: 1 mf; Aircraft Radio Corp . p/n 21485-9101 (Authorized allowances based on a total of 4.) | | | 2 | 1.0 | 0.7 | 10.0 | 36 | C241<br>C243 |

| SOURCE CODE | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5910-683-7371 | ✓ | ✓ | CAPACITOR, FIXED, PAPER DIELECTRIC: 1 mf, ±15%, 75 vdc; Aircraft Radio Corp. p/n 16653 | | | 1 | 0.3 | 0.1 | 5.0 | 35 | C235 |
| F | 5910-754-8665 | ✓ | ✓ | CAPACITOR, FIXED, ELECTROLYTIC: 2 sect, ea 15 mf; Aircraft Radio Corp. p/n 13928 | | | 3 | 0.7 | 0.2 | 10.0 | 35 | C207<br>C209<br>C219 |
| F | 5910-880-4509 | | ✓ | CAPACITOR, FIXED, ELECTROLYTIC: 1000 mf 10 vdc; Sprague Electric Co. part No. TYPE DES | | | 4 | 1.0 | 0.4 | 20.0 | 34 | C218<br>C234<br>C238<br>C239 |
| F | 5910-668-4160 | ✓ | | CAPACITOR, FIXED, ELECTROLYTIC: 1,000 mf, 10 vdc; CD type BRH-10036 | | | 4 | 1.0 | 0.3 | 20.0 | 34 | C218<br>C234<br>C238<br>C239 |
| F | 5935-204-8317 | ✓ | ✓ | CONNECTOR, RECEPTACLE, ELECTRICAL: ins cap red; Aircraft Radio Corp p/n 13152 | | | 2 | 0.3 | 0.1 | 5.0 | 34 | J201<br>J203 |
| F | 5935-204-8318 | ✓ | ✓ | CONNECTOR, RECEPTACLE, ELECTRICAL: 1 banana type female cont, ARC part No. 12921 | | | 1 | 0.2 | 0.1 | 5.0 | 34 | J202 |
| F | 5935-257-9735 | ✓ | ✓ | CONNECTOR, RECEPTACLE, ELECTRICAL: 7 rd female cont; Aircraft Radio Corp. p/n 5488 | | | 2 | 0.3 | 0.1 | 10.0 | 35 | J204<br>J205 |
| F | 5960-188-6584 | ✓ | ✓ | ELECTRON TUBE: MIL type 5670 | | | 3 | 14.7 | 7.2 | 300.0 | 34 | V201<br>V203<br>V204 |
| F | 5960-193-5145 | ✓ | ✓ | ELECTRON TUBE: MIL type 5751 | | | 1 | 3.7 | 1.8 | 100.0 | 34 | V205 |
| F | 5960-230-5253 | | ✓ | ELECTRON TUBE: MIL type 5783 | | | 1 | 3.7 | 1.8 | 100.0 | 34 | V202 |
| F | 5960-262-0210 | ✓ | ✓ | ELECTRON TUBE: MIL type 5814A | | | 1 | 3.7 | 1.8 | 100.0 | 34 | V206 |
| F | 5960-284-7166 | ✓ | | ELECTRON TUBE: MIL type 5683WA | | | 1 | 4.9 | 2.4 | 100.0 | 34 | V207 |
| F | 5960-262-0167 | | ✓ | ELECTRON TUBE: MIL type 12AT7WA | | | 1 | 4.9 | 2.4 | 100.0 | 34 | V207 |
| F | 5915-501-1575 | ✓ | ✓ | FILTER, BAND PASS: 90 cyc oper 8000 ohms input and 1500 ohm output; Aircraft Radio Corp p/n 15890 | | | 1 | 0.4 | 0.1 | 5.0 | 36 | Z202 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | | | | | | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5915-504-8041 | / | / | | | | | FILTER, BAND PASS: United Transformer Co. p/n H2001 Aircraft Radio Corp p/n 15891 | | | 1 | 0.4 | 0.1 | 5.0 | 36 | Z203 |
| | | F | | 5910-392-5931 | / | / | | | | | MOUNTING, CAPACITOR: Silver p/brass can 1-5/32 in h by 0.885 in dia o/a, ARC part No. 15535 | | | 2 | 0,3 | 0.1 | 8.0 | | |
| | | F | | 5945-204-6581 | / | / | | | | | RELAY, ARMATURE: 14 vdc max, 1-1/4 in lg by 7/8 in w, by 1-1/4 in h ARC part No. 12712 | | | 2 | 0.8 | 0.3 | 10.0 | 35 | K201 K202 |
| | | F | | 5905-513-9939 | / | | | | | | RESISTOR, FIXED, WIRE WOUND: 0.87 ohm ±5%; Aircraft Radio Corp. p/n 16643 (Note: used with 14 volt units) | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R266 |
| | | F | | 5905-513-9946 | | / | | | | | RESISTOR, FIXED, WIREWOUND: 4.1 ohm, ±5%; Aircraft Radio Corp p/n 16644 (Note: Used with 28 volt units) | | | 1 | 0.4 | 0.1 | 2.0 | 35 | R266 |
| | | F | | 5905-279-3517 | / | / | | | | | RESISTOR, FIXED, COMPOSITION: 51 ohm, ±5%; MIL type RC20GF510J | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R214 |
| | | F | | 5905-665-5350 | / | | | | | | RESISTOR, FIXED, COMPOSITION: 71 ohm, ±5%; IRC type 1A | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R267 |
| | | F | | 5905-279-3514 | | / | | | | | RESISTOR, FIXED, COMPOSITION: 180 ohms, ±5%; MIL type RC20GF181J | | | 1 | 0.5 | 0.3 | 5.0 | 36 | R270 |
| | | F | | 5905-665-5326 | / | / | | | | | RESISTOR, FIXED, COMPOSITION: 360 ohm, ±1%; MIL type RN20X3600F | | | 2 | 0.5 | 0.2 | 10.0 | 35 | R238 R240 |
| | | F | | 5905-195-6805 | | / | | | | | RESISTOR, FIXED, COMPOSITION: 510 ohms, ±5%; Aircraft Radio Corp p/n 202-0511 | | | 1 | 0.4 | 0.1 | 2.0 | 36 | R267 |
| | | F | | 5905-195-6806 | / | / | | | | | RESISTOR, FIXED, COMPOSITION: 560 ohms, ±5%; MIL type RC20GF561J | | | 2 | 0.6 | 0.2 | 10.0 | 35 | R262 R265 |
| | | F | | 5905-171-1999 | / | / | | | | | RESISTOR, FIXED, COMPOSITION: 820 ohms, ±5%; MIL type RC20GF821J | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R260 |
| | | F | | 5905-279-3509 | / | / | | | | | RESISTOR, FIXED, COMPOSITION: 910 ohm, ±5%; MIL type RC20GF911J | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R209 |
| | | F | | 5905-279-1757 | / | / | | | | | RESISTOR, FIXED, COMPOSITION: 1,500 ohms, ±5%; MIL type RC20GF152J | | | 2 | 0.7 | 0.2 | 15 | 36 | R215 R227 |
| | | F | | 5905-279-1757 | / | | | | | | RESISTOR, FIXED, COMPOSITION: 1,500 ohms, ±5%; MIL type RC20GF152J | | | 1 | 0.3 | 0.1 | 5.0 | | R263 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5905-279-3507 | / | / | RESISTOR, FIXED, COMPOSITION: 1,600 ohms ±5% MIL type RC20GF162J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R202 |
| | | F | | 5905-190-8881 | | / | RESISTOR, FIXED, COMPOSITION: 1,800 ohms ±5% MIL type RC20GF182J | | | 2 | 0.7 | 0.2 | 10.0 | 35 | R237<br>R245 |
| | | F | | 5905-190-8881 | / | / | RESISTOR, FIXED, COMPOSITION: 1,800 ohms ±5% MIL type RC20GF182J | | | 2 | 0.7 | 0.2 | 10.0 | 35 | R233<br>R251 |
| | | F | | 5905-190-8881 | / | | RESISTOR, FIXED, COMPOSITION: 1,800 ohms ±5% MIL type RC20GF182J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R251 |
| | | F | | 5905-190-8887 | / | / | RESISTOR, FIXED, COMPOSITION: 2,000 ohms ±5% MIL type RC20GF202J | | | 3 | 0.7 | 0.2 | 15.0 | 35 | R235<br>R236<br>R256 |
| | | F | | 5905-190-8881 | / | / | RESISTOR, FIXED, COMPOSITION: 2,200 ohms ±5% MIL type RC20GF222J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R237 |
| | | F | | 5905-279-2019 | / | / | RESISTOR, FIXED, COMPOSITION: 5,100 ohms,±5% MIL type RC20GF512J | | | 2 | 0.3 | 0.1 | 5.0 | 35 | R252<br>R234 |
| | | F | | 5905-279-2019 | / | / | RESISTOR, FIXED, COMPOSITION: 5,100 ohms,±5% MIL type RC20GF512J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R222 |
| | | | | | | | OR | | | | | | | | |
| | | F | | 5905-185-8510 | / | / | RESISTOR, FIXED, COMPOSITION: 10,000 ohms ±5%; MIL type RC20GF103J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R222 |
| | | | | | | | OR | | | | | | | | |
| | | F | | 5905-279-2616 | / | / | RESISTOR, FIXED, COMPOSITION: 15,000 ohms, ±5%; MIL type RC20GF153J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R222 |
| | | | | | | | OR | | | | | | | | |
| | | F | | 5905-192-0649 | / | / | RESISTOR, FIXED, COMPOSITION: 20,000 ohms, ±5%; MIL type RC20GF203J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R222 |
| | | F | | 5905-279-2673 | / | / | RESISTOR, FIXED, COMPOSITION: 6,200 ohms, ±5%; MIL type RC20GF622J | | | 2 | 0.5 | 0.2 | 10.0 | 36 | R204<br>R207 |
| | | F | | 5905-185-8510 | / | / | RESISTOR, FIXED, COMPOSITION: 10,000 ohms ±5%; MIL type RC20GF103J | | | 2 | 0.5 | 0.2 | 10.0 | 35 | R219<br>R220 |
| | | F | | 5905-279-2667 | / | / | RESISTOR, FIXED, COMPOSITION: 11,000 ohms, ±5%; MIL type RC20GF113J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R253 |

| Source Code A | B | C | D | Federal Stock Number | Designation by Model | | | | | Description | Unit of Issue | Exp | Qty in Unit | Direct Support | General Support | Depot | Illustration Figure No. | Illustration Item No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5905-171-2004 | ✓ | | | | | RESISTOR, FIXED, COMPOSITION: 22,000 ohms, ±5%; MIL type RC20GF223J | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R261 |
| | | F | | 5905-279-2616 | | ✓ | | | | RESISTOR, FIXED, COMPOSITION: 15,000 ohms, ±5%; MIL type RC20GF153J | | | 1 | 0.4 | 0.1 | 5.0 | 36 | R261 |
| | | F | | 5905-279-3496 | ✓ | ✓ | | | | RESISTOR, FIXED, COMPOSITION: 51,000 ohms, ±5%; MIL type RC20GF513J (Item nos. R203 R211,R212,R216,R217) | | | 5 | 1.0 | 0.5 | 25.0 | 35 | See desc column |
| | | F | | 5905-195-6761 | ✓ | ✓ | | | | RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±5%; MIL type RC20GF104J | | | 3 | 0.7 | 0.2 | 15.0 | 35 | R206 R228 R246 |
| | | F | | 5905-552-2442 | ✓ | ✓ | | | | RESISTOR, FIXED FILM: 100,000 ohms ±1%; MIL type RN20X1003F | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R224 |
| | | F | | 5905-284-3706 | ✓ | | | | | RESISTOR, FIXED FILM: 133,000 ohms, ±1%; MIL type RN20X1333F | | | 2 | 0.5 | 0.2 | 10.0 | 34 | R230 R248 |
| | | F | | 5905-192-0667 | ✓ | ✓ | | | | RESISTOR, FIXED, COMPOSITION: 220,000 ohm, ±5%; MIL type RC20GF224J | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R205 |
| | | F | | 5905-665-5326 | ✓ | ✓ | | | | RESISTOR, FIXED FILM: 265,000 ohms, ±1%; MIL type RN20X2653F | | | 1 | 0.3 | 0.1 | 5.0 | 34 | R249 |
| | | F | | 5905-665-5326 | ✓ | | | | | RESISTOR, FIXED FILM: 265,000 ohms, ±1%; MIL type RN20X2653F | | | 4 | 1.0 | 0.3 | 20.0 | 34 | R229,R231 R247,R249 |
| | | F | | 5905-665-5326 | | ✓ | | | | RESISTOR, FIXED FILM: 265,000 ohms ±1%; MIL type RN20X2653F | | | 1 | 0.4 | 0.1 | 5.0 | 34 | R249 |
| | | F | | 5905-502-4019 | ✓ | ✓ | | | | RESISTOR, FIXED FILM: 330,000 ohms, ±1%; MIL type RN20X3303F | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R213 |
| | | F | | 5905-279-2515 | | ✓ | | | | RESISTOR, FIXED, COMPOSITION: 470,000 ohms, ±5%; MIL type RC20GF474J | | | 2 | 1.0 | 0.7 | 10.0 | 36 | R272 R274 |
| | | F | | 5905-060-8516 | | ✓ | | | | RESISTOR, FIXED FILM: 475,000 ohms, ±1%; MIL type RN65D4753F | | | 1 | 0.4 | 0.1 | 2.0 | 35 | R241 |
| | | F | | 5905-500-9916 | ✓ | | | | | RESISTOR, FIXED FILM: 510,000 ohms, ±1%; MIL type RN20X5103F | | | 2 | 0.5 | 0.2 | 10.0 | 35 | R241 R242 |
| | | F | | 5905-500-9916 | | ✓ | | | | RESISTOR, FIXED FILM: 510,000 ohm, ±1%; MIL type RN20X5103F (Note: Used on order 4294-PP-61) | | | 3 | 0.8 | 0.3 | 8.0 | 35 | R242 R229 R230 |

| SOURCE CODE | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A B C D | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5905-279-2516 | / / | RESISTOR, FIXED, COMPOSITION: 510,000 ohms, ±5%; MIL type RC20GF514J | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R208 |
| F | 5905-280-2484 | / / | RESISTOR, FIXED, WIRE WOUND: 518,000 ohms ±1%; MIL type RB18K51802F | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R221 |
| F | 5905-192-0390 | / | RESISTOR, FIXED, COMPOSITION: 1 meg ohm ±5% MIL type RC20GF105J | | | 4 | 1.0 | 0.3 | 20.0 | 35 | R201, R210, R232, R233 |
| F | 5905-192-0390 | / | RESISTOR, FIXED, COMPOSITION: 1 meg ohm, ±5% MIL type RC20GF105J (Note: Used on order 4294-PP-61) (Item nos. R201, R210, R223, R232, R271, R273, R255) | | | 7 | 1.3 | 0.5 | 35.0 | 35 | See desc column |
| F | 5905-192-0390 | / | RESISTOR, FIXED, COMPOSITION: 1 meg ohm, ±5%; MIL type RC20GF105J (Item nos. R201, R210, R218, R232, R255, R223, R271, R273) | | | 8 | 1.6 | 0.8 | 28.0 | 35 | See desc column |
| F | 5905-539-4565 | / | RESISTOR, FIXED FILM: 1 meg ohm, ±1%; MIL type RN70B1004F | | | 3 | 1.0 | 0.3 | 20.0 | 35 | R218 R244 R255 |
| F | 5905-539-4565 | / | RESISTOR, FIXED FILM: 1 meg ohm, ±1%; MIL type RN70B1004F | | | 2 | 0.3 | 0.1 | 5.0 | 35 | R244 |
| F | 5905-280-1399 | / | RESISTOR, FIXED FILM: 1 meg ohm, ±1%; MIL type RN20X1004F (Note: Used on order 4294-PP-61) | | | 2 | 0.5 | 0.2 | 10.0 | 35 | R218 R244 |
| F | 5905-284-2809 | / | RESISTOR, FIXED, COMPOSITION: 1 meg ohm, ±10%; Globar part No. 997A | | | 2 | 0.5 | 0.2 | 10.0 | 36 | R254 R258 |
| F | 5905-201-6734 | / | RESISTOR, FIXED, COMPOSITION: 1 meg ohm, ±10%; MIL type RC09GF105K (Note: Also used on order 4294-PP-61) (Authorized allowances based on a total of 5) | | | 2 | 3.1 | 2.3 | 30.0 | 36 | R254 R258 |
| F | 5905-279-2668 | / / | RESISTOR, FIXED, COMPOSITION: 1.3 meg ohm, ±5%; MIL type RC20GF135J | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R259 |
| F | 5905-107-4767 | / / | RESISTOR, FIXED, COMPOSITION: 2 meg ohm, ±5%; MIL type RC20GF205J | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R243 |
| F | 5905-108-9919 | / / | RESISTOR, VARIABLE: 50 ohm ±10%; 2 w; AB type JLU-5001SD4040L | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R239 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | | F | 5905-107-8141 | ✓ | ✓ | RESISTOR, VARIABLE: 10,000 ohm ±10%; 2 w; AB type ILU-1031SD4040L | | | 2 | 0.5 | 0.2 | 10.0 | 34 | R226<br>R264 |
| | | | F | 5905-174-4905 | ✓ | ✓ | RESISTOR, VARIABLE: 100,000 ohm ±10%; 2 w; AB type JLU-1041SD4040L | | | 1 | 0.3 | 0.1 | 5.0 | 36 | R257 |
| | | | F | 5905-155-6935 | ✓ | ✓ | RESISTOR, VARIABLE: 500,000 ohm, ±10% 1 w; AB type JLU-5042SD4040L | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R225 |
| | | | F | 5905-108-0881 | ✓ | | RESISTOR, VARIABLE: 1 meg ohm, ±10%, 2 w; AB type JLU-1051SD4040L | | | 1 | 0.3 | 0.1 | 5.0 | 35 | R250 |
| | | | F | 5905-299-0845 | | ✓ | RESISTOR, VARIABLE: 2,500 ohms; AB type GLU2522SD3028L | | | 2 | 1.0 | 0.7 | 10.0 | 34 | R268<br>R269 |
| | | | F | 5960-646-4732 | ✓ | ✓ | SEMI CONDUCTOR DEVICE, DIODE: Retma type IN89 | | | 6 | 0.7 | 0.2 | 24.0 | 35 | CR201<br>thru<br>CR206 |
| | | | F | 5960-538-1031 | ✓ | ✓ | SEMI CONDUCTOR DEVICE, DIODE: Rema type IN118 | | | 2 | 0.5 | 0.2 | 8.0 | 35 | CR209<br>CR210 |
| | | | F | 5960-699-3291 | ✓ | ✓ | SEMI CONDUCTOR DEVICE, DIODE: Matched pair Retma IN118, ARC p/n 16670 | | | 1 | 0.3 | 0.1 | 4.0 | 35 | CR207<br>CR208 |
| | | | H | 5960-890-7156 | | ✓ | SEMI CONDUCTOR DEVICE, DIODE: Huges Aircraft p/n HD6226 (Authorized allowances based on a total of 6) | | | 3 | | 0.3 | 25.0 | 35<br>36<br>36 | CR211<br>CR212<br>CR213 |
| | | | F | 5960-262-0345 | ✓ | | SHIELD, ELECTRON TUBE: MIL type TS103U01 | | | 3 | 0.4 | 0.2 | 15.0 | | |
| | | | F | 5960-264-3004 | ✓ | | SHIELD, ELECTRON TUBE: MIL type TS103U02 | | | 2 | 0.3 | 0.1 | 10.0 | | |
| | | | F | 5935-222-9828 | ✓ | ✓ | SOCKET, ELECTRON TUBE: Cinch Mfg. part No. 13381 | | | 6 | 2.0 | 1.0 | 25.0 | 35<br>2<br>36 | XV201<br>XV203 thru<br>XV209 |
| | | | F | 5950-569-0181 | ✓ | | TRANSFORMER, AF: Line type Aircraft Radio p/n 1561-2-D | | | 2 | 0.5 | 0.2 | 10.0 | 34 | T101<br>T102 |
| | | | H | 5950-880-6859 | | ✓ | TRANSFORMER; AUDIO FREQUENCY: United Transformer Co. part No. G-3658 | | | | | 0.6 | 8.0 | 34 | T201<br>T202 |
| | | | F | 5950-645-5396 | ✓ | ✓ | TRANSFORMER, DISCRIMINATOR: 30 to 150 cycle freq range; Aircraft Radio Corp. p/n 15374 | | | 1 | 0.3 | 0.1 | 5.0 | 34 | Z201 |

| SOURCE CODE (A B C D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL 1 | DESIGNATION BY MODEL 2 | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | AN/ARN-30D & 30E (continued)<br>GROUP V<br>INDICATOR ID-453/ARN-30 | | | | | | | | |
| F | 5935-511-8455 | | | CONNECTOR, RECEPTACLE, ELECTRICAL: 19 male banana cont ARC part No. 16711 | | | 1 | 0.3 | 0.1 | 5 | 40 | |
| F | 5355-668-6597 | | | KNOB: Setscrew type, rd shape, Weston part No. 140468 | | | 1 | 0.2 | 0.1 | 3 | 40 | |
| F | 5305-511-8763 | | | SCREW, EXTERNALLY RELIEVED BODY: Brass unfinished Fil H 0.218 in dia by 0.300 in h o/a, Weston part/dwg No. 140503 | | | 1 | 0.2 | 0.1 | 3 | 40 | |
| F | 5826-506-8913 | | | SHAFT AND GEAR SUB-ASSEMBLY: Connects manual course selector knob to indicator sub-assembly, Weston part 140465 | | | 1 | 0.2 | 0.1 | 3 | 40 | |
| | | | | GROUP VI<br>MOUNTING MT-1174/ARN-30A | | | | | | | | |
| F | 5821-506-4555 | | | BUMPER, RUBBER: rubber, 1-3/8 in major od x 1-3/16 in minor od in dia recess, 19/32 in h o/a, ARC part No. 16619 | | | 4 | 0.5 | 0.2 | 20 | | |
| F | 5340-393-1398 | | | MOUNT, VIBRATION: rubber cushion w/stud for engaging, snap slides on rack 1-21/32 in h by 1-5/32 in dia o/a ARC dwg No. 14645 | | | 4 | 0.5 | 0.2 | 20 | | |
| | | | | GROUP VII<br>MOUNTING MT-1175/ARN-30A<br>MOUNTING MT-1175A/ARN-30A | | | | | | | | |
| | | | | NOTE: Model Column 1 refers to MT-1175/ARN-30A; Column 2 refers to MT-1175A/ARN-30A | | | | | | | | |
| F | 5910-668-4160 | / | / | CAPACITOR, FIXED, ELECTROLYTIC: 1,000 mmf, -40 c to 65 c Cornell-Dubilier type BRH 10086 | | | 3 | 0.7 | 0.2 | 15 | 39 | C301<br>C302<br>C303 |
| F | 5910-059-8065 | | / | CAPACITOR, FIXED, ELECTROLYTIC: Mallory part No. Type TS-15647 | | | 1 | 0.7 | 0.2 | 5.0 | | C304 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | | | | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5935-259-6785 | / | / | | | CONNECTOR, RECEPTACLE, ELECTRICAL: 7 rd female cont, straight shape, ARC part No. 12095 | | | 3 | 0.4 | 0.2 | 15 | 39 | J301<br>J302<br>J303 |
| | | F | | 5935-258-9988 | / | | | | CONNECTOR, RECEPTACLE, ELECTRICAL: 8 rd male cont, banana type, ARC part No. 12047 | | | 1 | 0.2 | 0.1 | 5 | 39 | J304 |
| | | F | | 5935-258-3007 | / | / | | | CONNECTOR, RECEPTACLE, ELECTRICAL: 2 banana type cont ARC part No. 12427 | | | 1 | 0.2 | 0.1 | 5 | 39 | J305 |
| | | F | | 5935-295-3337 | / | / | | | CONNECTOR, RECEPTACLE, ELECTRICAL: 8 cont banana type ARC part No. 12348 | | | 1 | 0.2 | 0.1 | 5 | 39 | J306 |
| | | F | | 5935-258-3010 | | / | | | CONNECTOR, RECEPTACLE, ELECTRICAL: ARC part No. 12097 | | | 1 | 0.5 | 0.2 | 3.0 | 39 | J304 |
| | | F | | 5935-258-3370 | | | | | FILTER, BAND PASS: 9 kc oper freq 8 10 kc band width ARC part No. 16798 | | | 1 | 0.2 | 0.1 | 5 | 39 | Z301 |
| | | F | | 5910-392-5931 | / | / | | | MOUNTING, CAPACITOR: 0.020 in thk silver, ARC part No. 15535 | | | 3 | 0.4 | 0.2 | 15 | | A304<br>A305<br>A306 |
| | | F | | 5945-249-9831 | | / | | | RELAY ARMATURE: 28 v, ARC part No. 12231 | | | 1 | 0.7 | 0.2 | 5.0 | 39 | K302 |
| | | F | | 5945-322-4122 | / | / | | | RELAY, ARMATURE: 15 v, 32 amp, 300 ohm ±10%, ARC part No. 14485 | | | 1 | 0.3 | 0.1 | 5 | 39 | K301 |
| | | F | | 5905-195-6806 | / | / | | | RESISTOR, FIXED, COMPOSITION: 1000 ohm ±5%, MIL type RC20GF102J | | | 4 | 0.8 | 0.2 | 20 | 39 | R301<br>thru<br>R304 |
| | | | | | | | | | GROUP VIII<br>RECEIVER, RADIO R-1021/ARN-30D | | | | | | | | |
| | | F | | 5826-863-3751 | | | | | GEAR ASSEMBLY: ARC part No. FES-1328 | | | 1 | 0.3 | 0.1 | 4.0 | 44 | |
| | | F | | 6105-629-0967 | | | | | MOTOR, DC: 28 vdc; Clifton Precision Prod part No. DC8C11 | | | 1 | 0.3 | 0.1 | 4.0 | 44 | B1 |

| SOURCE CODE | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A B C D | | | | | | | | | | | |
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | | GROUP VIII a<br>COVER ASSEMBLY<br>(ARC P/N 21779) | | | | | | | | A1 |
| F | 5826-863-3724 | | ARM ASSEMBLY, TUNING: 0.290 in w by 1.343 in h by 2.125 in lg o/a, ARC part No. 19732 | | | 1 | 0.2 | 0.1 | 5 | | |
| F | 5826-863-3731 | | BEARING ASSEMBLY: 0.437 in dia by 0.516 in w o/a, ARC part No. 19419 | | | 4 | 0.5 | 0.2 | 12 | | |
| F | 3110-863-3778 | | BEARING, BALL, ANNULAR: Single row, ss, New Departure part No. SSRS77NR3HGZD1228E | | | 5 | 1.0 | 0.3 | 15 | | |
| F | 3110-863-3781 | | BEARING, BALL, ANNULAR: Ground, single row 0.3125 in od by 1.1094 in w o/a, Nice Ball Bearing type 7434 (Authorized allowances based on a total of 3.) | | | 1 | 0.7 | 0.2 | 9 | | |
| F | 5826-863-3725 | | BEARING, SLEEVE: Aluminum, 1.1875 in id by 0.250 in od by 0.312 in lg, ARC part No. 19724 | | | 2 | 0.3 | 0.1 | 3 | | |
| F | 5826-863-3723 | | CAM SHAFT ASSEMBLY: 2.438 in lg by 2.042 in dia o/a, ARC part No. 19687 | | | 1 | 0.2 | 0.1 | 1 | | |
| F | 5826-863-3734 | | CAM ASSEMBLY: ARC part No. 23699 | | | 1 | 0.3 | 0.1 | 5 | | |
| F | 5910-864-3246 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.39 mmf ±0.02 mmf 500 vdc, Stackpole Carbon part No. GAO-39 | | | 1 | 0.3 | 0.1 | 5 | 27 | A1C7 |
| F | 5910-864-3241 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 0.82 ±.04%, Stackpole part No. GAO.82 | | | 1 | 0.3 | 0.1 | 5 | 28 | A1C18 |
| F | 5910-880-2597 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2 mmf ±25% 500 vdc, ARC part No. 31090-9201 (Note: Used on order FR-36-039-N-4-05935) | | | 1 | 0.4 | 0.1 | 5.0 | | A1C69 |
| F | 5910-010-4655 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 3 mmf ARC part No. 8278; MIL type CC20UJ070C | | | 1 | 0.3 | 0.1 | 5 | 28 | A1C20 |
| F | 5910-192-2242 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 3 mmf MIL type CC70UJ030C | | | 1 | 0.2 | 0.1 | 5 | 28 | A1C14 |
| | | | OR | | | | | | | | |
| F | 5910-101-4655 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 7 mmf MIL type CC20UJ070C | | | 1 | 0.2 | 0.1 | 5 | | A1C14 |
| | | | OR | | | | | | | | |

| SOURCE CODE (A B C D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5910-112-8240 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 15 mmf MIL type CC20UJ150C | | | 1 | 0.2 | 0.1 | 5 | | A1C14 |
| F | 5910-806-0668 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 7 mmf, MIL type CC20HH070C | | | 1 | 0.3 | 0.1 | 5 | 27 | A1C36 |
| F | 5910-892-2937 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 mmf, MIL type CC20HH100C | | | 1 | 0.3 | 0.1 | 5 | 27 | A1C3 |
| F | 5910-112-8240 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 15 mmf ±5%, Centralab Div type No. TU20-150J | | | 2 | 0.5 | 0.2 | 10 | 27 | A1C2<br>A1C8 |
| F | 5910-856-9382 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 30 mmf ±20%, MIL type CC20HG300G (Note: Used on orders FR-36-039-N-4-05935) | | | 1 | 0.3 | 0.1 | 5.0 | | A1C67 |
| F | 5910-864-3235 | | CAPACITOR, FIXED, MICA DIELECTRIC: 51 mmf ±5%, 500 vdc, Electro Motive part No. VTDM15-510J (Item nos. A1C9,A1C30,A1C32, A1C37) | | | 4 | 0.8 | 0.2 | 20 | 28 | See desc column |
| F | 5910-864-3239 | | CAPACITOR, FIXED, MICA DIELECTRIC: 71 mmf ±1%, 500 vdc Electro Motive part No. VTDM15-710F | | | 1 | 0.3 | 0.5 | 5 | 28 | A1C16 |
| F | 5910-864-3240 | | CAPACITOR, FIXED, MICA DIELECTRIC: 91 mmf ±1%, 500 vdc Electro Motive part No. VTDM15-910F | | | 1 | 0.3 | 0.1 | 5 | 28 | A1C19 |
| F | 5910-667-9693 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 mmf ±2%, Centralab Div part No. TU30-101G-U2J | | | 1 | 0.3 | 0.1 | 5 | 27 | A1C6 |
| F | 5910-864-3250 | | CAPACITOR, FIXED, MICA DIELECTRIC: 100 mmf ±5%, 500 vdc Electro Motive part No. VTDM-101J (Authorized allowances based on total of 5.) | | | 2 | 1.0 | 0.3 | 25 | 27 | A1C35<br>A1C68 |
| F | 5910-864-3237 | | CAPACITOR, FIXED, MICA DIELECTRIC: 240 mmf 500 vdc Electro Motive part No. VTDM15-241J | | | 1 | 0.3 | 0.1 | 5 | 28 | A1C38 |

| SOURCE CODE | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A B C D | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5910-101-4714 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 250 mmf ±20%, Centralab Div part No. BU2051MV5V | | | 1 | 0.3 | 0.1 | 5 | 27 | A1C33 |
| F | 5910-864-3247 | | CAPACITOR, FIXED, MICA DIELECTRIC: 510 mmf ±20%, 300 vdc, Electro Motive part No. VTCM15-511G | | | 1 | 0.3 | 0.1 | 5 | 26 | A1C47 |
| F | 5910-196-0547 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 mmf ±20%, Erie part No. 0357-007X5T10 (Item nos. A1C11, A1C12, A1C13, A1C40, A1C42, A1C44) | | | 6 | 1.0 | 0.3 | 30 | 26 | See desc column |
| F | 5910-864-3245 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 mmf, 500 vdc Solar Mfg part No. CF123XD-102Z-3K (Item nos. A1C10, A1C31, A1C34, A1C39, A1C43, A1C46) | | | 6 | 1.0 | 0.3 | 30 | 26 | See desc column |
| F | 5910-864-3236 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2700 mmf, 500 vdc Centralab Div part No. BY25272NZ5Z | | | 1 | 0.3 | 0.1 | 5 | 28 | A1C22 |
| F | 5910-822-5683 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 mmf +80 -20%, 500 vdc, MIL type CK63AW103M (Authorized allowances based on a total of 23.) | | | 19 | 3.3 | 1.3 | 115 | 28 | A1C48 thru A1C66 |
| F | 5910-814-7612 | | CAPACITOR, FIXED, PAPER DIELECTRIC: 10,000 mmf ±20%; 300 vdc; Cornell-Dubilier part No. TWA3S1-10 (Authorized allowances based on a total of 4.) | | | 3 | 0.8 | 0.3 | 20 | 28 | A1C23, A1C24, A1C25 |
| F | 5910-880-2596 | | CAPACITOR, FIXED, PAPER DIELECTRIC: 10,000 mmf ±20%; 300 vdc; ARC part No. 8837 (Authorized allowances based on a total of 18) | | | 3 | 2.7 | 1.0 | 90 | 28 | A1C17 A1C26 A1C27 |
| F | 5910-755-9291 | | CAPACITOR, FIXED, ELECTROLYTIC: 1 mg; 35 vdc; Sprague Elec. part No. 150D105X0035A2, (For authorized allowances see Group IV.) | | | 2 | Z | Z | Z | 29 | A1C41, A1C45 |

| SOURCE CODE | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5910-864-3238 | | CAPACITOR, VARIABLE: 0.08 mmg min, 8.5 mmg max; 100 v ac peak; ARC part No. 19946 | | | 2 | 0.7 | 0.2 | 15 | 28 | A1C15, A1C21 |
| F | 5910-864-3244 | | CAPACITIOR, VARIABLE, AIR DIELECTRIC: 1 mmf -13 mmf; ARC part No. 19929 | | | 3 | 0.9 | 0.3 | 18 | 27 | A1C1 A1C4 A1C28 |
| F | 5910-672-8644 | | CAPACITOR, VARIABLE AIR DIELECTRIC: 1 mmf -11 mmf; ARC part No. 19603 | | | 1 | 0.4 | 0.2 | 6 | 27 | A1C29 |
| F | 5910-964-3248 | | CAPACITOR, VARIABLE, AIR DIELECTRIC: 3 mmf -13 mmf; ARC part No. 19897 | | | 1 | 0.4 | 0.2 | 6 | 27 | A1C5A/B |
| F | 5950-863-3431 | | COIL ASSEMBLY, VARIABLE IF: ARC part No. 19715 | | | 2 | 0.5 | 0.2 | 10 | 28 | A1L5 A1L6 |
| F | 5950-632-7151 | | COIL, RF: Powder iron; 0.188 in dia by 0.438 in lg o/a; Jeffers Elec part No. 10100-622 | | | 2 | 0.5 | 0.2 | 10 | 27 | A1L1 A1L14 |
| F | 5950-632-7195 | | COIL, RF: 12 ohm inductance, 1 ohm dc; 0.6 amp; Jeffers Elec part No. 10102-634 | | | 1 | 0.3 | 0.1 | 5 | 28 | A1L13 |
| F | 5950-645-4253 | | COIL, RF: Single layer wnd; 0.188 in dia by 0.438 in lg o/a; Jeffers Elec Div 10100-628 | | | 1 | 0.3 | 0.1 | 5 | 27 | A1L9 |
| F | 5950-851-3990 | | COIL, RF: 3 turns; 0.539 in w by 0.610 in h by 0.219 in lg o/a; ARC part No. 22115 | | | 1 | 0.3 | 0.1 | 4 | 27 | A1L10 |
| F | 5950-863-3488 | | COIL, RF: Jeffers Elec part No. 10102-636, Authorized allowances based on a total of 2.) | | | 1 | 0.5 | 0.2 | 10 | 27 | A1L11 |
| F | 5950-851-3991 | | COIL, RF: 8 turns; 0.407 in w by 0.688 in h by 0.500 lg o/a; ARC part No. 22116 | | | 1 | 0.3 | 0.1 | 4 | 26 | A1L7 |
| F | 5950-863-3432 | | COIL, RF: 2 turns; 0.469 in w by 0.625 in h by 0.844 in lg o/a; ARC part No. 22112 | | | 1 | 0.3 | 0.1 | 5 | 26 | A1L1 |
| F | 5950-863-3433 | | COIL, RF: 0.188 in dia by 0.438 in lg o/a; Jeffers Elec part No. 10100-636 | | | 1 | 0.3 | 0.1 | 4 | 26 | A1L12 |
| F | 5950-863-3434 | | COIL, RF: 2 turns; 0.500 in w by 0.688 in h by 0.750 in lg o/a; ARC part No. 22113 | | | 1 | 0.3 | 0.1 | 4 | 26 | A1L3 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5950-863-3435 | | COIL, RF: 2 turns; 0.625 in w by 0.750 in w by 0.219 in lg o/a; ARC part No. 22114 | | | 1 | 0.3 | 0.1 | 4 | 27 | A1L4 |
| | | F | | 5950-870-6787 | | COIL, RF: 0.188 in dia by 0.438 in lg o/a; Jeffers Elec part No. 10102-620 | | | 1 | 0.3 | 0.1 | 4 | 26 | A1L8 |
| | | F | | 5935-863-3683 | | CONNECTOR, FEED-THRU: 0.800 in lg by 0.375 in dia o/a; Microdot part No. 3352 | | | 1 | 0.2 | 0.1 | 5 | | |
| | | F | | 5935-685-9816 | | CONNECTOR, PLUG, ELECTRICAL: 1 cont; Microdot part No. 3223 | | | 1 | 0.2 | 0.1 | 5 | 29 | A1P5 |
| | | F | | 5935-863-3679 | | CONNECTOR, PLUG, ELECTRICAL: 21 cont; ARC part No. 22813 | | | 1 | 0.3 | 0.1 | 5 | 28 | A1P1 |
| | | F | | 5935-863-3680 | | CONNECTOR, PLUG, ELECTRICAL: 5 cont; ARC part No. 19339 | | | 2 | 0.5 | 0.2 | 10 | 27 | A1P2, A1P4 |
| | | F | | 5935-863-3681 | | CONNECTOR, PLUG, ELECTRICAL: 2 cont; ARC part No. 22815 | | | 1 | 0.2 | 0.1 | 5 | 27 | A1P3 |
| | | F | | 5935-295-3109 | | CONNECTOR, RECEPTACLE, ELECTRICAL: 6 cont 3/4 in lg by 1-5/16 in dia; ARC part/dwg No. 11905 | | | 1 | 0.3 | 0.1 | 5 | 28 | A1J3 |
| | | F | | 5935-511-8105 | | CONNECTOR, RECEPTACLE, ELECTRICAL: 19 cont ARC part No. 12357 | | | 1 | 0.3 | 0.1 | 5 | 28 | A1J2 |
| | | F | | 5935-682-0458 | | CONNECTOR, RECEPTACLE, ELECTRICAL: ARC part No. 15185 | | | 1 | 0.2 | 0.1 | 5 | 28 | A1J1 |
| | | F | | 5826-863-3728 | | CONTACT: Brass; 0.624 in dia by 0.297 in lg ARC part No. 24017 | | | 1 | 0.2 | 0.1 | 5 | | |
| | | F | | 5826-863-3730 | | CONTACT ASSEMBLY, ELECTRICAL: 1 in lg by 7/8 in w by 1/2 in h o/a; ARC part No. 21303 | | | 2 | 0.3 | 0.1 | 5 | | |
| | | F | | 5955-852-1583 | | CRYSTAL UNIT, QUARTZ: 9.95000 mf; McCoy Elec part No. M-21(9.95) | | | 1 | 0:3 | 0.1 | 4 | 45 | A1Y21 |

| SOURCE CODE | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A B C D | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5955-852-1584 | | CRYSTAL UNIT, QUARTZ: 10.05000 mc; McCoy Elec part No. M-21 (10.05) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y22 |
| F | 5955-852-1585 | | CRYSTAL UNIT, QUARTZ: 10.15000 mc; McCoy Elec part No. MC-21 (10.15) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y23 |
| F | 5955-852-1586 | | CRYSTAL UNIT, QUARTZ: 10.25000 mc; McCoy part No. M-21 (10.25) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y24 |
| F | 5955-852-1587 | | CRYSTAL UNIT, QUARTZ: 10.35000 mc; McCoy Elec part No. M-21 (10.35) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y25 |
| F | 5955-852-1588 | | CRYSTAL UNIT, QUARTZ: 10.45000 mc; McCoy Elec part No. M-21 (10.45) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y26 |
| F | 5955-852-1589 | | CRYSTAL UNIT, QUARTZ: 10.55000 mc; McCoy Elec part No. M-21 (10.55) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y27 |
| F | 5955-852-1590 | | CRYSTAL UNIT, QUARTZ: 10.65000 mc; McCoy Elec part No. M-21 (10.65) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y28 |
| F | 5955-852-1591 | | CRYSTAL UNIT, QUARTZ: 10.75000 mc; McCoy Elec part No. M-21 (10.75) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y29 |
| F | 5955-852-1592 | | CRYSTAL UNIT, QUARTZ: 10.85000 mc; McCoy Elec part No. M-21 (10.85) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y30 |
| F | 5955-852-1593 | | CRYSTAL UNIT, QUARTZ: 48.17500 mc; McCoy Elec part No. M-21 (48.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y1 |
| F | 5955-852-1594 | | CRYSTAL UNIT, QUARTZ: 48.67500 mc; McCoy Elec part No. M-21 (48.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y19 |
| F | 5955-852-1595 | | CRYSTAL UNIT, QUARTZ: 49.17500 mc; McCoy Elec part No. M-21 (49.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y2 |
| F | 5955-854-8856 | | CRYSTAL UNIT, QUARTZ: 49.67500 mc; McCoy Elec part No. M-21 (49.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y18 |
| F | 5955-854-8857 | | CRYSTAL UNIT, QUARTZ:50.17500 mc; McCoy Elec part No. M-21 (50.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y3 |
| F | 5955-854-8858 | | CRYSTAL UNIT, QUARTZ:50.67500 mc; McCoy part No. M-21 (50.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y17 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | | F | 5955-854-8859 | | CRYSTAL UNIT, QUARTZ: 51.17500 mc; McCoy part No. M-21 (51.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y4 |
| | | | F | 5955-854-8860 | | CRYSTAL UNIT, QUARTZ: 51.67500 mc; McCoy Elec part No. M-21 (51.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y16 |
| | | | F | 5955-852-1596 | | CRYSTAL UNIT, QUARTZ:52.17500 mc; McCoy Elec part No. M-21 (52.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y5 |
| | | | F | 5955-852-1597 | | CRYSTAL UNIT, QUARTZ: 52.67500 mc; McCoy Elec part No. M-21 (52.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y15 |
| | | | F | 5955-852-1598 | | CRYSTAL UNIT, QUARTZ: 53.17500 mc; McCoy Elec part No. M-21 (53.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y6 |
| | | | F | 5955-878-9413 | | CRYSTAL UNIT, QUARTZ: 53.67500 mc; McCoy Elec part No. M-21 (53.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y14 |
| | | | F | 5955-878-9414 | | CRYSTAL UNIT, QUARTZ:54.17500 mc; McCoy Elec part No. M-21 (54.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y7 |
| | | | F | 5955-852-1682 | | CRYSTAL UNIT, QUARTZ: 54.67500 mc; McCoy Elec part No. M-21 (54.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y13 |
| | | | F | 5955-852-1683 | | CRYSTAL UNIT, QUARTZ:55.17500 mc; McCoy Elec part No. M-21 (55.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y8 |
| | | | F | 5955-852-1684 | | CRYSTAL UNIT, QUARTZ: 55.67500 mc; McCoy Elec part No. M-21 (55.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y12 |
| | | | F | 5955-852-1685 | | CRYSTAL UNIT, QUARTZ: 56.17500 mc; McCoy Elec part No. M-21 (56.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y9 |
| | | | F | 5955-852-1686 | | CRYSTAL UNIT, QUARTZ: 56.67500 mc; McCoy Elec part No. M-21 (56.675) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y11 |
| | | | F | 5955-852-1391 | | CRYSTAL UNIT, QUARTZ: 57.17500 mc; McCoy Elec part No. M-21 (57.175) | | | 1 | 0.3 | 0.1 | 4 | 45 | A1Y10 |
| | | | F | 5355-863-3779 | | DIAL, PRINTED: wigh black numerals, 00-90; 1.875 in dia by 0.609 in o/a; ARC part No. 22158 | | | 1 | 0.2 | 0.1 | 3 | 45 | |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5355-863-3780 | | DIAL, PRINTED: With black numerals, 108-126; 1.875 in dia by 0.609; ARC part No. 21813 | | | 1 | 0.2 | 0.1 | 3 | | |
| | | F | | 5960-228-3793 | | ELECTRON TUBE: MIL type 5718 | | | 3 | 14.7 | 7.2 | 300 | 26 | A1V1, A1V2, A1V7 |
| | | F | | 5960-729-5601 | | ELECTRON TUBE: MIL type 5899 (Authorized allowances based on a total of 5.) | | | 3 | 24.5 | 12.0 | 500 | 26 | A1V3 A1V4 A1V5 |
| | | F | | 5960-261-8679 | | ELECTRON TUBE: MIL type 6021 (Authorized allowances based on a total of 5.) | | | 1 | 7.4 | 3.6 | 200 | 26 | A1V6 |
| | | F | | 5826-863-3729 | | GEAR ASSEMBLY: 2.042 in dia by 1.000 in lg o/a; ARC part No. 22438 | | | 1 | 0.3 | 0.1 | 4 | | |
| | | F | | 5826-863-3737 | | LEVER ASSEMBLY, AUDIO: 1.125 in by 0.469 in by 0.406 in o/a; ARC part No. 23868 | | | 1 | 0.2 | 0.1 | 4 | | |
| | | F | | 5826-863-3738 | | LEVER ASSEMBLY, LOCALIZER: 0.219 in by 0.500 in by 1.125 in o/a; ARC part No. 23867 | | | 1 | 0.2 | 0.1 | 4 | | |
| | | F | | 5905-879-0327 | | RESISTOR, FIXED, COMPOSITION: 33 ohm ±10%; Carborundum part No. 997CX330K | | | 1 | 0.3 | 0.1 | 4 | 27 | A1R3 |
| | | F | | 5905-852-7380 | | RESISTOR, FIXED, COMPOSITION: 33 ohm ±10%; Carborundum part No. 997CX100K | | | 1 | 0.3 | 0.1 | 5 | 27 | A1R21 |
| | | F | | 5905-581-7949 | | RESISTOR, FIXED, COMPOSITION: 100 ohm ±5%; MIL type CR09GF101J | | | 1 | 0.3 | 0.1 | 5 | 27 | A1R2 |
| | | F | | 5905-665-5219 | | RESISTOR, FIXED, COMPOSITION: 220 ohm ±5%; MIL type RC09GF221J | | | 2 | 0.3 | 0.1 | 10 | 27 | A1R25 A1R26 |
| | | F | | 5905-686-3369 | | RESISTOR, FIXED, COMPOSITION: 330 ohm ±5%; MIL type RC09GF331J (Authorized allowances based on a total of 3.) | | | 1 | 0.7 | 0.2 | 15 | | A1R16 |
| | | F | | 5905-665-5249 | | RESISTOR, FIXED, COMPOSITION: 680 ohm ±5%; MIL type RC09GF681J | | | 1 | 0.3 | 0.1 | 5 | 29 | A1R12 |
| | | F | | 5905-502-8518 | | RESISTOR, FIXED, COMPOSITION: 1500 ohm ±5%; MIL type RC09GF152J | | | 1 | 0.5 | 0.2 | 5 | 26 | A1R23 |

| SOURCE CODE (A B C D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5905-501-8479 | | RESISTOR, FIXED, COMPOSITION: 2200 ohm ±5%; MIL type RC09GF222J (Authorized allowances based on a total of 5.) | | | 3 | 1.0 | 0.3 | 25 | 28 | A1R7<br>A1R10<br>A1R14 |
| F | 5905-542-8363 | | RESISTOR, FIXED, COMPOSITION: 3300 ohm ±10%; MIL type RC09GF332J | | | 1 | 0.5 | 0.2 | 5 | 26 | A1R22, |
| F | 5905-171-2004 | | RESISTOR, FIXED, COMPOSITION: 22,000 ohm ±5%; MIL type RC09GF223J | | | 1 | 0.3 | 0.1 | 5 | 28 | A1R28 |
| F | 5905-171-1998 | | RESISTOR, FIXED, COMPOSITION: 33,000 ohm ±5%; MIL type RC20GF333J (Authorized allowances based on a total of 3.) | | | 2 | 0.7 | 0.2 | 15 | 29 | A1R19<br>A1R24 |
| F | 5905-549-7599 | | RESISTOR, FIXED, COMPOSITION: 68,000 ohm ±5%; MIL type RC09GF683J (Authorized allowances baded on a total of 4.) | | | 1 | 0.8 | 0.2 | 20 | 29 | A1R30 |
| F | 5905-549-7600 | | RESISTOR, FIXED, COMPOSITION: 82,000 ohm ±5%; MIL type RC20GF823J | | | 2 | 0.5 | 0.2 | 10 | 28 | A1R9,<br>A1R11 |
| F | 5905-577-9674 | | RESISTOR, FIXED, COMPOSITION: 100,000 ohm ±5%; MIL type RC09GF104J (Authorized allowances based on a total of 8.) | | | 2 | 1.7 | 0.6 | 45 | 28<br>29 | A1R18<br>A1R27 |
| F | 5905-501-7539 | | RESISTOR, FIXED, COMPOSITION: 220,000 ohms ±5%; MIL type RC09GF224J (Authorized allowances based on a total of 5.) | | | 2 | 1.0 | 0.3 | 25 | 28 | A1R8<br>A1R13 |
| F | 5905-542-8134 | | RESISTOR, FIXED, COMPOSITION: 470,000 ohms ±5%; MIL type RC09GF474J (Authorized allowances based on a total of 5.) | | | 2 | 1.0 | 0.3 | 25 | 26 | A1R4<br>A1R5 |
| F | 5905-201-6734 | | RESISTOR, FIXED, COMPOSITION: 1 meg; MIL type RC09GF105J (For authorized allowances see Group IV.) | | | 3 | Z | Z | Z | 27 | A1R1<br>A1R6<br>A1R15 |
| F | 5905-850-9780 | | RESISTOR, VARIABLE: 5000 ohm ±20%; 1/2 w; AB part No. JA4M0328502MZ | | | 1 | 0.4 | 0.2 | 8 | 28 | A1R17 |
| F | 5905-850-9779 | | RESISTOR, VARIABLE: 100,000 ohm ±20%; AB part No. GA1M032S104MZ | | | 1 | 0.4 | 0.2 | 8 | | A1R20 |
| F | 5826-863-3735 | | SHAFT, ASSEMBLY: 3.188 in by 0.250 in dia; ARC part No.21482 | | | 1 | 0.3 | 0.1 | 2 | | |

| SOURCE CODE A | SOURCE CODE B | SOURCE CODE C | SOURCE CODE D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5826-863-3727 | | SPRING, FORMED: Beryllium copper; 1.437 in dia by 0.125 ARC part No. 19650 | | | 2 | 0.3 | 0.1 | 6 | | |
| | | F | | 5821-700-4530 | | SPRING, HELICAL, EXTENSION: ss; 25 coils; ARC part No. 14785 | | | 2 | 0.5 | 0.2 | 10 | | |
| | | F | | 5826-863-3726 | | SPRING, HELICAL, COMPRESSION: ss; 5 coils; ARC part No. 19871 | | | 2 | 0.3 | 0.1 | 6 | | |
| | | F | | 5826-863-3732 | | SPRING, HELICAL EXTENSION: ss; 30 coils; ARC part No. 23685 | | | 1 | 0.3 | 0.1 | 5 | | |
| | | F | | 5826-863-3736 | | SPRING, HELICAL, EXTENSION: ss; 25 coils; ARC part No. 23723 | | | 1 | 0.3 | 0.1 | 5 | | |
| | | F | | 5826-863-3754 | | SPRING, HELICAL, COMPRESSION: ss; 11 coils; ARC part No. 19869 | | | 1 | 0.2 | 0.1 | 3 | | |
| | | F | | 5930-855-8978 | | SWITCH, ASSEMBLY, AUDIO: 0.438 in by 0.688 in by 0.813 in o/a; ARC part No. 23695 | | | 1 | 0.3 | 0.1 | 5 | 29 | A1S2 |
| | | F | | 5930-855-8979 | | SWITCH, ASSEMBLY, LOCALIZER: 0.438 in by 0.688 in by 0.813 in o/a; ARC part No. 23696 | | | 1 | 0.3 | 0.1 | 5 | 29 | A1S1 |
| | | F | | 5950-849-7991 | | TRANSFORMER, IF: 1.7 mc peak freq; ARC part No. 22124 (Authorized allowances based on a total of 3.) | | | 1 | 0.9 | 0.3 | 15 | 28 | A1T1, |
| | | F | | 5950-863-3430 | | TUNING SLUG ASSEMBLY: 0.437 in dia max by 1.469 in lg; ARC part No. 19698 | | | 2 | 0.3 | 0.1 | 4 | | |

| SOURCE CODE (A B C D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Group VIII b | | | | | | | | |
| | | | FRAME ASSEMBLY: ARC part No. 22297 | | | | | | | | |
| F | 5910-864-3261 | | CAPACITOR, FIXED, MICA DIELECTRIC: 100 mmf ±2%; 500 vdc Electro Motive part No. VTCM15-101G. | | | 1 | (0.3) | 0.1 | 5.0 | 25 | C2 |
| F | 5910-822-5683 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 mmf +.80 -20%; 500 dc, Mil type CK63AW103M (For authorized allowances see Group VIII a). | | | 4 | Z | Z | Z | 23 | C38 thru C41 |
| F | 5910-880-2596 | | CAPACITOR, FIXED, PAPER DIELECTRIC: 10,000 mmf, ±20%; 300 vdc; ARC part No. 8837 (For authorized allowances see Group VIII a). | | | 11 | Z | Z | Z | 25 | A2C3 thru C8, A2C10 thru C14 |
| F | 5910-519-9081 | | CAPACITOR, FIXED, PAPER DIELECTRIC: 22,000 mmf, ±20%; Sprague Elec; part No. 196P22302S4. | | | 1 | (0.3) | 0.1 | 5.0 | 24 | C31 |
| F | 5910-666-7778 | | CAPACITOR, FIXED, ELECTROLYTIC: 2mf ±20%; 150 vdc; Sprague Elec. part No. 11DD47. | | | 1 | (0.4) | 0.1 | 5.0 | 24 | C26 |
| F | 5910-583-4831 | | CAPACITOR, FIXED, ELECTROLYTIC: 12 mf; 150 vdc; Sprague Elec part No. 110D47. | | | 2 | (0.5) | 0.2 | 10.0 | 23 | C34, C37 |
| F | 5960-230-5241 | | ELECTRON TUBE: MIL type 5840. | | | 1 | (4.9) | 2.4 | 100.0 | 26 | V3 |
| F | 5960-248-3091 | | ELECTRON TUBE: MIL type 5896. | | | 1 | (3.7) | 1.8 | 100.0 | 24 | V4 |
| F | 5960-729-5601 | | ELECTRON TUBE: MIL type 5899. (For authorized allowances see Group VIII a). | | | 2 | Z | Z | Z | 26 | V1, V2 |
| F | 5960-248-3090 | | ELECTRON TUBE: MIL type 5902. | | | 1 | (6.0) | 3.0 | 100.0 | 24 | V7 |
| F | 5960-261-8679 | | ELECTRON TUBE: MIL type 6021. (For authorized allowances see Group VIIIa). | | | 1 | Z | Z | Z | 24 | V5 |
| F | 5960-280-5585 | | ELECTRON TUBE: MIL type 6112. | | | 1 | (3.7) | 1.8 | 100.0 | 24 | V6 |
| F | 5905-683-7563 | | RESISTOR, FIXED, WIRE WOUND: 3 ohm ±3%; 3 w Dale Prod part No. RS2-3R04. | | | 1 | (0.3) | 0.1 | 5.0 | | R42 |
| F | 5905-299-2059 | | RESISTOR FIXED, COMPOSITION: 3,300 ohms, ±5%; MIL type RC32GF332J. | | | 1 | (0.4) | 0.1 | 5.0 | 24 | R43 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30 E (continued) | | | | | | | | |
| | | F | | 5905-249-4200 | | RESISTOR FIXED, COMPOSITION: 9,100 ohm ±5%; MIL TYPE RC20GF912J. | | | 1 | (0.4) | 0.1 | 4.0 | | R46 |
| | | F | | 5905-201-6735 | | RESISTOR FIXED, COMPOSITION: 47,000 ohm ±5&, MIL TYPE RC09GF473J (Authorized allowances based on a total of 3). | | | 1 | | (0.3) | 15 | 24 | R1 |
| | | H | | 5905-577-9674 | | RESISTOR, FIXED, COMPOSITION; 100,000 ohms, ±5%; MIL type RC09GF104J (For authorized allowances see Group VIII a). | | | 1 | | Z | Z | 25 | R2 |
| | | F | | 5905-501-7539 | | RESISTOR FIXED, COMPOSITION: 220,000 ohm ±5%; MIL type RC09GF224J (For authorized allowances see Group VIII a). | | | 1 | Z | Z | Z | 25 | R13 |
| | | F | | 5950-863-3437 | | TRANSFORMER, AF; plate coupling type; 400-3000 cps; 0.875 in. h by 1.125 in lg by 0.938 in w; Colin-Campbell part No. L1883. | | | 1 | (0.3) | 0.1 | 5.0 | 24 | T4 |
| | | H | | 5960-878-9604 | | SEMI CONDUCTOR DEVICE, DIODE MIL type 1N1371. | | | 1 | | (0.1) | 3.0 | 24 | CR4 |
| | | F | | 5950-849-7991 | | TRANSFORMER, IF: ARC part No. 22124 (For authorized allowances see Group VIII a). | | | 2 | Z | Z | Z | 24 | T1, T2 |
| | | F | | 5950-849-7992 | | TRANSFORMER, IF: 1.7 mc freq. interstage; 1.032 in lg by 0.719 in. w by 1.953 in h o/a: ARC part No. 22126. | | | 1 | (0.3) | 0.1 | 5.0 | 24 | T3 |
| | | | | | | Group VIII b 1 | | | | | | | | |
| | | F | | 5999-864-3253 | | PRINTED CIRCUIT ASSEMBLY: 0.500 in. h, by 2.187 in. w by 4.500 in lg o/a; ARC part No. 22244. | | | 1 | (0.3) | 0.1 | 5.0 | | |
| | | H | | 5999-864-3254 | | BOARD PRINTED CIRCUIT: 0.500 in. h by 2.187 in. w by 4.500 in lg o/a; ARC part No. 22245. | | | 1 | | (0.1) | 3.0 | | |
| | | H | | 5910-685-9700 | | CAPACITOR, FIXED, ELECTROLYTIC: 220,000 mmf, ±20%; 35 vdc, Sprague Elec part No. 150D225XD035B2. | | | 2 | | (0.2) | 10.0 | 24, 25 | A2C9 A2C15 |
| | | H | | 5905-615-5215 | | RESISTOR FIXED, COMPOSITION: 150 ohm ±5%; MIL type RC09GF151J. | | | 1 | | (0.1) | 5.0 | 24 | A2 R6 |
| | | H | | 5905-192-3971 | | RESISTOR FIXED, COMPOSITION: 180 ohm ±5%; MIL type RC09GF181J. | | | 1 | | (0.1) | 5.0 | 24 | A2 R10 |

| SOURCE CODE (A B C D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| H | 5905-581-7948 | | RESISTOR FIXED, COMPOSITION; 270 ohm ±5%; MIL type RC09GF271J. | | | 1 | | (0.1) | 5.0 | 24 | A2 R3 |
| F | 5905-686-3369 | | RESISTOR, FIXED, COMPOSITION; 330 ohm ±5%; MIL type RC09GF331J (For authorized allowances see Group VIII a).<br><br>Note: Used on Order FR-36-039-N-4-05935. | | | 2 | Z | Z | Z | 24 | A2 R10 |
| F | 5905-501-8479 | | RESISTOR, FIXED, COMPOSITION: 2200 ohms; MIL type RC09GF222J (For authorized allowances see Group VIII a). | | | 2 | Z | Z | Z | 24 | A2 R5<br>A2 R8 |
| H | 5905-642-0486 | | RESISTOR, FIXED, COMPOSITION: 4700 ohm ±5%; MIL type RC09GF472J. | | | 2 | | (0.2) | 10.0 | 24 | A2 R4<br>A2 R7 |
| H | 5905-192-0651 | | RESISTOR, FIXED, COMPOSITION: 20,000 ohm ±5%; MIL type RC42GF203J. | | | 1 | | (0.1) | 5.0 | 24 | A2 R12 |
| H | 5905-279-3495 | | RESISTOR, FIXED, COMPOSITION: 75,000 ohm ±5%; MIL type RC20GF753J. | | | 1 | | (0.1) | 5.0 | 24 | A2 R11 |
| H | 5905-201-6735 | | RESISTOR, FIXED, COMPOSITION: 47,000 ohm ±5%; MIL type RC09GF473J (For authorized allowances see Group VIII b).<br><br>OR | | | 2 | | Z | Z | 25 | A2 R44<br>A2 R45 |
| H | 5905-549-7599 | | RESISTOR, FIXED, COMPOSITION: 68,000 ohm ±5%; MIL type RC09GF683J.<br><br>OR | | | 2 | | (0.1) | 10.0 | 25 | R44, R45 |
| H | 5905-577-9674 | | RESISTOR, FIXED, COMPOSITION: 100,000 ohm ±5%; MIL type RC09GF1D4J (For authorized allowances see Grou[illegible] VIII a).<br><br>OR | | | 2 | | Z | Z | 25 | A2R44<br>A2R45 |
| H | 5905-279-4600 | | RESISTOR, FIXED, COMPOSITION: 150,000 ohm ±5%; MIL type RC09GF154J.<br><br>OR | | | 2 | | (0.1) | 10.0 | 25 | A2R44<br>A2R45 |
| H | 5905-681-8821 | | RESISTOR, FIXED, COMPOSITION: 200,000 ohms ±5%; MIL type RC09GF204J<br><br>OR | | | 2 | | (0.1) | 10.0 | 25 | A2R44<br>A2R45 |

| Source Code A | Source Code B | Source Code C | Source Code D | Federal Stock Number | Designation by Model | Description | Unit of Issue | Exp | Qty in Unit | Direct Support | General Support | Depot | Illustration Figure No. | Illustration Item No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | H | | 5905-542-8134 | | RESISTOR FIXED, COMPOSITION: 470,000 ohm ±5%; MIL type RC09GF474J (For authorized allowances see Group VIIIa). | | | 2 | | (0.1) | 10.0 | 25 | A2R44<br>A2R45 |
| | | H | | 5905-577-9674 | | RESISTOR FIXED, COMPOSITION: 100,000 ohms; MIL type RC09GF104J (For authorized allowances see Group VIII a). | | | 1 | | Z | Z | 24 | A2R9 |

| SOURCE CODE | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A B C D | | | | | | | | | | | |
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| H | 5905-542-8259 | | RESISTOR, FIXED, COMPOSITION: 330,000 ohm ±5%; MIL type RC09GF334J (Authorized allowances based on a total of 4.) | | | 1 | | 0.4 | 20.0 | 29 | A2R15 |
| H | 5960-890-7156 | | SEMI CONDUCTOR DEVICE, DIODE: Huges Prod Div part No. HD6226 (For authorized allowances see Group IV.) | | | 2 | | Z | Z | 24 | CR2<br>CR3 |
| | | | GROUP VIII b2<br>PRINTED CIRCUIT ASSEMBLY | | | | | | | | |
| F | 5999-864-3255 | | PRINTED CIRCUIT ASSEMBLY: 1.125 in h by 2.859 in w by 4.500 in lg o/a; ARC part No. 22285 | | | 1 | 0.3 | 0.1 | 5.0 | 25 | |
| H | 5999-864-3260 | | BOARD, PRINTED CIRCUIT: 7/64 in thk, by 2.859 in w by 4.500 in lg o/a ARC part No. 22283 | | | 1 | | 0.1 | 3.0 | 25 | |
| H | 5910-864-3250 | | CAPACITOR, FIXED, MICA DIELECTRIC: 100 mmf, ±5%; 500 vdc; Electro Motive part No. VTDM15101J (For authorized allowances see Group VIII a.) | | | 3 | | Z | Z | 25 | C17<br>C18<br>C20 |
| H | 5910-864-3259 | | CAPACITOR, FIXED, MICA DIELECTRIC: 240 mmf ±5%; 500 vdc; Electro Motive part No. VTDM19241J | | | 1 | | 0.1 | 5.0 | 25 | A2C16 |
| H | 5910-864-3257 | | CAPACITOR, FIXED, MICA DIELECTRIC: 510 mmf ±5%; 500 vdc Electro Motive part No. VTDM-511J | | | 1 | | 0.1 | 5.0 | 25 | A2C22 |
| H | 5910-864-3258 | | CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 mmf ±5%; 500 vdc; Electro Motive, part No. VTDM19102J | | | 1 | | 0.1 | 5.0 | 25 | A2C25 |
| H | 5910-880-2596 | | CAPACITOR, FIXED, PAPER DIELECTRIC: 10,000 mmf; ARC part No. 8837 (For authorized allowances see Group VIII a.) | | | 4 | | Z | Z | 24 | C1<br>C21<br>C24<br>C28 |
| H | 5910-755-0014 | | CAPACITOR, FIXED, ELECTROLYTIC: 100,000 mmf, ±20%; Sprague Elec part No. 150D104X0035A2 | | | 2 | | 0.2 | 10.0 | 25 | C23<br>C27 |
| H | 5910-814-7612 | | CAPACITOR, FIXED, PAPER DIELECTRIC: 10,000 mmf ±20%; Cornell-Dubilier part No. TWA3S1-10 (For authorized allowances see Group VIII a.) | | | 1 | | Z | Z | 25 | C30 |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | H | | 5910-667-4294 | | CAPACITOR, FIXED, ELECTROLYTIC: 5 mf +50% -15%; Fanstell Metallurgical part No. PB5B50A2 | | | 1 | | 0.1 | 5.0 | 25 | C29 |
| | | H | | 5905-686-3369 | | RESISTOR, FIXED, COMPOSITION: 330 ohm ±5%; MIL type RC09GF331J (For authorized allowances see Group VIII a.) | | | 1 | | Z | Z | 25 | R18 |
| | | H | | 5905-299-2051 | | RESISTOR, FIXED, COMPOSITION: 470 ohm ±5%; MIL type RC32GF471J | | | 1 | | 0.1 | 5.0 | 25 | R40 |
| | | H | | 5905-642-0474 | | RESISTOR FIXED, COMPOSITION: 6800 ohm ±5%; MIL type RC09GF682J | | | 2 | | 0.2 | 10.0 | 25 | R35<br>R34 |
| | | H | | 5905-577-0935 | | RESISTOR, FIXED, COMPOSITION: 10,000 ohm ±5%; MIL type RC09GF103J (Authorized allowances based on a total of 2.) | | | 1 | | 0.2 | 10.0 | 25 | R21 |
| | | H | | 5905-581-7952 | | RESISTOR, FIXED, COMPOSITION: 15,000 ohm ±5%; MIL type RC09GF153J | | | 1 | | 0.1 | 5.0 | 25 | R14 |
| | | H | | 5905-577-0626 | | RESISTOR, FIXED, COMPOSITION: 22,000 ohm ±5%; MIL type RC09GF223J | | | 1 | | 0.1 | 5.0 | 25 | R19 |
| | | H | | 5905-171-1998 | | RESISTOR, FIXED, COMPOSITION: 33,000 ohm ±5%; MIL type RC09GF333J (For authorized allowances see Group VIII a.) | | | 1 | | Z | Z | 25 | R17 |
| | | H | | 5905-549-7599 | | RESISTOR FIXED COMPOSITION: 68,000 ohm ±5%; MIL type RC09GF683J (For authorized allowances see Group VIII a.) | | | 3 | Z | Z | Z | 25 | R26<br>R30<br>R33 |
| | | H | | 5905-577-9674 | | RESISTOR FIXED, COMPOSITION: 100,000 ohm ±5%; MIL type RC09GF104J (For authorized allowances see Group VIII a.) | | | 4 | | Z | Z | 25 | R16<br>R22<br>R36<br>R48 |
| | | H | | 5905-501-7539 | | RESISTOR FIXED, COMPOSITION: 220,000 ohm ±5%; MIL type RC09GF224J (For authorized allowances see Group VIII a.) | | | 2 | | Z | Z | 25 | R23<br>R24 |
| | | F | | 5905-542-8259 | | RESISTOR, FIXED, COMPOSITION: 330,000 ohms MIL type RC09GF334J (For authorized allowances see Group VIII bl.) | | | 3 | | Z | Z | 25 | R28<br>R29<br>R38 |

| SOURCE CODE A | SOURCE CODE B | SOURCE CODE C | SOURCE CODE D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | H | | 5905-542-8134 | | RESISTOR, FIXED, COMPOSITION: 470,000 ohm ±5%; MIL type RC09GF474J (For authorized allowances see Group VIII a.) | | | 2 | | Z | Z | 25 | R25<br>R39 |
| | | H | | 5905-284-3533 | | RESISTOR, FIXED, COMPOSITION: 1 meg ohm ±5% MIL type RC09GF105J | | | 4 | | 0.4 | 10.0 | 25 | R27,R31<br>R32,R2 |
| | | H | | 5960-890-7156 | | SEMI CONDUCTOR DEVICE, DIODE: Huges Prod Div part No. HD6226 (For authorized allowances see Group IV.) | | | 1 | | Z | Z | 25 | CR5 |
| | | | | | | GROUP VIII b3<br>PLATE ASSEMBLY:<br>ARC part No. 21848 | | | | | | | | |
| | | F | | 5910-519-6124 | | CAPACITOR, FIXED, PAPER DIELECTRIC: 100,000 mmf, ±20%; 200 vdc; Sprague Elect. part No. 186P10402T15 | | | 1 | 0.3 | 0.1 | 5.0 | 24 | C19 |
| | | | | | | GROUP VIII b4<br>PLATE ASSEMBLY:<br>ARC part No. 22102 | | | | | | | | |
| | | F | | 5935-503-5380 | | JACK TIP: Microdot part No. 3101 | | | 1 | 0.2 | 0.1 | 4.0 | 25 | J2 |
| | | F | | 5905-577-0935 | | RESISTOR FIXED, COMPOSITION: 10,000 ohm ±5% MIL type RC09GF103J (For authorized allowances see Group VIII b2.) | | | 1 | Z | Z | Z | 25 | R20 |
| | | F | | 5935-863-3685 | | CONNECTOR, RECEPTACLE, ELECTRICAL: ARC part No. 21809 | | | 1 | 0.3 | 0.1 | 5.0 | 24 | J1 |
| | | H | | 5960-852-1360 | | SEMICONDUCTOR DEVICE, DIODE: MIL type IN1364 | | | 1 | | 0.1 | 3.0 | 24 | CR6 |
| | | | | | | GROUP VIII b5<br>INTERCON BOX<br>ARC part No. 22312 | | | | | | | | |
| | | F | | 5910-376-9762 | | CAPACITOR, FIXED, PAPER DIELECTRIC: 3 sect 20,000 mmf ±20%; ARC part No. 5413 | | | 1 | 0.3 | 0.1 | 5.0 | 23 | C35 |
| | | F | | 5910-546-9279 | | CAPACITOR, FIXED, ELECTROLYTIC: 5 mf; 300 vdc; ARC part No. 6350 | | | 2 | 0.5 | 0.2 | 10.0 | 23 | C33<br>C36 |
| | | F | | 5340-597-6467 | | MOUNT, RESILIENT: 0.795 in dia by 0.872 in h o/a; ARC part No. 4681 | | | 4 | 0.5 | 0.2 | 16.0 | | |

| SOURCE CODE (A B C D) | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| F | 5950-295-7648 | | REACTOR: Fixed inductance, 50 ma dc; 390 ohm dc; ARC part No. 5634 | | | 1 | 0.3 | 0.1 | 3.0 | 26 | L1 |
| F | 5950-387-0470 | | REACTOR: Fixed inductance 0.10 mh; 0.126 ohm dc; ARC part No. 5546 | | | 1 | 0.3 | 0.1 | 3.0 | 23 | L2 |
| F | 5905-850-9792 | | RESISTOR, FIXED, WIRE WOUND: 5000 ohm ±5%, 10 w; ARC part No. 3065 | | | 1 | 0.3 | 0.1 | 3.0 | 23 | R41 |
| F | 5905-256-3361 | | RESISTOR FIXED, COMPOSITION: 1,000 ohm ±5%; MIL type RC42GF102J | | | 1 | 0.3 | 0.1 | 5.0 | | R47 |
| | | | GROUP VIII b5a INTERCON BOX SUBASSEMBLY: ARC part No. 21773 | | | | | | | | |
| F | 5935-257-9735 | | CONNECTOR, RECEPTACLE, ELECTRICAL: ARC part No. 5488 | | | 1 | 0.3 | 0.1 | 5.0 | | J4 |
| F | 5935-258-3864 | | CONNECTOR, RECEPTACLE, ELECTRICAL: ARC part No. 4718 | | | 1 | 0.3 | 0.1 | 5.0 | | J3 |
| | | | GROUP VIII c TUNER ASSEMBLY: ARC part No. 22203-0028 | | | | | | | | |
| F | 3110-863-3781 | | BEARING BALL ANNULAR: Ground, single row, 0.3125 in od by 1.1094 in w o/a, Nice Ball Bearing type 7434 (For authorized allowances see Group VIII a.) | | | 2 | Z | Z | Z | 47 | |
| F | 3110-863-3782 | | BEARING, BALL, ANNULAR: Single row, radical ss, New Departure Div part No. SSRS77NR4HGZD1228E | | | 2 | 0.5 | 0.2 | 10.0 | 47 | |
| F | 5910-615-4671 | | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 mmf ±10%; 500 vdc; AB part No. 24-102W | | | 1 | 0.3 | 0.1 | 5.0 | 41 | C1 |
| F | 5950-863-3438 | | COIL RF: Single Coil; 15 uh 1.2 ohm dc; 0.6 amp; 0.188 in dia by 0.438 in lg o/a; Jeffers Elec 1012-636 (For authorized allowances see Group VIII a.) | | | 1 | Z | Z | Z | 47 | L1 |
| F | 5935-863-3686 | | JACK: ARC part No. 13392 | | | 1 | 0.3 | 0.1 | 5.0 | | |

| SOURCE CODE A | B | C | D | FEDERAL STOCK NUMBER | DESIGNATION BY MODEL | DESCRIPTION | UNIT OF ISSUE | EXP | QTY IN UNIT | DIRECT SUPPORT | GENERAL SUPPORT | DEPOT | ILLUSTRATION FIGURE NO. | ILLUSTRATION ITEM NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | AN/ARN-30D & 30E (continued) | | | | | | | | |
| | | F | | 5826-863-3718 | | LEVER, ASSEMBLY, LH: 1.875 in by 1.063 in by 0.688 in o/a; ARC part No. 19668 | | | 1 | 0.3 | 0.1 | 3.0 | 47 | |
| | | F | | 5826-863-3744 | | LEVER ASSEMBLY RH: 1.875 in by 1.063 in by 0.688 in o/a; ARC part No. 19674 | | | 1 | 0.3 | 0.1 | 3.0 | 47 | |
| | | F | | 5826-864-0451 | | PANEL, PRINTED CIRCUIT: ARC part No. 19656 | | | 1 | 0.3 | 0.1 | 4.0 | 31 | |
| | | F | | 5826-863-3739 | | PAWL ASSEMBLY, LH: 0.921 in by 0.390 in by 0.281 in o/a; ARC part No. 19568 | | | 2 | 0.3 | 0.1 | 4.0 | 47 | |
| | | F | | 5826-863-3740 | | PAWL ASSEMBLY RH: 0.921 in by 0.390 in by 0.281 in o/a; ARC part No. 19571 | | | 2 | 0.3 | 0.1 | 4.0 | 47 | |
| | | F | | 5826-863-3749 | | PLATE ASSEMBLY CONTACT: 2.156 in by 0.562 in by 0.688 in o/a; ARC part No. 22105 | | | 2 | 0.5 | 0.2 | 5.0 | 47 | |
| | | F | | 5826-863-3746 | | PLATE, INDEX: 1.400 in dia by 0.093 in o/a; ARC part No. 19572 | | | 2 | 0.3 | 0.1 | 4.0 | 47 | |
| | | F | | 5826-683-3747 | | RATCHET, ASSEMBLY LH: 1.437 in dia by 0.188 in thk o/a; ARC part No. 19446 | | | 1 | 0.2 | 0.1 | 3.0 | 47 | |
| | | F | | 5826-863-3748 | | RATCHET ASSEMBLY RH: 1.437 in dia by 0.188 in thk o/a; ARC part No. 19447 | | | 1 | 0.2 | 0.1 | 3.0 | 47 | |
| | | F | | 5945-855-8977 | | RELAY ARMATURE: 140 ohm dc, 18 vdc; 2 in lg by 3/4 in w by 1-3/16 in h o/a; ARC part No. 19665 | | | 2 | 0.7 | 0.2 | 8.0 | 47 | K1<br>K2 |
| | | F | | 5905-279-8977 | | RESISTOR FIXED, COMPOSITION: 15 ohm ±5%; MIL type RC20GF150J | | | 1 | 0.4 | 0.1 | 5.0 | R1 | |
| | | H | | 5960-890-7156 | | SEMI CONDUCTOR DEVICE, DIODE: Huges Prod Div part No. HD6226 (For authorized allowances see Group IV.) | | | 2 | | Z | Z | 31<br>47 | CR1<br>CR2 |
| | | F | | 5826-863-3750 | | SPRING CONTACT: ARC part No. 19432 | | | 2 | 0.5 | 0.2 | 5.0 | 47 | |
| | | F | | 5826-863-3741 | | SPRING, FORMED: as 7/8 turn; ARC part No. 19566 | | | 2 | 0.5 | 0.2 | 10.0 | 47 | |
| | | F | | 5826-863-3743 | | SPRING, FORMED: 7/8 turn; ARC part No. 21504 | | | 2 | 0.5 | 0.2 | 10.0 | 47 | |
| | | F | | 5826-863-3742 | | SPRING HELICAL, EXTENSION: cres; cylindrical shape; 10 coils; ARC part No. 19569 | | | 1 | 0.3 | 0.1 | 5.0 | 47 | |
| | | F | | 5826-863-3745 | | SPRING, HELICAL, EXTENSION: cres; cylindrical shape; 11 coils; ARC part No. 19442 | | | 4 | 0.8 | 0.2 | 20.0 | 47 | |

By Order of the Secretary of the Army:

HAROLD K. JOHNSON,
*General, United States Army,*
*Chief of Staff.*

Official:
J. C. LAMBERT,
*Major General, United States Army,*
*The Adjutant General.*

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CHANGE No. 6

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *21 October 1969*

# DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tools Lists

# RECEIVING SETS, RADIO AN/ARN-30D AND AN/ARN-30E

TM 11-5826-215-35, 6 November 1961, is changed as follows:

*Note.* The parenthetical reference to a previous change (example: page 7 of C 1) indicates that pertinent material was published in that change.

*Page 2,* paragraph 1*c* (page 1 of C 3, as changed by C 5, 1 Jul 66). Delete and substitute the following:

*c.* The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commanding General, U. S. Army Electronics Command, ATTN: AMSEL-ME-NMP-AD, Fort Monmouth, N. J., 07703.

Paragraph 1.2 (page 1 of C 3). Delete and substitute:

1.2. Indexes of Publications

*a. DA Pam 310-4.* Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

*b. DA Pam 310-7.* Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

*Page 117,* paragraph 117.1 (page 7 of C 1, as changed by C 5, 1 Jul 66), chart.

Make the following changes in the *Performance standard* column:

Step No. 3*f*, last word. Delete the word "light" and substitute "extinguish."

Step No. 4*a*. Delete subparagraph *a* and substitute:

*a.* Cycling test unit REC CYCLING lamps listed below light for each of the selected megacycle channels.

| *Megacycle channel (mc)* | *REC CYCLING lamps* |
|---|---|
| 108 | K, L |
| 109 | J, K, L |
| 110 | H, L |
| 111 | I, J, K, L |
| 112 | I |
| 113 | H, I, J, K |
| 114 | J |
| 115 | H, I, J, L |
| 116 | K |
| 117 | H, I, K |
| 118 | L |
| 119 | H, J, L |
| 120 | H |
| 121 | I, K |
| 122 | H, I |
| 123 | H, J |
| 124 | I, J |
| 125 | I, L |
| 126 | J, K |

*This change supersedes C 5, 1 July 1966.

Step No. 4*b*. "FRACT CYCLING lamps" column, first line. Delete the letter "P"

*Page 124.* Add chapter 5 after chapter 4.

## CHAPTER 5

## DEPOT OVERHAUL STANDARDS

### 1. General

The tests outlined herein are designed to measure the performance capability of a repaired equipment. Equipment that meets the minimum standards stated in the tests will furnish satisfactory operation equivalent to that of new equipment.

### 2. Test Facilities Required

The following equipment and test equipment will be used in determining compliance with these tests.

*a Equipment.*

*Note.* The following equipment must meet established new equipment specifications.

| *Equipment* | *Technical Manual* | *Common Name* |
|---|---|---|
| Receiver, Radio R-1021/ARN-30D. | TM 11-5826-215-12.... | Receiver |
| Indicator, Course ID-453/ARN-30. | TM 11-5826-215-12.... | Indicator |
| Converter, Signal Data CV-265A/ARN-30A. | TM 11-5826-215-12.... | Converter |
| Dynaverter PP-2792/ARN-30D. | TM 11-5826-215-12.... | Dynaverter |
| Rack MT-1175/ARN-30A. | TM 11-5826-215-12.... | Rack |
| Control, Radio Set C-3436/ARN-30D or C-3436A/ARN-30E. | TM 11-5826-215-12.... | Control unit |

*b. Test Equipment.*

| *Test Equipment* | *Technical Manual* | *Common name* |
|---|---|---|
| Test Set, Radio AN/ARM-63 or Aircraft Radio Corp Model BTK-35A. | TM 11-6625-556-12.............. | Test set. |
| Generator, Signal AN/ARM-5A.............................. | TM 11-6625-828-15.............. | Signal generator. |
| Digital Readout, Electronic Counter AN/USM-207. | TM 11-6625-700-10.............. | Frequency counter. |
| Frequency Converter, Electronic AN/ARM-69. | TM 11-6625-636-12.............. | Frequency converter. |
| Generator, Signal AN/USM-44................................ | TM 11-6625-508-10.............. | RF signal generator. |
| Power Supply PP-1104A/G.................................... | TM 11-5126............................. | Power Supply. |
| Multimeter ME-26B/U.............................................. | TM 11-6625-200-15.............. | Multimeter. |
| Headset HS-33.......................................................... | ............................................... | Headset. |
| Fabricated RF Coaxial Cable (CG-409/U)............. | ............................................... | Coaxial cable. |

### 3. Connections for Test Setup (fig. 80 and 81)

To test the receiver, connect the components as shown in figure 81 or 82 and as explained below:

*a.* Use Wiring Harness ARC 29418 or CX-8749/ARM-63 (yellow) (part of Test Set, Radio AN/ARM-63) to connect the test set, receiver, converter, and control unit as follows:

| Wiring harness (yellow) | | | |
|---|---|---|---|
| ARC 29418 (BTK-35A | CX-8749/ARM-63 (AN/ARM-63) | Unit | Unit connector |
| P1 | P1 | Test set | J103 |
| P2 | P2 | Receiver | J2 |
| P3 | P3 | Receiver | J4 |
| P4 | [a]P4 | Converter | [a]J204 |
| P5 | — | Converter | J205 |
| P6 | P6 | Control unit | J1 |
| P7 | P7 | Control unit | J2 |
| [c]P8 | [c]P8 | | Connect to P10 |
| P9 | — | Test set | [b]J101 |
| [c]P10 | [c]P10 | | Connect to P8 |

[a] In the CX-8749/ARM-63, P4 and P5 are combined into one connector which, with a connector assembly, connects P4 to both J204 and J205.

[b] Test Set, Radio AN/ARM-63 does not include connector J101 and CX-8749/ARM-63 has no plug P9.

[c] Plug connectors P8 and P10 together.

*b.* Set the test set NAV MOD switch to RCVR. Connect the signal generator DEMOD jack to the test set EXT NAV MOD jack and the signal generator ATTEN jack to the receiver ANT jack (J1). Use a 6-foot long coaxial cable fabricated from type RG-58/U coaxial cable with BNC connectors on each end.

*c.* Use Power Cord Assembly ARC 30070 or CX-8739/ARM-63 (red and black) (part of Test Set, Radio AN/ARM-63) to connect the test set to the power supply.

Caution: Observe polarity when connecting the power cable to the power supply.

## 4. General Test Equipment

Most of the tests will be performed under the conditions listed below and illustrated in figure 81 or 82. Testing will be simplified if conditions and panel control settings are made initially and modifications are made as required for the individual tests.

*a.* Turn on the power supply and adjust for an output of 28 volts direct current (dc).

*b.* Set the test set dc circuit breaker to ON and observe that the test set POWER DC indicator lamp glows.

*c.* Set the test set CP LOAD switch to VOR and set the test set METER switch to LV 0-30V. The test set multimeter should indicate 28 volts dc (LV+ set point).

*d.* Remove the dynaverter from the receiver and use the multimeter to check that the dynaverter input primary power, measured across pins 1 and 2 of receiver connector J3, is 28 volts dc. Replace the dynaverter.

*e.* Set the test set METER switch to AUDIO 0-6V and energize the signal generator. Set the signal generator for 30-percent modulation at 1,000 Hertz (HZ) and adjust the signal generator 1000Ω MOD control until the signal generator %M meter indicates on the left-hand edge of the red set mark.

*f.* Position the test set SQUELCH control and VOR-GS on-off switch fully clockwise and set the test set control selector switch to INT. Allow the test setup to warm up for at least 10 minutes.

*g.* Disconnect the coaxial cable from the receiver ANT jack. Set the test set METER switch to VH+0-600V and observe that the test set multimeter indicates between 235 and 270 volts dc (on or near the B+ set point).

*h.* Reconnect the coaxial cable to the receiver ANT jack.

5. Receiver, Radio R-1021/ARN-30D

Connect the equipment as illustrated in figure 80 or 81, and test the receiver as follows:

*a. Channeling Test.*

(1) Set the test set UHF-XMTR-EXT-VOF-INT switch to INT and turn the knobs of the test set megacycle selector control until the control MC dial indicates 108.00. Observe that the test set indicating lights K, L, N, and O glow and that the receiver megacycle channel crystal drum dial indicates 108.

*Note.* The receiver crystal drum dial can be observed through the front frequency window located on the right-hand side of the receiver.

(2) Set the left-hand knob of the test set megacycle selector control through all positions. Observe that the test set indicating lights listed in the chart below glow for the corresponding listed megacycle channels and that the megacycle channel crystal drum dial indicates the same channel reading as the MC dial of the test set megacycle selector control.

| Test set megacycle channel (MC dial) | Test set indicating lights |
|---|---|
| 108 | K, L |
| 109 | J, K, L |
| 110 | H, L |
| 111 | I, J, K, L |
| 112 | I |
| 113 | H, I, J, K |
| 114 | J |
| 115 | H, I, J, L |
| 116 | K |
| 117 | H, I, K |
| 118 | L |
| 119 | H, J, I |
| 120 | H |
| 121 | I, K |
| 122 | H, I |
| 123 | H, J |
| 124 | I, J |
| 125 | I, L |
| 126 | J, K |
| Space | H, K, L |

(3) Turn the test set megacycle selector control right-hand knob through all positions. Observe that the test set indicating lights listed in the chart below glow for the corresponding listed fractional megacycle channels and that the receiver fractional megacycle channel crystal drum dial indicates the same channel reading as the MC dial of the test set megacycle selector control.

*Note.* The receiver fractional crystal drum dial can be observed through the rear frequency window on the right-hand side of the receiver.

| Test set megacycle channel (MC dial) | Test set indicating lights |
|---|---|
| .00 | N, O |
| .10 | N, R |
| .20 | Q |
| .30 | P |
| .40 | O |
| .50 | N |
| .60 | R |
| .70 | Q, R |
| .80 | P, Q |
| .90 | O, P |

(4) Set the test set METER switch to LV 0-30V and adjust the power supply output until the test set multimeter indicates 20.0 volts dc.

(5) Repeat the procedure given in (2) and (3) above. The corresponding test set indicating lights must glow for the channels as listed and the receiver crystal drum dials must indicate the proper channels. Observe that the drum dials rotate at a slower rate.

(6) Adjust the power supply for 28 volts dc output.

*b. Sensitivity Test.*

(1) Deenergize and disconnect Generator, Signal AN/ARM-5A. Connect RF signal generator to the test setup and connect the RF signal generator RF connector to the receiver ANT jack (J1) with a 6-foot long coaxial cable.

(2) Adjust the test set megacycle selector control for a reading of 108.00 on the

control MC dial and position the test set SQUELCH control and VOR-GS on-off switch fully counter clockwise.

(3) Set the RF signal generator for 30-percent modulation at 1,000 Hertz and adjust the RF signal generator output to 3 microvolts ($\mu$v).

(4) Set the test set METER switch to AUDIO 0-6V.

(5) Turn the RF signal generator in the vicinity of 108.00 Megahertz (MHZ) for a maximum audio signal as heard in the headset. Adjust the VOL knob of the test set SQUELCH control and VOR-GS on-off switch to obtain a 5-volt alternating current 5(ac) indication on the test set multimeter.

(6) Remove the modulation from the RF signal generator and observe that the test set multimeter reading drops a minimum of 2 volts. The RF signal generator must indicate anoutput of not more than 3 microvolts.

c. *AG Operation.* With the same test connections used in *b* above, proceed as follows:

(1) Check to see that the MC dial of the test megacycle selector control indicates 108.00 and that the test set SQUELCH control and VOR-GS on-off switch is positioned fully counterclockwise.

(2) Set the RF signal generator for 30-percent modulation at 1,000 Hertz. Adjust the RF signal generator output to 3 microvolts and tune the RF signal generator to 108.00 MHZ

(3) Set the test set METER switch to AUDIO 0-6V and adjust the VOL knob of the test set SQUELCH control and VOR-GS on-off switch to obtain a 5-volt ac indication on the test set multimeter.

(4) Set the test set METER switch to AUDIO 0-30V and adjust the RF signal generator output to 100,000 microvolts. Observe that the test set multimeter reads between 7.8 and 10 volts ac.

(5) Adjust the RF signal generator output to 200,000 microvolts and observe that the test set multimeter reads between 10 and 12.5 volts ac.

d. *Receiver Selectivity Test.* With the same test connections as in *b* above, proceed as follows:

(1) Tune the AN/ARN-30 control unit to 126.90 Megahertz.

(2) Remove the RF signal generator from the test setup and connect the RF signal generator output to the frequency counter. Tune the RF signal generator for a frequency counter indication of exactly 126.90 Megahertz. Reconnect the RF signal generator into the test setup.

(3) Remove the receiver from its case and connect the multimeter to the junction of resistor R22 and R26 in the IF/AF assembly (fig. 25 and 73, part 2). Adjust the microvolt output level of the RF signal generator until the multimeter indicates —5 volts dc and record the output level setting. Slowly move the RF signal generator frequency control through the adjusted setting in both directions and note that the multimeter indication does not increase by more than 3 decibels (db) above the—5-volt level.

(4) Reset the RF signal generator to 126.90 Megahertz and adjust the microvolt output level until it is twice that determined in (3) above. Adjust the RF signal generator nose vernier in one direction from the 126.90 MHZ setting until the multimeter indicates —5 volts dc. Disconnect the RF signal generator from the test setup and connect it to the frequency counter. Note and record the frequency counter indication. Disconnect the frequency counter and reconnect the RF signal generator to the test setup. Adjust the RF signal generator nose vernier in the other direction from the 126.90 MHZ setting until the multimeter again indicates —5 volts dc. Note and record the frequency counter indication. The difference between the two indications represents the 6-db band width and must be a minimum of 45 kilohertz (kHZ).

(5) With the RF signal generator connected into the test setup, reset the RF signal gererator to 126.90 Megahertz and adjust the microvolt output level until it is 1,000 times that determined in (3) above. Adjust the RF signal generator skirt vernier

in one direction from the 126.90 MHZ setting until the multimeter indicates —5 volts dc. Disconnect the RF signal generator from the test setup and connect it to the frequency counter. Note and record the frequency counter indication. Disconnect the frequency counter and reconnect the RF signal generator into the test setup. Adjust the RF signal generator skirt vernier in the other direction from the 126.90-MHZ setting until the multimeter again indicates —5 volts dc. Note and record the frequency counter indication. The difference between the two indications represents the 60-db bandwidth and must not exceed 160 kilohertz.

(6) Disconnect the multimeter from the receiver and place the receiver back in its case.

## 6. Converter, Signal Data CV-265A/ARN-30A

Connect the equipment as illustrated in figure 80 and also the connections specified in paragraph 3 except that Generator, Signal AN/ARM-5A is used instead of the RF signal generator.

*a. VOR Operation.*

(1) Set the test set NAV MOD switch to RCVR and set the test set METER switch to NAV MOD 0-6V. Disconnect the BNC connector from the test set EXT NAV MOD connector.

(2) Adjust the test set megacycle selector control for a reading of 114.90 on the control MC dial.

(3) Set the signal generator for 30-percent modulation at 1,000 Hertz. Switch the signal generator MC switch to B (114.90 Megahertz) and adjust the signal generator DEMOD potentiometer to obtain a reading of 1.8 volts dc on the test set multimeter.

(4) Set the signal generator MODULATION switch to OMNI.

(5) Set the signal generator OMNI TRACK ANGLE "TO" control to each of its 24 settings (one setting at a time), and rotate the test set indicator selector knob to position the indicator pointer to the corresponding signal generator setting. The test set indicator vertical pointer should be centered within ±3 degrees for each setting the vertical OFF flag should not be visible, and the TO-FROM meter should indicate TO for each setting.

(6) Set the signal generator MODULATION switch to 30 Ω. Observe that the test set indicator vertical OFF flag is fully visible.

(7) Set the signal generator MODULATION switch to 9960 Ω. Observe that the test set indicator vertical OFF flag remains fully visible.

(8) Set the signal generator MODULATION switch to OMNI. Observe that the test set indicator vertical OFF flag is not visible.

*b. Localizer Circuits.*

(1) Adjust the test set megacycle selector control for a reading of 110.90 on the control MC dial and set the test set UHF-XMTR-EXT-VOR-INT switch to INT.

(2) Set the signal generator MC switch to A (110.90 Megahertz) and adjust the signal generator modulation to the redline setting on the signal generator %M meter. Position the signal generator ATTENUATOR uV control to 500 microvolts, the signal generator MODULATION switch to AMP LOC(▸), and adjust the signal generator output to obtain a reading of 1.8 volts on the test set multimeter.

(3) Set the test set VHF REC switch to LOC and the METER switch to NAV MOD 0-6V. Observe that the test set indicator vertical pointer is centered within ±1/2° and the indicator vertical OFF flag is not visible. Set the test set VERT-CP-HOR switch to VERT and observe that the test set DEVIATION meter reads within ±7 microamperes.

(4) Set the signal generator MODULATION switch to AMP LOC(▸). Observe that the test set indicator vertical pointer swings left to the outer edge of the blue sector and the indicator vertical OFF flag is not visible. The test set DEVIATION meter must read 90 microamperes ±10 to the right.

(5) Set the isgnal generator MODULATION switch to AMP LOC(◂). Observe that

the test set indicator vertical pointer swings right to the outer edge of the yellow sector and the indicator vertical OFF flag is not visible. The test set DEVIATION meter must read 90 microamperes ±10 to the left.

(6) Set the signal generator MODULATION switch to 90 Ω and observe that the test set indicator vertical OFF flag is fully visible.

(7) Set the signal generator MODULATION switch to 150 Ω and observe that the test set indicator vertical OFF flag is fully visible.

(8) Set the signal generator function switch to AMP LOC Ⓥ and observe that the test set indicator vertical OFF flag is not visible.

**7. Dynaverter PP-2792/ARN-30D**

Connect the equipment as illustrated in figure 80 or figure 81 and perform the following output tests:

*a.* Check to see that the power supply is set for an output of 28 volts dc.

*b.* Set the test set METER switch to HV+ 0-600V and observe that the test set multimeter indicates between 235 and 270 volts dc.

*c.* Set the test set METER switch to LV 0-5A. Observe that the output current, as read on the test set multimeter DC 0 to 5 scale, does not exceed 2.3 amperes.

**8. Control, Radio Set C-3436A/ARN-30E**

Connect the equipment as illustrated in figure 80 or 81 and proceed as follows:

*a. MC Selection Test.*

(1) Set the test set METER switch to AUDIO 0-6V and position the test set SQUELCH control and VOR-GS on-off control fully counterclockwise.

(2) Set the test set control selector switch to EXT.

(3) Position the control unit VOL-OFF control and SQUELCH control fully clockwise.

(4) Set the signal generator for 30-percent modulation at 1,000 Hertz and adjust the output so that the signal generator %M meter indicates on the left-hand edge of the red set point.

(5) Position the control unit fractional megacycle channel selector switch (right-hand knob) to obtain a reading of .00 on the control unit MC dial.

(6) Position the control unit megacycle channel selector switch (left-hand knob) to obtain a reading of 108 on the control unit MC dial. Observe that the test set indicating lights K, L, N, and O glow and that the receiver megacycle channel crystal drum dial indicates the same reading of 108.

*Note.* The receiver crystal drum dial can be observed through the front frequency window located on the right-hand side of the receiver.

(7) Position the control unit megacycle channel selector switch through all positions. Observe that the test set indicating lights listed in the chart below glow for the corresponding listed megacycle channels and that the receiver megacycle channel crystal drum dial indicates the same channel reading as the control unit MC dial.

| *Control unit megacycle channel (MC dial)* | *Test set indicating lights* |
|---|---|
| 108 | K, L |
| 109 | J, K, L |
| 110 | H, L |
| 111 | I, J, K, L |
| 112 | I |
| 113 | H, I, J, K |
| 114 | J |
| 115 | H, I, J, L |
| 116 | K |
| 117 | H, I, K |
| 118 | L |
| 119 | H, J, L |
| 120 | H |
| 121 | I, K |
| 122 | H, I |
| 123 | H, J |
| 124 | I, J |
| 125 | I, L |
| 126 | J, K |
| Space | H, K, L |

(8) Position the control unit fractional megacycle channel selector switch in the sequence listed below. Observe that the test set indicating lights listed in the chart below glow for the corresponding listed fractional megacycle channels and that the receiver fractional megacycle channel crystal drum dial indicates the same channel reading as the control unit MC dial.

| *Control unit fractional megacycle channel (MC dial)* | *Test set indicating lights* |
|---|---|
| .00 | N, O |
| .10 | N, R |
| .20 | Q |
| .30 | P |
| .40 | O |
| .50 | N |
| .60 | R |
| .70 | Q, R |
| .80 | P, Q |
| .90 | O, P |

(9) Set the test set METER switch to LV 0-30V and adjust the power supply output until the test set multimeter indicates 20.0 volts dc.

(10) Repeat the procedure given in (7) and (8) above. Observe that the test set indicating lights glow for channels as listed in the chart above, and that the receiver crystal drum dials indicate the proper channels. Note that the drum dials rotate slower in switching to new positions.

*b. VOL-OFF Control Test.*

(1) Adjust the control unit megacycle channel selector switches to obtain a reading of 114.90 on the control unit MC dial and position the control unit SQUELCH control fully counterclockwise.

(2) Set the test set METER switch to AUDIO 0-6V.

(3) Set the signal generator for 30-percent modulation at 1,000 Hertz and set the signal generator MC switch to B (114.90 Megahertz).

(4) Position the control unit VOL-OFF control clockwise and note that a 1,000-Hertz tone is heard in the headset. Position the control unit VOL-OFF control counterclockwise and then clockwise and observe that the volume of the 1,000-Hertz tone decreases with counterclockwise rotation and increases with clockwise rotation.

*c. SQUELCH Control Test.*

(1) With the same settings as specified in *b*(1) and (2) above, slowly position the control unit VOL-OFF control clockwise until a 1000-Hertz tone is heard on the headset.

(2) Position the control unit megacycle channel selector switches so that any frequency other than 114.90 is indicated on the control unit MC dial.

(3) Position the control unit SQUELCH control clockwise and note that the noise in the headset is quieted. Position the control unit SQUELCH control counterclockwise and note that the noise reappears.

9. Rack MT-1175/ARN-30A

The rack is tested independently of any other AN/ARN-30E components. Use Multimeter ME-26B/U to perform the following tests.

*a. Continuity Test.* Check for continuity between the rack terminals as listed in the chart below:

| *From* | | *To* | |
|---|---|---|---|
| *Connector* | *Pin* | *Connector* | *Pin* |
| J304 | G | J301 | 4 |
| J304 | E | J303 | 4 |
| J304 | C | J303 | 5 |
| J304 | H | J303 | 2 |
| J304 | A | J305 | A |
| J306 | H | J303 | 7 |
| J306 | G | J303 | 6 |
| J306 | B | J302 | 5 |
| J306 | D | J302 | 4 |
| J306 | A | J302 | 3 |
| J306 | F | J303 | 3 |
| J306 | E | J303 | 1 |
| J302 | 1 | J301 | 6 |
| J302 | 2 | J301 | 5 |
| J302 | 7 | J301 | 7 |

*b. Resistance Test.* Perform resistance measurements to obtain the values listed in the chart below.

| *From* | | *To* | | |
|---|---|---|---|---|
| *Connector* | *Pin* | *Connector* | *Pin* | *Indication* |
| J305........... | A........... | J305........... | B... | Infinity |
| J301........... | 6........... | J301........... | 1.... | Infinity |
| J304........... | H........... | J304........... | D... | 300 ohms |
| J304........... | F........... | J304........... | D... | 300 ohms |

**10. Indicator, Course ID-453/ARN-30**

Connect the equipment as illustrated in figure 80 or 81. Use known good AN/ARN-30E components and proceed as follows:

*a. Indicator Resolver Check.*

(1) Set the signal generator MODULATION switch to OMNI. Set the signal generator MC switch to B (114.90 Megahertz). Position the signal generator ATTENUATION control to 50 microvolts.

(2) Position the signal generator OMNI TRACK ANGLE "TO" control to the 0-degree setting.

(3) Set the test set METER switch to FLAG O-1MA and adjust the test set megacycle selector control for a reading of 114.90 on the control MC dial.

(4) Rotate the test set indicator selector knob until the indicator reads exactly 0°. Set the test set VERT-CP-HOR switch to VERT. Note and record the reading on the test set DEVIATION meter. (This reading represents the system error of the test setup.)

(5) Rotate the test set indicator selector knob and the signal generator OMNI TRACK ANGLE "TO" control until the indicator and control read 90°, 180°, and 270°, in turn. Note and record the reading on the test set DEVIATION meter for each of the indicator settings.

(6) Disconnect the cable from the rear of the test set ID-453/ARN-30 and connect the cable to the indicator under test.

(7) Repeat the procedure given in (4) and (5) above using the indicator under test in place of the Test Set ID-453/ARN-30. The test set DEVIATION meter reading should not be in excess of ±20 microamperes of the comparable recorded reading.

*b. Vertical Cross Pointer Check.*

(1) Check to see that the signal generator MODULATION switch is set to OMNI, the signal generator MC switch is set to B, and the signal generator ATTENUATION control is set to 50 microvolts.

(2) Check to see that the test set METER switch is set to FLAG O-1MA, the test set megacycle selector control MC dial reads 114.90, and the test set VERT-CP-HOR switch is set to VERT.

(3) Use the selector knob to rotate the indicator omni bearing selector dial not less than 10° clockwise from the 0° position until the indicator vertical cross pointer moves left to the last dot. Observe that the test set DEVIATION meter reads 150 microampers ±7.5 to the right.

(4) Rotate the indicator omni bearing selector dial not less than 10° counterclockwise from the 0° position until the indicator vertical cross pointer moves right to the last dot. Observe that the test set DEVIATION meter reads 150 microamperes ±7.5 to the left.

*c. Vertical OFF Flag Check.*

(1) Position the signal generator ATTENUATION control to 0 microvolt. Check to see that the signal generator MODULATION switch is set to OMNI and that the signal generator MC switch is set to B.

(2) Check to see that the test set settings are the same as in *b*(2) above. Set the test set FLAG-VERT-HOR switch to VERT.

(3) Slowly rotate the signal generator ATTENTUATION control clockwise until the indicator vertical OFF flag just starts to disappear. Observe that the test set multimeter reads 245 microamperes ±20 on the DC scale.

(4) Continue to rotate the signal generator ATTENUATION control clockwise until the indicator vertical OFF flag is just completely out of sight. Check to see that

the test set multimeter reads 250 microamperes ±12.5 on the DC scale.

(5) Slowly rotate the signal generator ATTENUATION control counterclockwise until the indicator vertical OFF flag is just fully visible. Observe that the test set multimeter reads 245 microamperes ±12.5 on the DC scale.

*d. TO-FROM Meter Check.*

(1) Check to see that the signal generator and test set settings are the same as in *c*(1) and (2) above.

(2) Position the signal generator ATTENUATION control to 50 microvolt. Set the indicator omni bearing selector dial to 0°. Observe that the indicator TO-FROM meter indicates TO and the indicator vertical OFF flag is not visible.

(3) Rotate the indicator omni bearing selector dial to 20° on either side of the 0° position and observe that the indicator TO-FROM meter continues to indicate TO and the indicator vertical OFF flag is not visible.

(4) Rotate the indicator omni bearing selector dial to 180°. Observe that the indicator TO-FROM meter indicates FROM and the indicator vertical OFF flag is not visible.

(5) Rotate the indicator omni bearing selector dial to 20° on either side of the 180° position and observe that the indicator TO-FROM meter continues to indicate FROM and the indicator vertical OFF flag is not visible.

*e. Horizontal Cross Pointer Check.*

*Note.* A glide slope receiver in place of the AN/ARN-30E components and an electronic frequency converter are required to check out the glide slope features of the indicator. Connect the test equipment as illustrated in figure 82.

(1) Set the signal generator OMNI TRACK ANGLE "TO" control to 0°. Set the signal generator MC switch to B (114.90 Megahertz). Position the signal generator ATTENUATION control to 700 microvolts.

(2) Position the frequency converter FREQ MC control to 332.0 Megahertz.

(3) Set the test set METER switch to FLAG 0-1MA. Set the test set VERT-CP-HOR and FLAG-VERT-HOR switches to HOR. Adjust the test set megacycle selector control for a reading of 109.30 on the control MC dial.

(4) Set the signal generator MODULATION control to AMP LOC (▸). The test set DEVIATION meter should read 150 microamperes ±7.5 and the indicator horizontal cross pointer should drop down to the lowest dot.

(5) Set the signal generator MODULATION control to AMP LOC (◂). The test set DEVIATION meter should read 150 microamperes ±7.5 and the indicator horizontal cross pointer should climb up to the highest dot.

*f. Horizontal OFF Flag Check.*

(1) Check to see that the settings of the signal generator, frequency converter, and test set are the same as those in *e*(1), (2), and (3) above. Position the signal generator ATTENUATION control to 0 microvolt.

(2) Slowly rotate the signal generator ATTENUATION control clockwise until the indicator horizontal OFF flag just starts to disappear. Observe that the test set multimeter reads 245 microamperes ±20 on the DC scale.

(3) Continue to rotate the signal generator ATTENUATION control clockwise until the indicator horizontal OFF flag is just completely out of sight. Observe that the test set multimeter reads 250 microamperes ±12.5 on the DC scale.

(4) Slowly rotate the signal generator ATTENUATION control counterclockwise until the indicator horizontal OFF flag is just fully visible. Observe that the test set multimeter reads 245 microamperes ±20 on the DC scale.

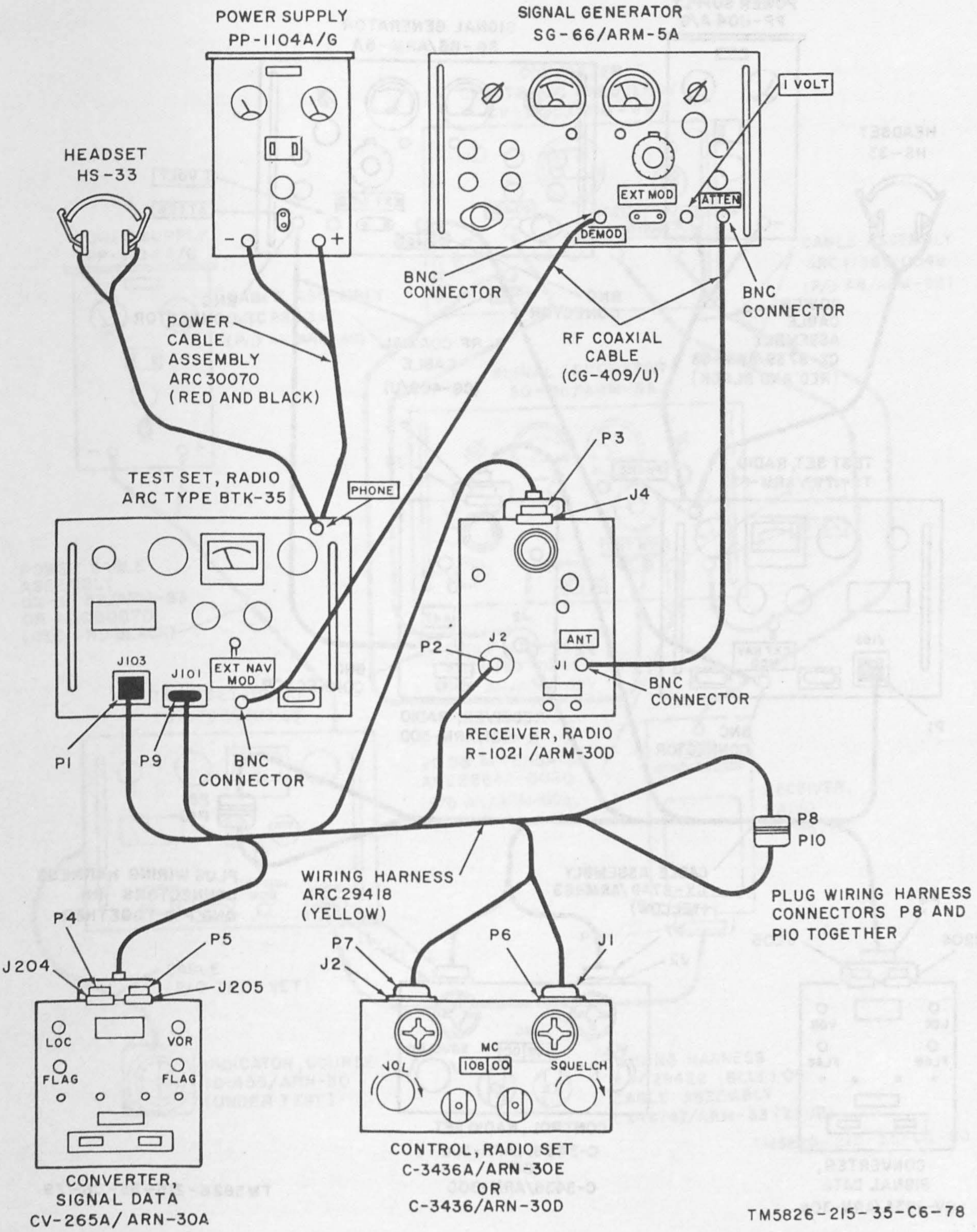



*Figure 80. Receiving Set, Radio AN/ARN-30 (*) test setup with Aircraft Radio Corp Model BTK-35.*

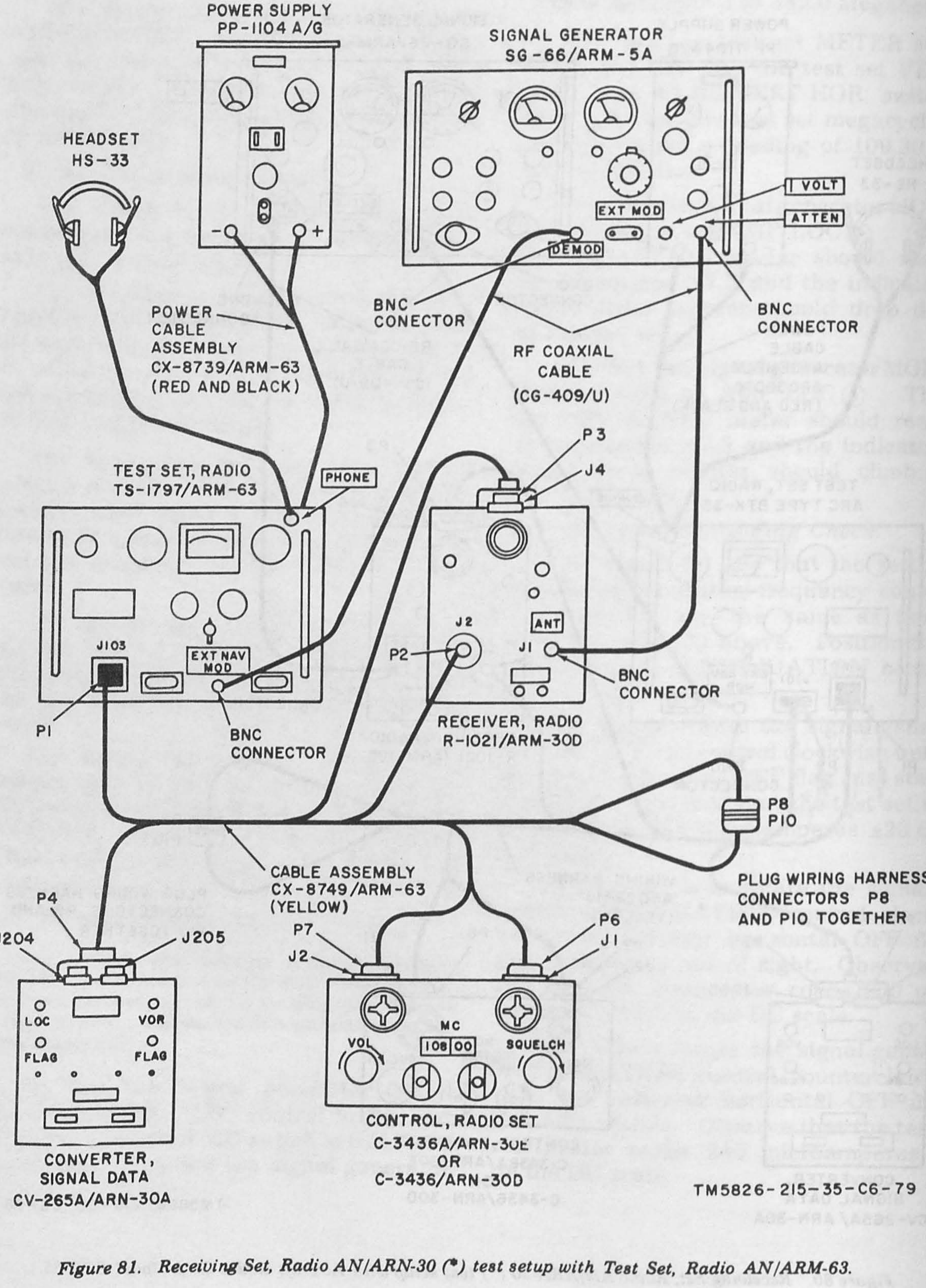



*Figure 81. Receiving Set, Radio AN/ARN-30 (*) test setup with Test Set, Radio AN/ARM-63.*

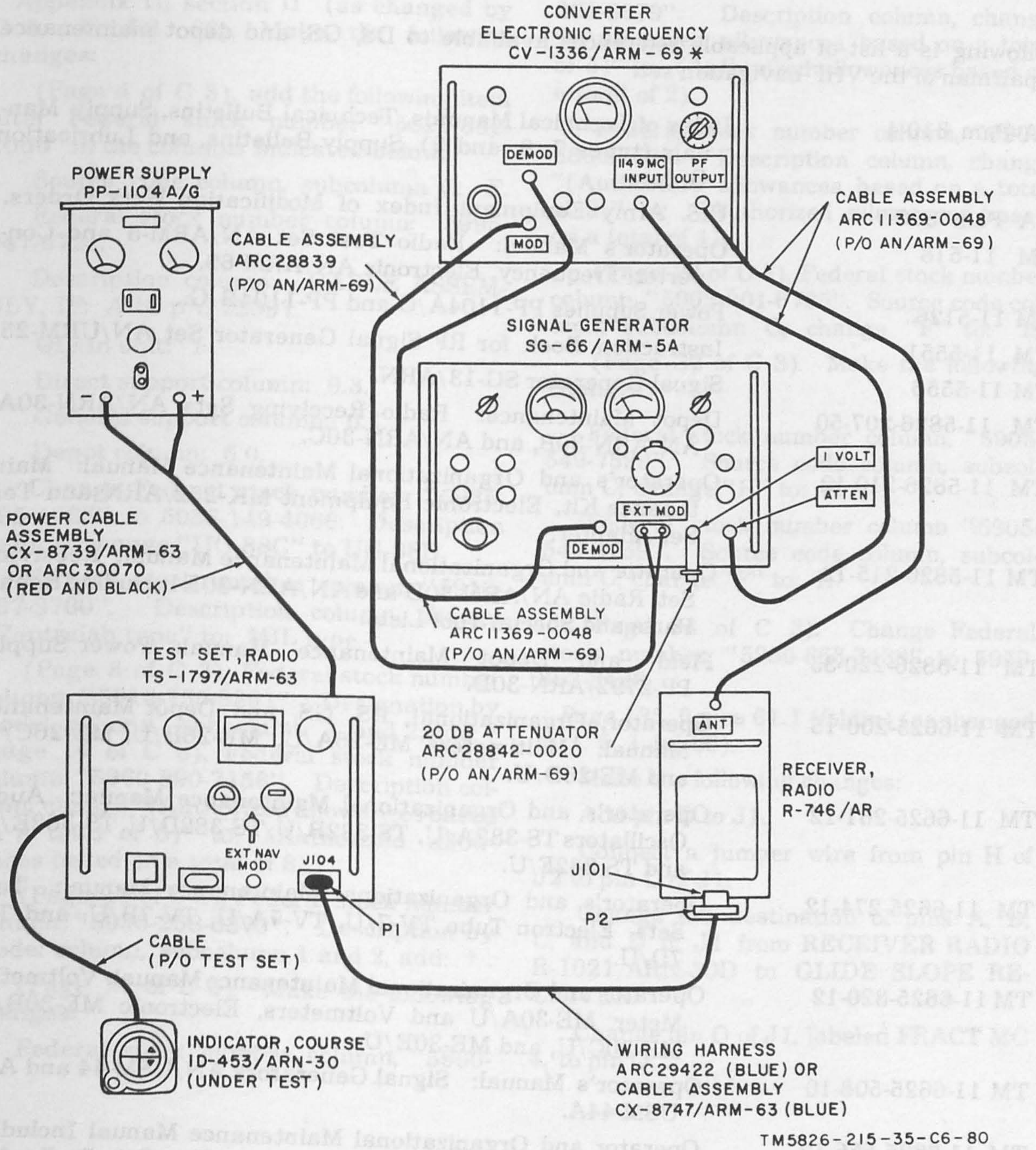



*Figure 82. Indicator, Course ID-453/ARN-30 glide slope test setup.*

*Page 126,* appendix I (page 1 of C 3). Delete and substitute:

## APPENDIX I

## REFERENCES

Following is a list of applicable references available to DS, GS, and depot maintenance repairman of the VHF navigation set.

| | |
|---|---|
| DA Pam 310-4 | Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders. |
| DA Pam 310-7 | U.S. Army Equipment Index of Modification Work Orders. |
| TM 11-518 | Operator's Manual: Radio Test Set AN/ARM-5 and Converter, Frequency, Electronic AN/ARM-69. |
| TM 11-5126 | Power Supplies PP-1104A/G and PP-1104B/G. |
| TM 11-5551 | Instruction Book for RF Signal Generator Set AN/URM-25. |
| TM 11-5556 | Signal Generator SG-13/ARN. |
| TM 11-5826-207-50 | Depot Maintenance: Radio Receiving Sets AN/ARN-30A, AN/ARN-30B, and AN/ARN-30C. |
| TM 11-5826-210-12 | Operator's and Organizational Maintenance Manual: Maintenance Kit, Electronic Equipment MK-252/ARN and Test Set Adapter. |
| TM 11-5826-215-12 | Operator and Organizational Maintenance Manual: Receiving Set, Radio AN/ARN-30D and AN/ARN-30E Including Repair Parts and Special Tool Lists. |
| TM 11-5826-220-35 | Field and Depot Maintenance Manual: Power Supply PP-2792/ARN-30D. |
| TM 11-6625-200-15 | Operator, Organizational, DS, GS, and Depot Maintenance Manual: Multimeters ME-26A/U, ME-26B/U, ME-26C/U, and ME-26D/U. |
| TM 11-6625-261-12 | Operator's and Organizational Maintenance Manual: Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, TS-382E/U, and TS-382F/U. |
| TM 11-6625-274-12 | Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U. |
| TM 11-6625-320-12 | Operator and Organizational Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U. |
| TM 11-6625-508-10 | Operator's Manual: Signal Generators AN/USM-44 and AN/USM-44A. |
| TM 11-6625-556-12 | Operator and Organizational Maintenance Manual Including Repair Parts and Special Tool Lists: Test Set, Radio AN/ARM-63 (Aircraft Radio Corp Model BTK-35A). |
| TM 11-6625-636-12 | Operator and Organizational Maintenance Manual: Converter, Frequency, Electronic AN/ARM-69. |

| | |
|---|---|
| TM 11-6625-828-15 | Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tools Lists: Generator, Signal H-14A (Test Set, Radio AN/ARM-5A). |
| TM 38-750 | Army Equipment Record Procedures. |

Appendix II, section II (as changed by C 5, 1 Jul 66). Make the following changes:

(Page 4 of C 3), add the following item after Federal stock number "5826-892-1056" in the columns indicated below:

Source code column, subcolumn C: F.

Federal stock number column: 5995-947-6724.

Description column: CABLE ASSEMBLY, IF: ARC p/n 22097.

Qty in unit: 1

Direct support column: 0.3.

General support column: 0.1.

Depot column: 5.0.

Change Federal stock number "5935-195-4066" to 5035-149-4066. Description column, change "UG-88C" to UG-88D.

Federal stock number column, "5910-667-9700". Description column, change "Centralab type" to: MIL type.

(Page 8 of C 3), Federal stock number column, "5910-755-9291". Designation by model column, subcolumn 1 and 2, add: † (page 14 of C 3), Federal stock number column "5960-890-7156". Description column, change "(Authorized allowances based on a total of 6)" to: (Authorized allowances based on a total of 8).

(Page 16 of C 3), Federal stock number column "5935-258-3370". Description by model column, subcolumn 1 and 2, add: † .

(Page 24 of C 3). Make the following changes:

Federal stock number column, "5960-261-8679". Description column, change "(Authorized allowances based on a total of 5)" to: (Authorized allowances based on a total of 2).

Federal stock number column, "5905-686-3369". Description column, change "(Authorized allowances based on a total of 3)" to: (Authorized allowances based on a total of 4).

(Page 28 of C 3), Federal stock number column, "5905-201-6735". Source code column, subcolumn C, change "F" to: H.

(Page 32 of C 3). Make the following changes:

Federal stock number column, "5905-549-7599". Source code column, subcolumn C, change "H" to: F.

Federal stock number column "5905-542-8259". Source code column, subcolumn C, change "F" to: H.

(Page 34 of C 3). Change Federal stock number "5950-863-3438" to 5950-863-3488.

*Page 135,* figure 61.1 (foldin) (as changed by C 5, 1 Jul 66).

Make the following changes:

Add pin D to J1.

Connect a jumper wire from pin H of J2 to pin D of J1.

Change the destination of pins A, B, C, and D of J1 from RECEIVER RADIO R-1021/ARN-30D to GLIDE SLOPE RECEIVER.

Change pin O of J1, labeled FRACT MC 4, to pin Q.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
*General, United States Army,*
*Chief of Staff.*

Official:

KENNETH G. WICKHAM,
*Major General, United States Army,*
*The Adjutant General.*

Distribution:

To be distributed in accordance with DA Form 12-36, one (1) copy to each account.

Technical Manual
No. 11-5826-215-35

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *6 November 1961*

# RECEIVING SET, RADIO AN/ARN-30D

# CHAPTER 1

# THEORY

## Section I. GENERAL

### 1. Scope

*a.* This manual covers field and depot maintenance of Receiving Set, Radio AN/ARN-30D (vhf navigation set). It includes instructions appropriate to third, fourth, and fifth echelons for troubleshooting, testing, aligning, and repairing the equipment, and replacing maintenance parts. It also lists materials and test equipment for third, fourth, and fifth echelon maintenance. Detailed functions of the equipment are described in paragraphs 2 through 55.

*b.* The complete technical manual for the vhf navigation set includes TM 11-5826-215-12 and TM 11-5826-220-35.

*c.* Forward comments concerning this manual direct to the Commanding Officer, United States Army Signal Materiel Support Agency, ATTN: SIGMS-PA2d, Fort Monmouth, N. J.

*Note:* For applicable forms and records, see paragraph 2, TM 11-5826-215-12.

### 2. System Application

The vhf navigation set receives, interprets, and provides indication of aircraft navigational data contained in two types of very high-frequency (vhf) radio transmissions: omnidirectional radio range (VOR) reception (*a* below) and localizer (*b* below). General system application is discussed in TM 11-5826-215-12.

*a. VOR Reception.*

(1) A VOR station radiates signals representing an infinite number ot courses (radials) around its antenna system (fig. 1). These signals consists of two independent components: a reference phase signal ((2) below) and a variable phase signal ((3) below).

(2) The reference phase signal (designated R), which is at a set frequency associated with a given VOR station, produces an omnidirectional field pattern around the antenna system. The phase of this pattern does not vary with direction.

(3) The variable phase signal (designated V) produces a rotating field pattern. The phase of this variable signal changes constantly at a 30-cycle per second (cps) rate with respect to the reference signal ((2) above).

(4) The phase relationship between the reference and variable signals, therefore, is a function of the bearing of the receiving equipment from the VOR station transmitter's magnetic north radial. The phase relationship between the two signals is zero (signals in phase) at all points on the magnetic north radial. On all other radials, they differ in phase by an amount which corresponds to the degree of angular displacement from magnetic north. When operating on VOR, the vhf navigation set receives and amplifies the two signal components, detects the phase difference, and displays the bearing from the transmitter on the vhf navigation set course indicator.

(5) The VOR signals are transmitted at all even-10th megacycles (mc) from 108.2 mc to 112.0 mc and at all frequencies from 112.1 to 117.9 mc.

*b. Runway Localizer Reception.* Runway localizers use 90- and 150-cps modulated signals that are transmitted at all odd-numbered, 10th-megacycle frequencies from 108.1 mc to 111.9 mc.

(1) On the runway centerline (fig. 2), the two modulated signals are equal in strength. On either side of the centerline, one modulated signal is stronger than the other.

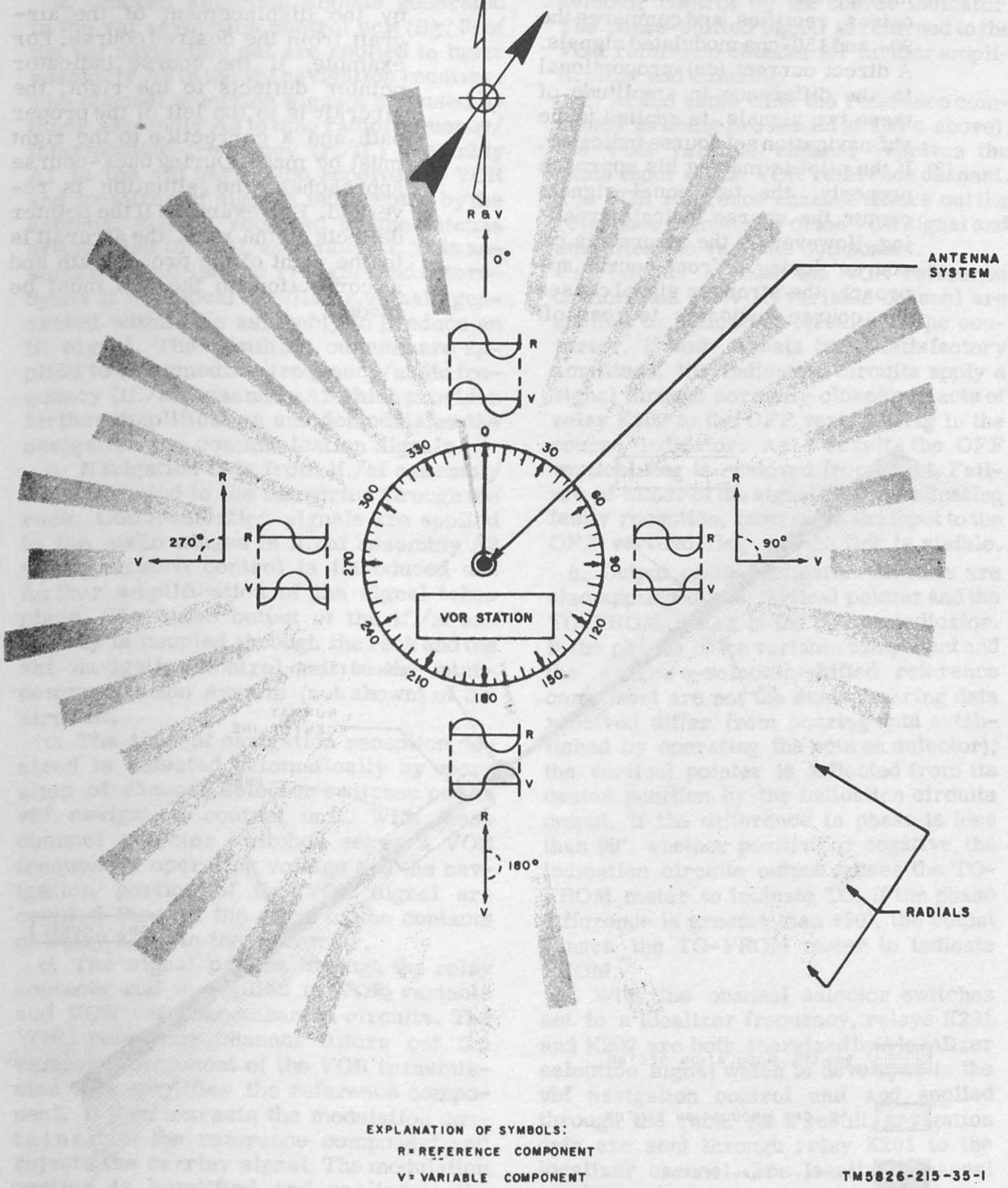
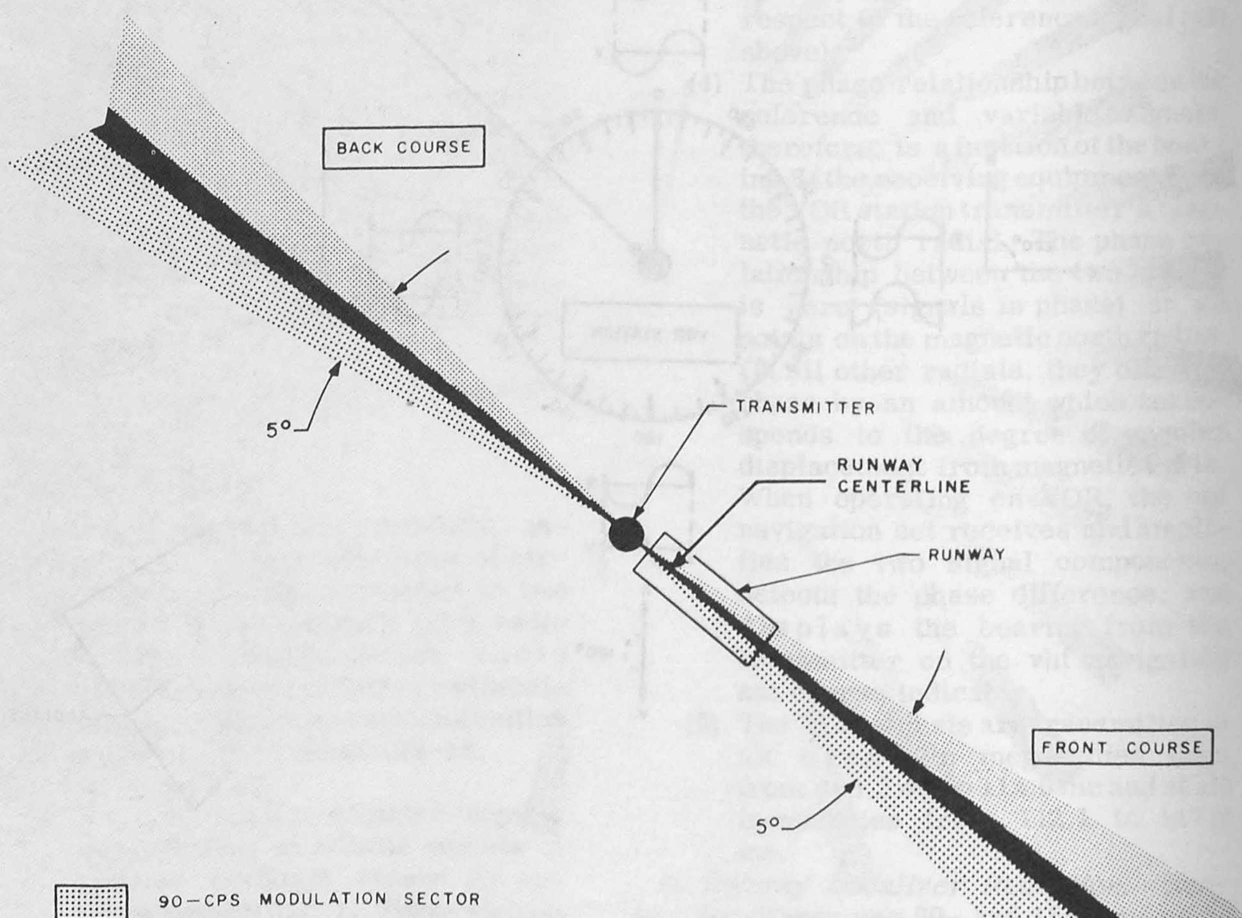



*Figure 1. Phase relationship of VOR reference and variable phase signal components.*

(2) When tuned to the runway transmitter, the vhf navigation set receives, rectifies, and compares the 90- and 150-cps modulated signals. A direct current (dc), proportional to the difference in amplitude of these two signals, is applied to the vhf navigation set course indicator.

(3) If the pilot is making his approach properly, the two equal signals center the course indicator reading. However, if the aircraft is off course during a front-course approach, the stronger signal causes the course indicator to read off center. The amount the course indicator is off center is determined by the displacement of the aircraft from the desired course. For example, if the course indicator pointer deflects to the right, the aircraft is to the left of the proper path and a correction to the right must be made. During back-course approaches, the situation is reversed. For example, if the pointer deflects to the right, the aircraft is to the right of the proper path and a correction to the left must be made.




TM5826-215-35-2

*Figure 2. Localizer beam characteristics.*

### 3. Signal Paths

*a.* Channel selection signals generated in the vhf navigation control unit (fig. 3) of the vhf navigation set are applied to tuner assembly A3 in the vhf navigation receiver. The channel selection signals are used by tuner assembly A3 to tune radiofrequency/intermediate-frequency (rf/if.) assembly A1 in the vhf navigation receiver to VOR and localizer rf signals intercepted by the antenna. Signals received by the antenna are applied to rf/if. assembly A1. This assembly amplifies the rf signal and heterodynes it with local oscillator signals generated within the assembly to produce an if. signal. The resulting outputs are applied to intermediate frequency/audio frequency (if./af) assembly A2 which provides further amplification and demodulates the navigation and communication signals.

*b.* Navigation data from if./af assembly A2 are routed to the converter through the rack. Communication signals are applied to the audio stages in if./af assembly A2 where squelch control is introduced and further amplification of the signal takes place. The audio output of the if./af assembly is coupled through the rack and the vhf navigation control unit to the intercommunication system (not shown) of the aircraft.

*c.* The type of navigation reception desired is selected automatically by operation of channel selector switches on the vhf navigation control unit. With these channel selector switches set to a VOR frequency, operating voltage and the navigation portion of the VOR signal are coupled through the rack to the contacts of relay K201 in the converter.

*d.* The signal passes through the relay contacts and is applied to VOR variable and VOR reference channel circuits. The VOR reference channel filters out the variable component of the VOR transmission and amplifies the reference component. It then extracts the modulation contained in the reference component and rejects the carrier signal. The modulation portion is amplified and applied to the course selector in the course indicator.

*e.* The course selector shifts the phase of the reference component by an amount established by the positioning of the course selector control on the course indicator. The phase-shifted signal is returned to the VOR reference channel for further amplification and filtering.

*f.* At the same time the reference component is being processed (*d* and *e* above), the VOR variable channel receives the same input as the VOR reference channel. The VOR reference channel filters out the reference component of the VOR signal and amplifies the variable component.

*g.* Outputs of both the VOR reference channel and the VOR variable channel are applied to indication circuits in the converter. If both signals have satisfactory amplitude, the indication circuits apply a signal through normally closed contacts of relay K202 to the OFF vertical flag in the course indicator. As a result, the OFF vertical flag is removed from sight. Failure of either of the signal inputs, indicating faulty reception, interrupts the input to the OFF vertical flag and the flag is visible.

*h.* Output of the indication circuits are also applied to the vertical pointer and the TO-FROM meter in the course indicator. If the phases of the variable component and the course-selector-shifted reference component are not the same (bearing data received differ from bearing data established by operating the course selector), the vertical pointer is deflected from its center position by the indication circuits output. If the difference in phase is less than 90°, whether positive or negative, the indication circuits output causes the TO-FROM meter to indicate TO. If the phase difference is greater than ±90°, the output causes the TO-FROM meter to indicate FROM.

*i.* With the channel selector switches set to a localizer frequency, relays K201 and K202 are both energized by a localizer selection signal which is developed in the vhf navigation control unit and applied through the rack. As a result, navigation data are sent through relay K201 to the localizer channel. The localizer channel amplifies the localizer signals, compares their components, and applies the results to the vertical pointer on the course indicator. If the localizer components are not

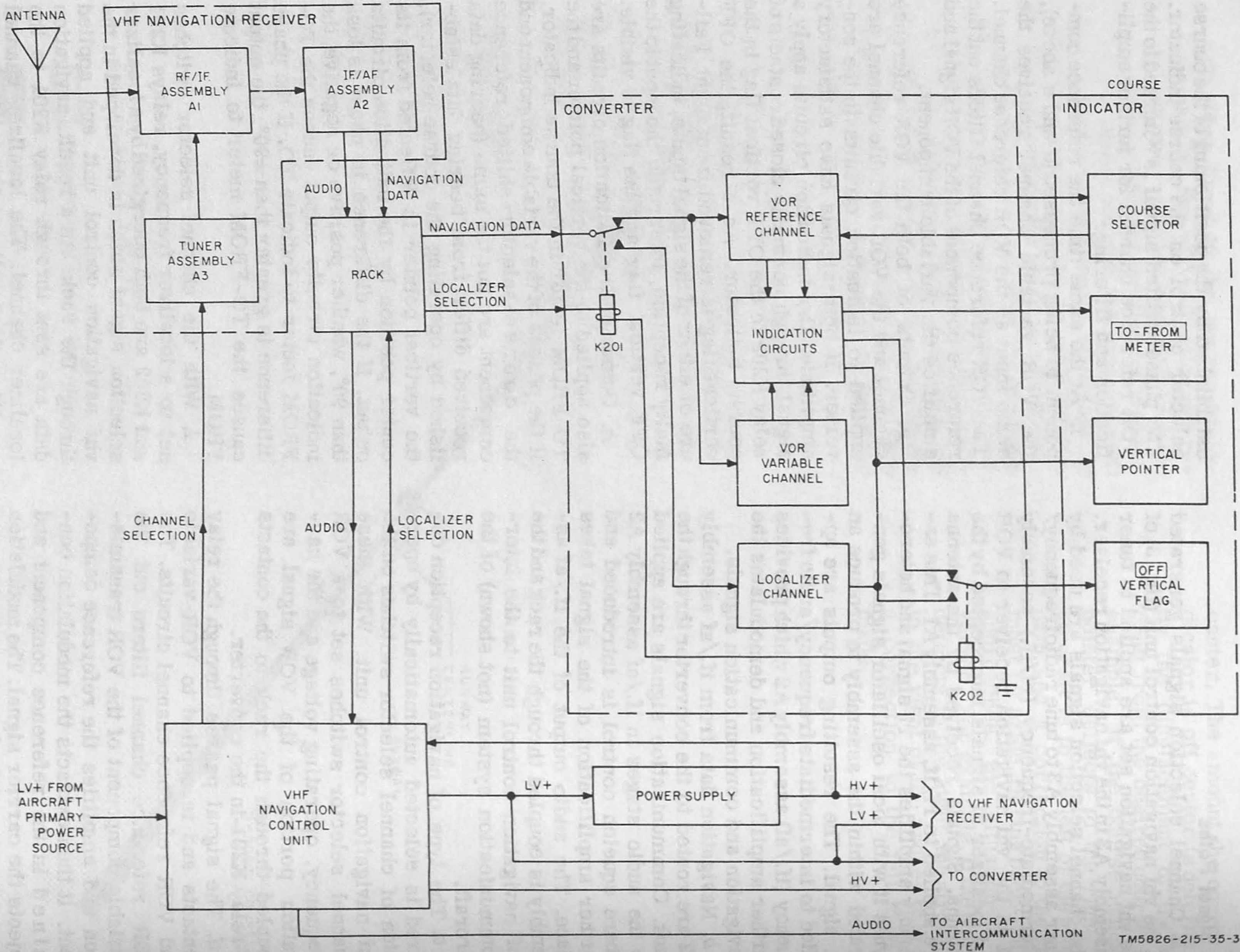



*Figure 3. Vhf navigation set, functional block diagram.*

equal, the pointer deflects in the appropriate direction. The output of the localizer amplifiers is also sent through energized relay K202 to the OFF vertical flag. If the signal amplitude is sufficient, the flag disappears; if not, the flag remains in view.

### 4. Power Distribution

*a.* Low voltage (LV+) from the aircraft's primary power source is applied to the vhf navigation control unit (fig. 3). With the closing of the switch portion of the VOL-OFF control (not shown) and the switch on the vhf navigation control unit, a power relay (not shown) in the rack is energized. Energizing the relay completes the filament circuits of the vhf navigation receiver and converter, and applies low voltage to the vhf navigation receiver and converter, and the power supply.

*b.* As a result of application of low voltage to the power supply, high voltage is developed and is distributed directly to the vhf navigation receiver circuits and from the vhf navigation receiver through the rack to the converter. Power for the panel lamps of the vhf navigation control unit is supplied through a separate lead connected to the primary power source of the aircraft.

## Section II. THEORY OF VHF NAVIGATION RECEIVER

*Note:* In the following discussion, the reference designations of the vhf navigation receiver stages and parts are frequently abbreviated. For completeness, abbreviated designations should be prefixed by the designation of the assembly in which the stage or part is contained; for example, stage V3 in rf/if. assembly A1 reads stage A1V3 when the reference designation is complete.

### 5. Block Diagram

The vhf navigation receiver is a crystal controlled, navigation-communication type receiver which operates in the vhf range of 108.00 mc to 126.90 mc. The vhf navigation receiver is remotely operated by the vhf navigation control unit to provide a total of 190 channels spaced 100 kilocycles (kc) apart. A block diagram of the unit is shown in figure 4. For complete circuit details, refer to the overall schematic diagram (fig. 73).

*a.* Rf signals between 108.00 mc and 126.90 mc are intercepted by the antenna, amplified by double-tuned rf cascode amplifiers V1 and V2, and applied to first mixer and if. filter V3 in rf/if. assembly A1. The output (96.3 mc to 114.3 mc) of megacycle crystal oscillator-doubler V6 is also applied to first mixer and if. filter V3 in rf/if. assembly A1 to produce the first if. signal of 11.7 mc to 12.6 mc. The first if. signal is coupled to second mixer V4.

*b.* The output (10.0 mc to 10.9 mc) of fractional megacycle crystal oscillator V7 is also applied to second mixer V4 to produce the second if. signal of 1.7 mc. This second if. signal is amplified by four double-tuned if. stages. The first of these stages is stage V5 in rf/if. assembly A1. The second, third, and fourth if. amplifiers are stages V1, V2, and V3, respectively, in if./af assembly A2. The output of fourth if. amplifier V3 is demodulated by detector and automatic gain control (agc) stage V4 in if./af assembly A2.

*c.* The detected output is applied to three separate circuits: cathode follower V5A, squelch control V6B, and noise limiter V6A. Cathode follower V5A couples the navigation output of the vhf navigation receiver to the converter. Noise limiter V6A clips noise pulses and passes voice-communication signals to first audio amplifier and squelch V5B. When properly adjusted, current flowing through squelch control V6B is small, and first audio amplifier and squelch V5B conducts normally with a detector and agc V4 output present.

*d.* When no signal is received, or when a muting circuit in the tuner assembly is conducting during channeling, increased current flowing through squelch control V6B cuts off first audio amplifier and squelch V5B silencing the vhf navigation receiver. Further amplification of voice signals is accomplished in audio output V7 and the signal is applied to the vhf navigation control unit for volume control and distribution to the aircraft intercommunication system.

*e.* The vhf navigation receiver frequency is selected by remote control of two pawl-driven, ratchet-rotated crystal drums in tuner assembly A3. The megacycle drum contains 19 crystals, which determine the value of the whole-megacycle portion of the channel received. The fractional megacycle drum contains 10 crystals, which determine the value of the tenth-megacycle portion of the channel received. The drums provide a total of 190 channels with 100-kc spacing.

*f.* The pawls associated with the megacycle crystal drum, fractional megacycle drum, and muting circuit are mechanically connected to drive motor B1. Drive motor B1 is operated by relays K1 and K2 in tuner assembly A3. These relays energize and deenergize under control of channel selection signals from the vhf navigation control unit.

*g.* The tuned circuits of rf cascode amplifiers V1 and V2 megacycle crystal oscillator-doubler V6 in rf/if. assembly A1 are linked by a cam and tuning plate MP2 (not shown) to the megacycle drum. This mechanical arrangement (shown by a dashed line) provides continuous adjustment of the tuning circuits. Independent upper and lower frequency-limit adjustments in the circuits are used to align the vhf navigation receiver for optimum tracking.

*h.* Another cam, driven by the fractional megacycle drum and tuning plate MP1 (not shown), is linked to the tunable parts of first mixer end if. filter V3 in rf/if. assembly A1. These parts, like their corresponding parts in megacycle tuning (*g* above), tune the filter in stage V3 to the desired intermediate frequency.

*i.* Operating voltages for both the vhf navigation receiver and the converter are provided by the power supply through the power supply filter in if./af assembly A2.

## 6. Rf Cascode Amplifiers V1 and V2

(fig. 5)

Rf cascode amplifiers V1 and V2, in rf/if. assembly A1 of the vhf navigation receiver, consist of a series dc coupled cascode circuit using two type 5718 triode tubes. These stages amplify signals received from the antenna and apply them to first mixer V3.

*a.* Signals within the frequency range between 108.0 mc and 126.9 mc are received by the antenna and applied through ANT connector J1 to an input tuning network at the grid of amplifier V1. This input tuning network is a tank circuit consisting of coil L1, fixed capacitor C2, and variable capacitor C1. When a new channel is selected by the megacycle channel selector switch on the vhf navigation control unit, megacycle tuning plate PM2, in tuning unit A3, is indexed to the correct crystal position. Indexing the tuning plate operates the megacycle drum and adjusts C1 to tune the rf cascode amplifiers to the desired frequency.

*b.* The signal developed across the input tuning network is coupled to the control grid of the tube V1 by capacitor C3. The rf signal at the control grid rides at a dc level between +0.5 and -4.5 volts. This voltage is applied through resistor R1 by the detector and agc circuit (para 16) through feedthrough capacitor C11. Capacitor C11 directly couples the dc level through, but bypasses rf signals to ground, thereby decoupling the rf cascode amplifiers from the agc circuit.

*c.* The cascode connection of tubes V1 and V2 provides the high-input gain of a pentode, while maintaining the low-noise characteristics of the triode tubes. Coupling between the two tubes is provided by rf choke L2. Cathode bias for V1 is developed by current flow through resistor R2.

*d.* The operating voltage for stage V2 is provided by voltage divider R4 and R5, bypass capacitor C6, and feedthrough capacitor C12. The combination of R4 and R5 places 125 volts at the control grid of V2.

*e.* The signal at the output of cascoded amplifiers V1 and V2 is developed across double-tuned output tuning network C4A, C4B, C5A, C5B, C7, C47, L3, L4, and L12.

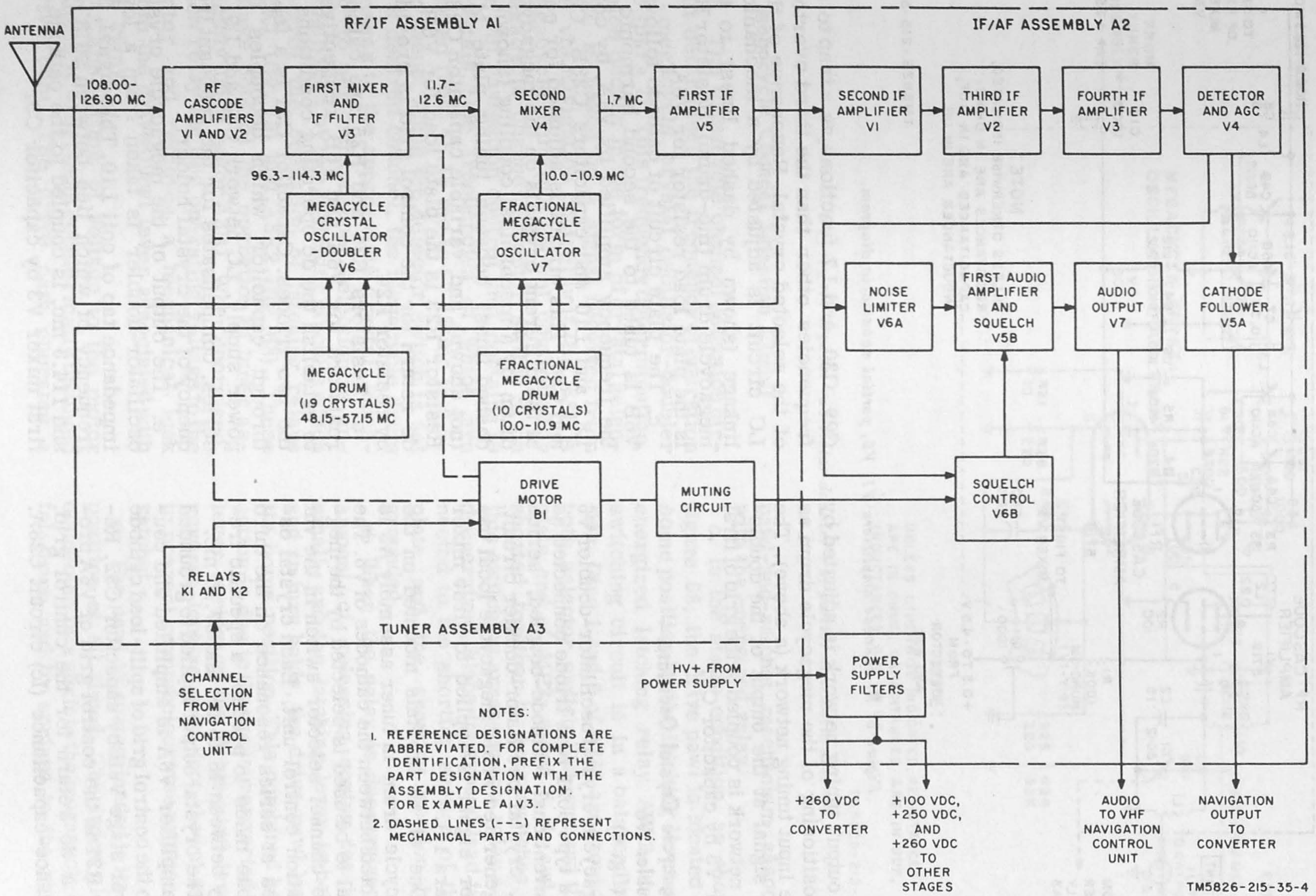



*Figure 4. Vhf navigation receiver, block diagram.*

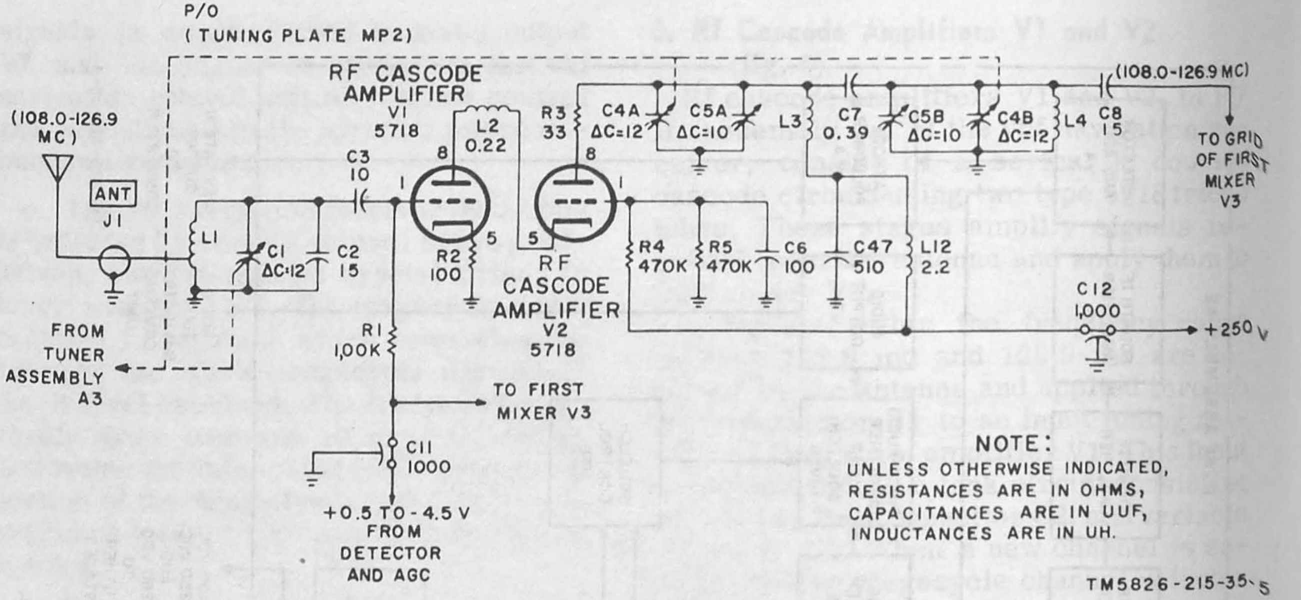



*Figure 5. Rf cascode amplifiers V1, V2, partial schematic diagram.*

This output tuning network is adjusted by the positioning of the megacycle drum as is the input tuning network (*a* above). The tuned signal at the output of the double-tuned network is coupled to the grid of first mixer V3 by capacitor C8.

## 7. Megacycle Crystal Oscillator-Doubler V6

(fig. 6)

Megacycle crystal oscillator-doubler V6 uses a type 6021 twin triode connected as a conventional cathode-coupled, series mode, crystal oscillator-doubler circuit. The generated whole megacycle local oscillator signal is applied to first mixer V3 (para 10).

*a.* One of 19 crystals mounted on the megacycle drum in tuner assembly A3 is connected between the cathodes of V6. The crystal to be used is selected by the megacycle channel selector switch in the vhf navigation control unit. Each crystal oscillates at series resonance on the third overtone mode to produce a specific frequency between 48.15 mc and 57.15 mc.

*b.* The crystal output applied to grounded grid amplifier V6A is amplified and coupled to the control grid of split-load cathode follower stage V6B by capacitor C32. Resistor R21 in the control grid of V6A provides a dc return for the control grid. Inductance-capacitance (lc) circuit C28A, C29, C30, and L7 functions as a trap to all frequencies other than the third overtone of the selected crystal. Resonance of this LC circuit is adjusted by a mechanical linkage (shown by dashed lines) to the megacycle drum (mc-drum). Resistor R22 is the plate load resistor for V6A.

*c.* The plate circuit of cathode follower V6B is tuned to the second harmonic of the frequency amplified by V6A, by coils L8, and L10 and capacitors C28B, C35, and C36. This circuit is adjusted for each of the different crystals on the megacycle drum by a mechanical coupling (shown by dashed lines) between tuning plate MP2 (not shown) and variable capacitor C28B. Resistor R23 is the plate load for V6B. A dc return for the control grid is provided by resistor R24.

*d.* Resistors R26 and R25 are cathode resistors for V6A and V6B, respectively to establish the dc operating conditions of the two triodes. Capacitor C31 is a feed-through capacitor which decouples the power supply. LC network C33 and L9, in series, compensates for the resonant frequency of the crystal holder.

*e.* The output of the megacycle crystal oscillator-doubler is taken from a low-impedance tap of coil L10. This signal, the frequency of which lies between 96.3 mc and 114.3 mc, is coupled to the cathode of first mixer V3 by capacitor C9.

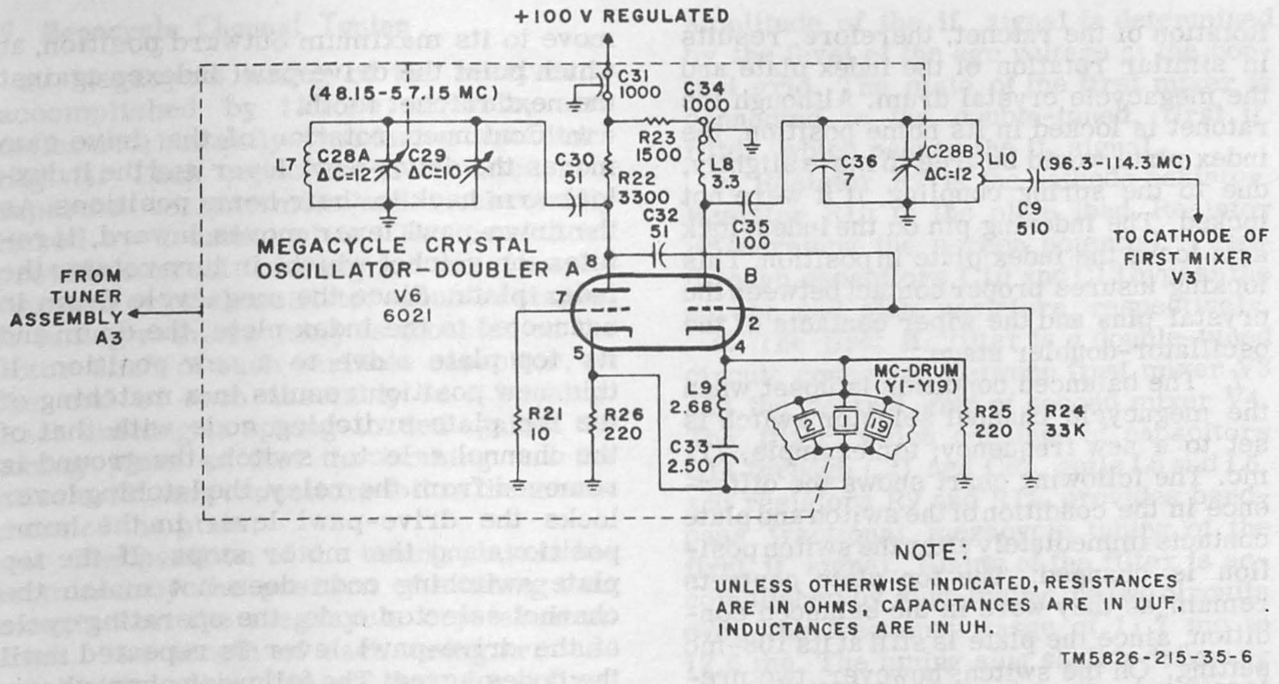



*Figure 6. Megacycle crystal oscillator-doubler V6, partial schematic diagram.*

## 8. Megacycle Channel Selection Circuit

*a.* The megacycle channel selection circuit determines the frequency of operation of megacycle crystal oscillator-doubler V6 (para 7). This frequency determination, which occurs in the form of crystal selection, is based on a signal received from the vhf navigation control unit (fig. 68). A megacycle drum (not shown), controlled by megacycle channel selector switch S1 on the vhf navigation control unit, contains 19 crystals, the frequencies of which are spaced from 48.15 mc to 57.15 mc in 0.5-mc steps. When the selector switch is set to a desired channel, the megacycle drum indexes to the appropriate crystal. Indexing to perform channel selection is accomplished by two switching circuits which control the operation of latching relays A3K1 (fig. 73) and A3K2 (fig. 68). These relays control the operation of tuner assembly drive motor A3B1. When energized, each relay applies operating voltage to the motor and removes a mechanical lock from the drive-pawl lever associated with the relay.

*b.* Application of voltage to the motor causes it to drive an eccentrically mounted drive cam. The drive cam operates a pawl-and-ratchet mechanism associated with the energized relay.

*c.* In the static condition, as shown in figure 68, the drive pawl is located at its *home* position by the latching lever on deenergized latching relay A3K2, and the switching circuit is in a balanced condition. Pins 1 and 2 of A3J2 are grounded at both selector switch S1A end and the top plate end of MP2; wires 3, 4, and 5 are shorted together by both switches. With this switching arrangement, relay A3K2 is deenergized, since its ground lead is connected to the shorting section of the top plate and the shorting section is not grounded.

*d.* When the relay is deenergized, the amount of releasing spring tension is small, and the latching lever is held by, and in turn holds, the drive-pawl lever in its home position. This combined holding action is due to the pressure exerted by the lever spring on the drive-pawl lever. A reverse-locking pawl (not shown) is used to prevent counterclockwise rotation of the ratchet.

*e.* The pawl is spring-loaded to its home position at all times. The index plate is connected by a shaft to the megacycle crystal drum and by springs to the ratchet.

Rotation of the ratchet, therefore, results in similar rotation of the index plate and the megacycle crystal drum. Although the ratchet is locked in its home position, the index plate would be free to move slightly, due to the spring coupling, if it were not locked. The indexing pin on the index-lock arm locks the index plate in position. This locking insures proper contact between the crystal pins and the wiper contacts of the oscillator-doubler stage.

*f.* The balanced condition is upset when the megacycle channel selector switch is set to a new frequency; for example, 111 mc. The following chart shows the difference in the condition of the switch and plate contacts immediately after the switch position is changed. The top plate contacts remain as they were in the balanced condition, since the plate is still at its 108-mc setting. On the switch, however, two previously shorted wires (3 and 4) are connected to ground. This new combination grounds the shorting section of the top plate, through vhf navigation receiver connector A1J2 and control unit connector J1, applying a ground to the relay coil, thereby energizing the relay.

| Condition | Selector switch and top plate positions | Condition of control wire[a] (G or I)[b] | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Balanced | Selector switch – 108 mc | G | G | I | I | I |
| | top plate – 108 mc | G | G | I | I | I |
| Unbalanced | Selector switch – 111 mc | G | G | G | G | I |
| | top plate – 108 mc | G | G | I | I | I |

[a] Numbers refer to wires in megacycle five-wire channel-selector switching circuit.
[b] G = Connected to ground.
I = Insulated from ground and shorted together.

*g.* Energizing latching relay A3K2 spring-loads the latching lever to apply releasing pressure and connects primary voltage (LV+) through the energized relay contacts to motor A3B1. The motor rotates the drive cam against the drive-pawl lever, releasing the spring-loaded latching lever. With the lever released, the drive-pawl lever and the index-lock arm are free to move away from the ratchet and the index plate, respectively, as the eccentrically mounted drive cam rotates. Rotation of the drive cam permits the drive-pawl lever to move to its maximum outward position, at which point the drive pawl indexes against the next ratchet tooth.

*h.* Continued rotation of the drive cam moves the drive-pawl lever and the index-lock arm back to their home positions. As the drive-pawl lever moves inward, it rotates the ratchet which, in turn rotates the index plate. Since the megacycle drum is connected to the index plate, the drum and its top plate move to a new position. If this new position results in a matching of the top plate switching code with that of the channel selector switch, the ground is removed from the relay, the latching lever locks the drive-pawl lever in the home position, and the motor stops. If the top plate switching code does not match the channel selector code, the operating cycle of the drive-pawl lever is repeated until the codes agree. The following chart shows the codes for all crystal drum positions.

| Crystal drum position | | Top plate contact number[a] (G or I)[b] | | | | |
|---|---|---|---|---|---|---|
| Mc | Fractional mc | | | | | |
| 108 | 0.00 | G | G | I | I | I |
| 109 | | G | G | G | I | I |
| 110 | 0.10 | G | I | I | I | G |
| 111 | | G | G | G | G | I |
| 112 | 0.20 | I | I | I | G | I |
| 113 | | I | G | G | G | G |
| 114 | 0.30 | I | I | G | I | I |
| 115 | | G | I | G | G | G |
| 116 | 0.40 | I | G | I | I | I |
| 117 | | I | G | G | G | G |
| 118 | 0.50 | G | I | I | I | I |
| 119 | | G | I | G | I | G |
| 120 | 0.60 | I | I | I | I | |
| 121 | | I | G | I | I | I |
| 122 | 0.70 | I | I | I | G | G |
| 123 | | I | I | I | G | G |
| 124 | 0.80 | I | G | G | I | I |
| 125 | | G | I | G | G | I |
| 126 | 0.90 | I | G | I | I | I |
| BLANK | | G | G | I | I | G |

[a] Top plate contact numbers refer to top plate A3MP2 for megacycle switching and top plate A3MO1 for fractional megacycle switching.
[b] G = Connected to ground.
I = Insulated from ground and shorted together.

*i.* Megacycle frequency selection wires 1 through 5 have switching transients bypassed to ground by 0.01-microfarad capacitors A1C51 through A1C55 (fig. 73①).

## 9. Megacycle Channel Tuning

*a.* Megacycle tuning of the receiver is accomplished by three variable, air-dielectric, butterfly-type tuning capacitors (fig. 7). Each capacitor is mounted in a separate compartment and mechanically linked by a tuning plate. The capacitors provide correct tracking for the rf amplifier and crystal oscillator-doubler stages. A tuning arm assembly is mounted on the rotor shaft of each variable capacitor. At the end of each assembly is a bushing. Each bushing is spring-loaded against the tuning plate so that the bushing and the attached tuning capacitors follow the movement of the plate.

*b.* The position of the tuning plate is determined by the position of a tuning cam mounted on the megacycle crystal drum shaft. The length of each tuning arm assembly is adjustable so that, for a fixed movement of the tuning plate, the angle of rotation of each capacitor shaft is independently adjustable. The capacitors are adjusted by rotating the capacitor shaft with respect to its tuning arm. For optimum tuning, the capacitor is peaked at 126 mc and the arm length is adjusted at 108 mc.

## 10. First Mixer V3 and If. Filter

*a.* First mixer V3, in rf/if. assembly A1, uses a type 5899 pentode (fig. 8) connected as a nonlinear amplifier to heterodyne the rf signal received from rf cascode amplifiers V1 and V2 with the signal generated by megacycle crystal oscillator-doubler V6 (para 7). The resulting if. signal is applied through the first if. filter to second mixer V4. The rf signal output (108.0 mc to 126.9 mc) from rf cascode amplifiers V1 and V2 is coupled to the grid of V3 and is developed across resistor R6. The local oscillator injection frequency (96.3 mc to 114.3 mc), provided by megacycle crystal oscillator-doubler V6, is coupled to the cathode of V3 by capacitor C9.

*b.* The injection frequency beats in the mixer with the received signal frequency to produce a first if. The if. signal is variable from 11.7 mc to 12.6 mc. The amplitude of the if. signal is determined by the level of the agc voltage at the control grid. The plate of the first mixer is connected to the double-tuned, first if. filter, which passes the if. signal.

*c.* Resistor R7 is the cathode resistor. Resistor R10 is the plate load. Resistor R8 develops the screen potential. Feed-through capacitors C10 and C13 bypass the screen and plate resistors, respectively.

*d.* The first if. filter is a double-tuned circuit connected between first mixer V3 and the control grid of second mixer V4. The filter, which consists of capacitors C14 through C21 and C67, coils L5 and L6, and resistors R9 and R11, provides band-pass fractional megacycle tuning of the first if. signal. Tuning of the filter is accomplished by slug-tuning the two circuits over the frequency range of 11.7 mc to 12.6 mc. The tuning slug shaft is driven by a cam which is geared to the fractional megacycle drum.

## 11. Fractional Megacycle Crystal Oscillator V7

*a.* Crystal oscillator V7 (fig. 9) is a type 5718 triode connected as a Pierce type oscillator to generate frequencies between 10.0 and 10.9 mc in 0.1-mc steps. The stage develops a stable local oscillator injection frequency for the second mixer. The frequency of the oscillator is controlled by the fractional megacycle drum crystals which are inserted between the grid and plate of the tube.

*b.* Resistor R27 and capacitor C37 are a resistance-capacitance (rc) grid network. Resistor R28 is the plate resistor and choke L13 serves as an inductive load. Capacitor C38 compensates for the capacitance of the crystal drum.

## 12. Fractional Megacycle Channel Selection Circuit

*a.* The fractional megacycle channel selection circuit receives a signal from the vhf navigation control unit to perform a mechanical crystal selection operation for fractional megacycle crystal oscillator V7.
fractional megacycle drum, con-
*b.* A fractional megacycle channel
trolled by the fractional megacycle channel

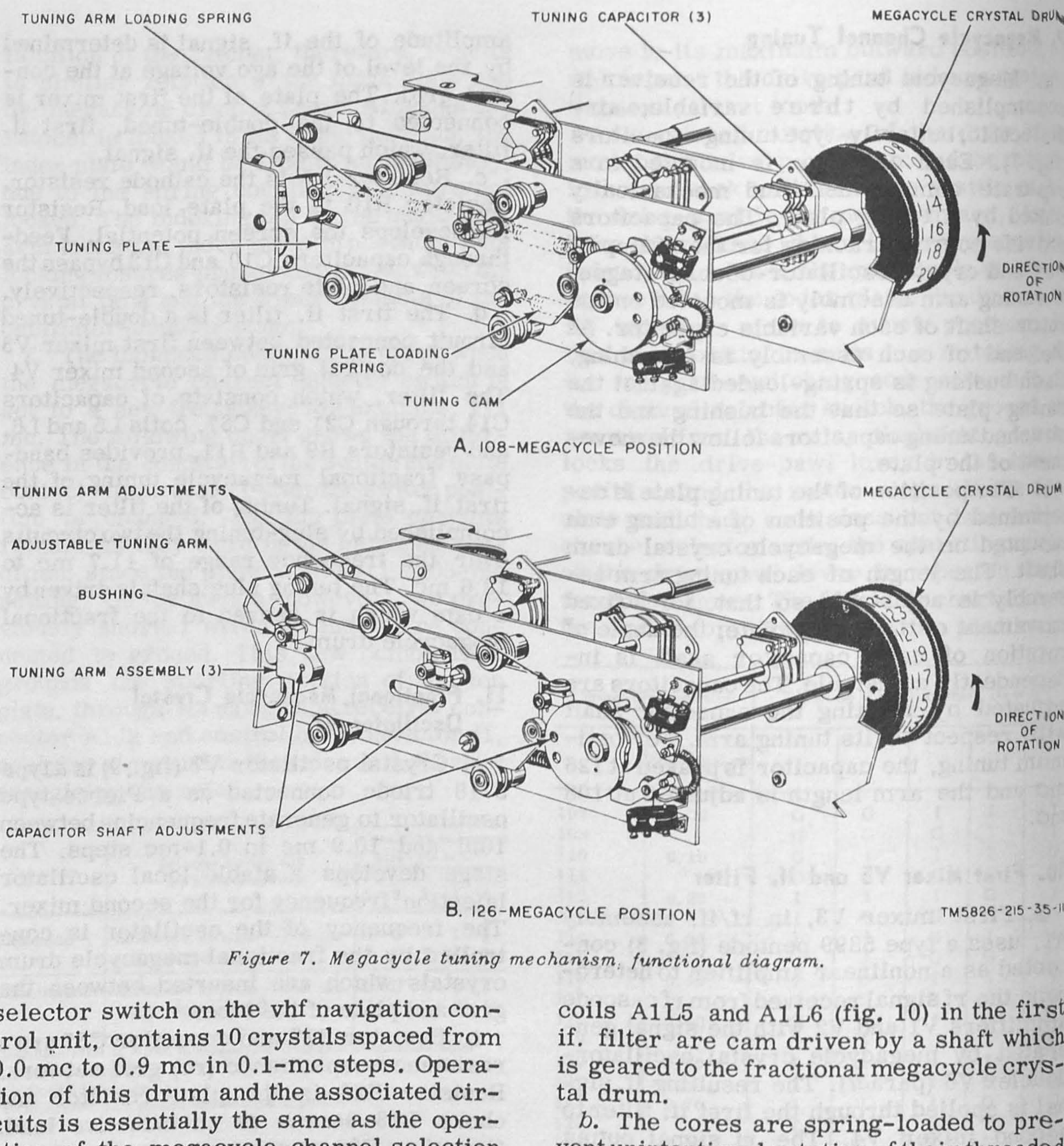



*Figure 7. Megacycle tuning mechanism, functional diagram.*

selector switch on the vhf navigation control unit, contains 10 crystals spaced from 0.0 mc to 0.9 mc in 0.1-mc steps. Operation of this drum and the associated circuits is essentially the same as the operation of the megacycle channel selection circuit (para 8). The switching sequence code for fractional megacycle channel selection is contained in paragraph *8h*. The selection wires are bypassed to ground by capacitors C57 through C61 (fig. 73①).

## 13. Fractional Megacycle Tuning

*a.* Fractional megacycle tuning is accomplished by slug-tuning the if. filter in the output circuit of first mixer A1V3 (para 10). The ferrite cores which tune coils A1L5 and A1L6 (fig. 10) in the first if. filter are cam driven by a shaft which is geared to the fractional megacycle crystal drum.

*b.* The cores are spring-loaded to prevent unintentional rotation of their threaded shafts, but they can be turned with a small capstan wrench to increase or decrease their penetration into the coil.

## 14. Second Mixer V4

*a.* Second mixer V4 (fig. 9) is a type 5899 pentode connected as a nonlinear amplifier to beat the filtered output of first mixer V3 against the output of fractional megacycle crystal oscillator V7. The resulting if. signal is applied to first 1.7-mc

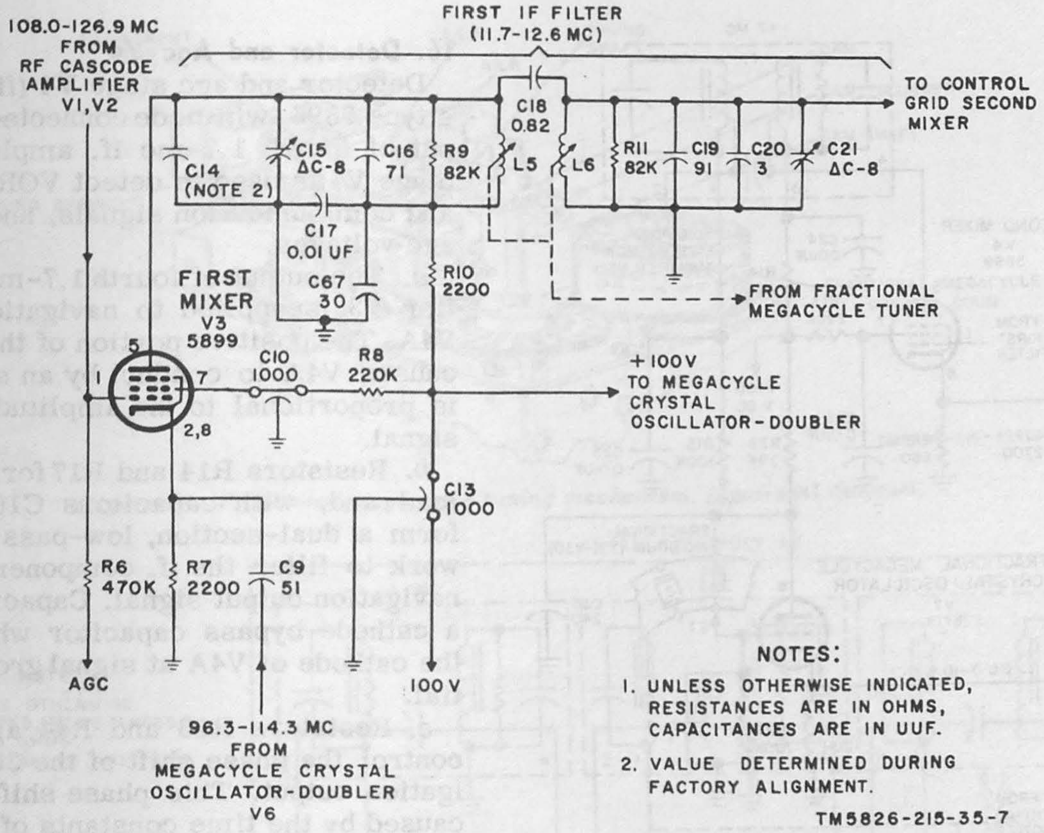



*Figure 8. First mixer V3 and if. filter, partial schematic diagram.*

if. amplifier V5. The output of the first if. filter (11.7 mc to 12.6 mc) is coupled to the grid of V4, and the injection frequency (10.0 mc to 10.9 mc), obtained from fractional megacycle crystal oscillator V7, is coupled to the cathode of V4 by capacitor C22.

*b.* The first if. signal beats with the injection frequency to produce the second if. signal of 1.7 mc. The output of second mixer V4 is coupled to first 1.7-mc amplifier V3 by double-tuned, 1.7-mc if. transformer T1, which is pretuned and hermetically sealed. The transformer is tuned to pass the difference frequency (1.7 mc) of the second mixer and attentuate all other frequencies. The secondary of transformer T1 is tapped for optimum impedance matching to the grid of tube V5; the low side of the secondary is connected to the agc circuit through decoupling circuit R15 and C25.

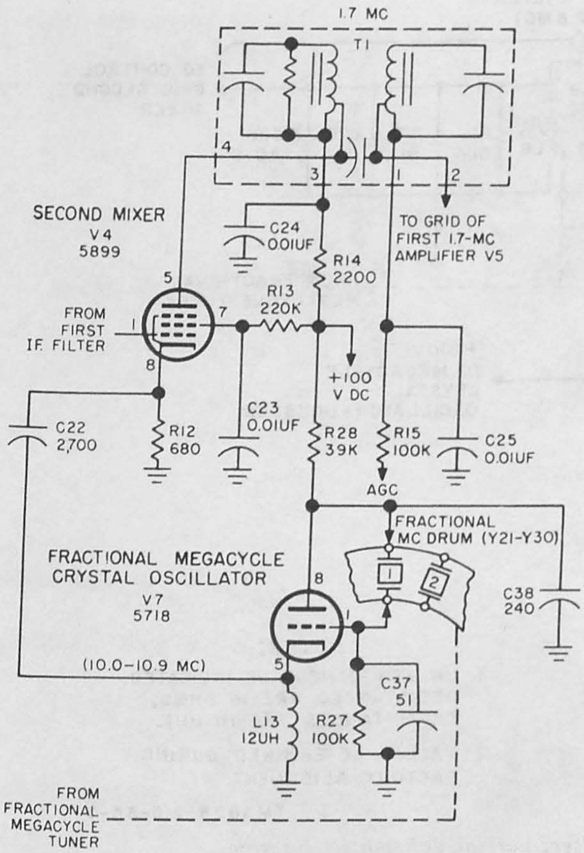
*c.* Resistor R12 is the cathode resistor, R14 and C24 make up a plate decoupling network, and R13 (bypassed by C23) is the screen potential developing resistor.

## 15. Amplifier Stages, 1.7–Mc If.

*a.* The 1.7-mc if. amplifier stages, consisting of V5 (fig. 11), V1, V2, and V3, are used to raise the amplitude of signals received from second mixer V4 to a level sufficient for application to detector and agc A2V4. First amplifier V5 is a type 5899 pentode tube. The remaining three 1.7-mc amplifiers, V1, V2, and V3 of if./af assembly A2, are also 5899 pentodes. Interconnection of the signal circuits of assemblies A1 and A2 is made through a miniature coaxial cable which is connected at pin A1P5.

*b.* Potentiometer A1R17, series-connected with cathode resistor A1R16, is adjusted to control the overall if. gain by controlling the cathode bias of tube A1V5. Both resistors are bypassed by capacitor A1C26.

*c.* Resistor R18 establishes the screen grid potential. It is bypassed by capacitor C27. Resistor R19 is the plate load resistor. Signals developed across this load are coupled to second 1.7-mc if. amplifier A2V1 by capacitor A2C2 and resistor A2R2.




NOTE:
UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.

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*Figure 9. Fractional megacycle crystal oscillator V7 and second mixer V4, partial schematic diagram.*

*d.* The second, third, and fourth 1.7-mc if. amplifiers, A2V1, A2V2, and A2V3, are almost identical in operation. The difference is that A2V1 is controlled by the agc circuit, and A2V2 and A2V3 are not. Resistors A2R3, A2R6, and A2R10 are cathode resistors for their respective stages and are bypassed by capacitors A2C3, A2C6, and A2C10. Resistors A2R4, A2R7, and A2R11 are screen-dropping resistors and are bypassed by capacitors A2C4, A2C7, and A2C11, respectively. The RC networks, A2R5-A2C5, A2R8-A2C8, and A2R12-A2C13-A2C14, are decoupling networks for transformers A2T1, A2T2, and A2T3. The parallel combination of capacitors A2C12, A2C13, and A2C14 acts to reduce the effects of modulation rise, which is common to receivers controlled by an agc circuit.

## 16. Detector and Agc V4

Detector and agc stage V4 (fig. 12) uses a type 5896 twin diode connected to the output of fourth 1.7-mc if. amplifier A2V3. Stage V4 is used to detect VOR, localizer, and communication signals, and to develop agc voltages.

*a.* The output of fourth 1.7-mc if. amplifier V3 is applied to navigation detector V4A. The positive portion of the if. signal causes V4A to conduct by an amount that is proportional to the amplitude of the if. signal.

*b.* Resistors R14 and R17 form the diode load and, with capacitors C16 and C17, form a dual-section, low-pass filter network to filter the if. component from the navigation output signal. Capacitor C19 is a cathode bypass capacitor which places the cathode of V4A at signal ground potential.

*c.* Resistors R13 and R44 are used to control the phase shift of the 30-cps navigation output. This phase shift, which is caused by the time constants of the detector circuit and the agc circuit, causes the navigation output signal to lead the modulation envelope by approximately 192° when the output line is open-circuited. The value of resistor R44 is selected at the factory to produce an open-circuit phase shift across the entire vhf navigation receiver of exactly 192°.

*Caution:* **Parts which affect the phase shift are capacitors C16, C17, C18, and C19, resistors R13 and R14, and if. transformer T3. If one or more of these parts are changed, the vhf navigation receiver must be tested as outlined in paragraph 101.**

*d.* Communication and agc detector V4B develops an audio frequency (af) output voltage across capacitor C22. The amplitude of the af voltage is proportional to the amplitude of the if. signal. The detected output, filtered by low-pass filter R22 and R26 and capacitor C22, is applied to first audio amplifier V5B and through resistor R26 to noise limiter V6A (para 18) and squelch control V6B (para 19).

*e.* When a carrier is present, a voltage, the magnitude of which varies proportionally with the strength of the received

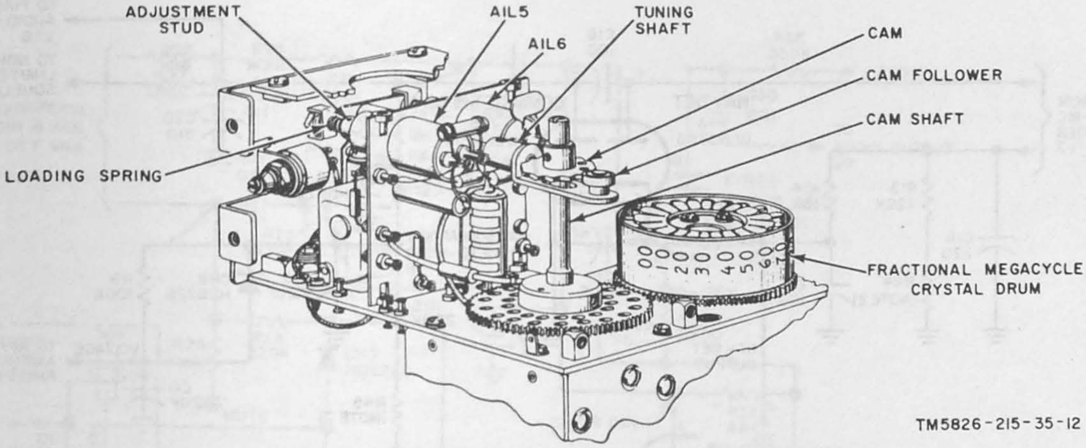


*Figure 10 Fractional megacycle tuning mechanism, functional diagram.*

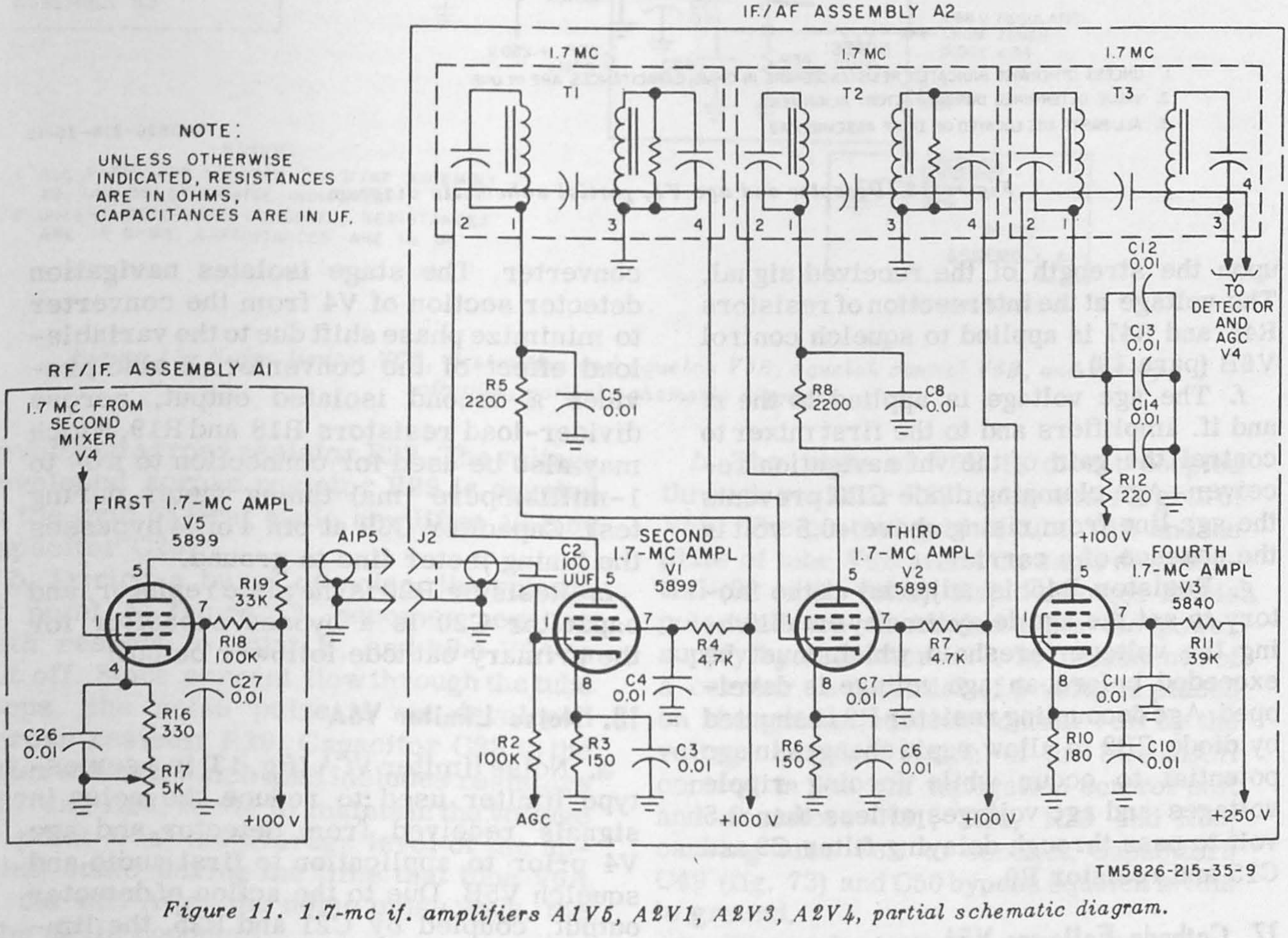


*Figure 11. 1.7-mc if. amplifiers A1V5, A2V1, A2V3, A2V4, partial schematic diagram.*

signal, is developed across capacitor C18. This voltage (the polarity shown) is added algebraically across resistors R16, R45, and R15 to +68 volts. The +68 volts is maintained at the intersection of resistors R37 and R45 by Zener diode CR4. Zener diodes act as normal diodes in the forward direction of current flow and act as opposite-polarity diodes in the reverse current direction when the reverse breakdown (Zener) voltage is exceeded. The sum of the +68 volts and the voltage at C18 produces an agc voltage of from +0.5 to -4.5 volts. The value of this voltage depends

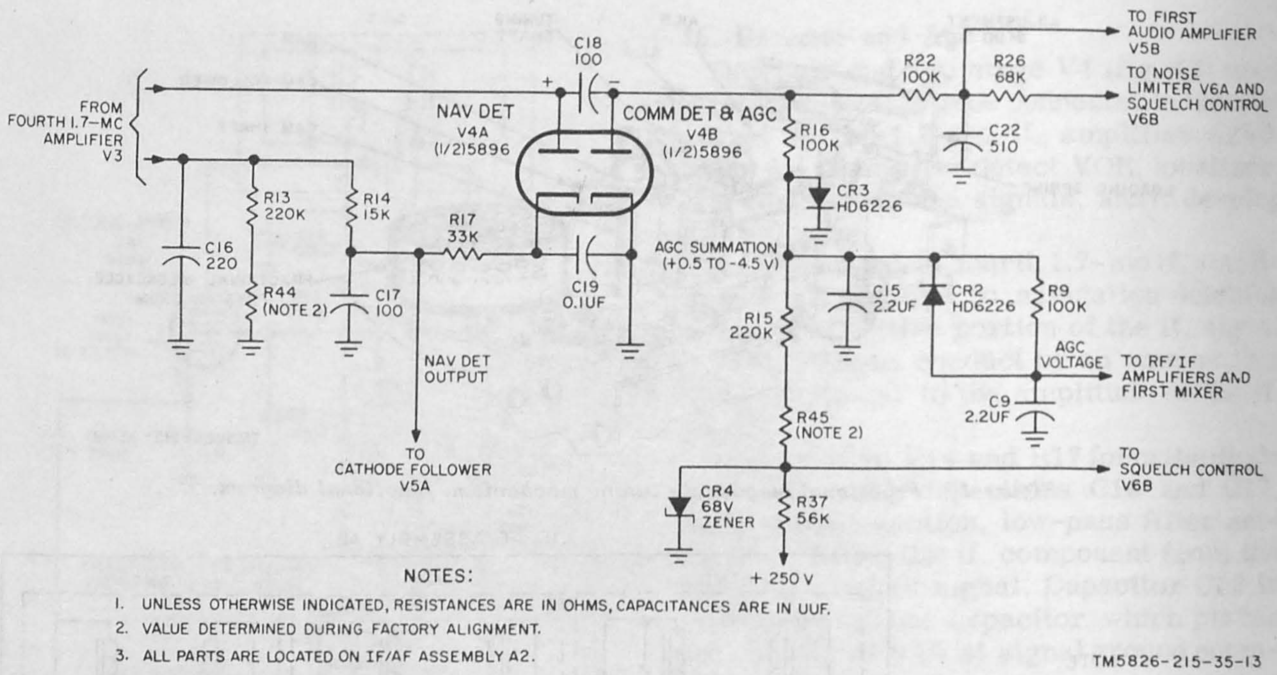


*Figure 12. Detector and agc V4, partial schematic diagram.*

upon the strength of the received signal. The voltage at the intersection of resistors R45 and R47 is applied to squelch control V6B (para 19).

*f.* The agc voltage is applied to the rf and if. amplifiers and to the first mixer to control the gain of the vhf navigation receiver. Agc clamping diode CR3 prevents the agc line from rising above +0.5 volt in the absence of a carrier.

*g.* Resistor R45 is adjusted at the factory to set the agc delay time by establishing the voltage threshold which must be exceeded before an agc voltage is developed. Agc decoupling resistor R9 is shunted by diode CR2 to allow rapid changes in agc potential to occur while forcing ripple voltages and agc voltages of less than 0.5 volt to pass through delaying filter C9 and C15 and resistor R9.

## 17. Cathode Follower V5A

Cathode follower V5A (A2V5, fig. 73②) couples the outputs of the A section of detector and agc V4 to the converter (nav output).

*a.* Cathode follower V5A provides a low-impedance, low-level navigation signal across cathode load resistor R21 for the converter. The stage isolates navigation detector section of V4 from the converter to minimize phase shift due to the variable-load effect of the converter. It also provides a second isolated output, across divider-load resistors R18 and R19, which may also be used for connection to a 0- to 1-milliampere (ma) tuning meter during test. Capacitor C39 at pin 4 of J4 bypasses the tuning meter line to ground.

*b.* Resistor R20 is the plate resistor, and capacitor C20 is a bypass capacitor for the primary cathode follower output.

## 18. Noise Limiter V6A

*a.* Noise limiter V6A (fig. 13) is a series-type limiter used to reduce the noise in signals received from detector and agc V4 prior to application to first audio and squelch V5B. Due to the action of detector output, coupled by C21 and R25, the limiter is normally conducting. When an unmodulated carrier is received, current flow through V6A is constant and the voltage drop across resistor R29 is also constant (polarity as shown). When the carrier is modulated, the audio signal passes through the limiter, which appears as a low resistance when conducting, and is

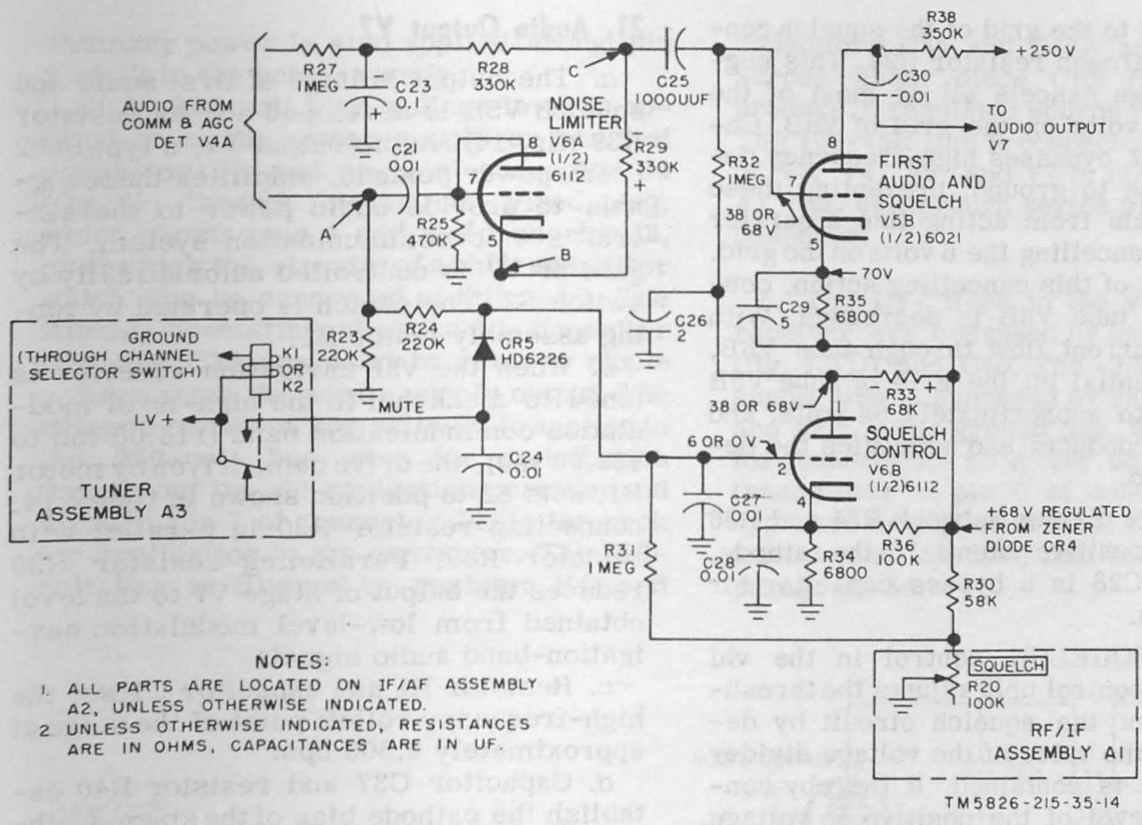


*Figure 13. Noise limiter V6A, first audio and squelch V5B, squelch control V6B, and muting circuits, partial schematic diagram.*

developed across resistor R29. The voltage developed across resistor R29 is coupled to the grid of first audio amplifier V5B by capacitor C25.

*b.* During a burst of noise, the voltage at point A, figure 13, becomes negative with respect to point B, and tube V6A is cut off. Since current flow through the tube stops, the noise pulse is not developed across resistor R29. Capacitor C23 in the filter circuit, which also includes resistors R27 and R28, tends to maintain the voltage at point C at the average level of the applied audio during the time that tube V6A is cut off. After the noise pulse ends, the tube again conducts.

## 19. Squelch Control V6B

*a.* Squelch control stage V6B (fig. 13) controls conduction in first audio and squelch tube V5B. Control is accomplished by applying sufficient bias voltage to cut off V5B in the absence of a carrier.

*b.* The plate of V6B is direct-coupled through resistor R32 to the control grid of V5B. The control grid of tube V5B and the plate of tube V6B are at the same dc potential (38 or 68 volts). Rapid changes in this potential are decoupled from the power supply by capacitor C26. In the absence of a carrier, a potential of 6 volts is placed on the grid of squelch control V6B by the voltage divider action of the SQUELCH control in the vhf navigation control unit and resistors R31, R24, R23 and R30, causing tube V6B to conduct. Capacitors C49 (fig. 73) and C50 bypass squelch levels to ground.

*c.* When tube V6B (fig. 13) conducts, its plate voltage (applied through resistor R33) and the grid voltage of tube V5B are reduced to approximately 38 volts dc. The cathode of tube V5B has a potential of 70 volts dc which, when the grid voltage is reduced, serves to cut the tube off.

*d.* When a carrier is present, a negative voltage is developed across resistor R23, and applied to the grid of the squelch control tube through resistor R24. This negative voltage cancels all or most of the positive 6 volts on the grid of V6B. Capacitor C27 bypasses high-frequency detector noise to ground, preventing these noise signals from acting like a carrier input and cancelling the 6 volts on the grid. As a result of this cancelling action, conduction in tube V6B is decreased. With reduced current flow through tube V6B, the dc potential on the grid of tube V5B increases to approximately 68 volts, and tube V5B conducts and amplifies the detected audio.

*e.* Voltage divider network R34 and R36 provides a positive potential to the cathode. Capacitor C28 is a bypass capacitor for the cathode.

*f.* The SQUELCH control in the vhf navigation control unit adjusts the threshold level of the squelch circuit by determining the value of the voltage divider in which it is contained. It thereby controls the level of the positive dc voltage applied to the grid of the squelch control tube.

*g.* A muting circuit, controlled by tuner assembly relay K1 or K2 applies LV+ to the control grid of V6B during vhf navigation receiver channeling to silence the unit. Capacitor C24 and diode CR5 prevent the production of switching transients when the relay contacts operate.

## 20. First Audio and Squelch V5B (fig. 13)

*a.* First audio and squelch V5B use one-half of a type 6021 twin triode to amplify audion signals received from noise limiter V6A. The outputs of first audio and squelch V5B are applied to audio output V7. The grid bias of V5B is controlled by squelch control tube V6B. Tube V5B operates as a voltage amplifier to supply the required driving potential for audio output stage V7.

*b.* Resistor R35 and capacitor C29 provide cathode bias for the stage. Resistor R38 is the plate load resistor and capacitor C30 couples the audio outputs to audio amplifier V7.

## 21. Audio Output V7

*a.* The output voltage of first audio and squelch V5B is developed across resistor R39 (fig. 14). Audio output V7, a type 5902 beam-power pentode, amplifies these signals to provide audio power to the aircraft's intercommunication system. The gain of V7 is controlled automatically by switch S2. The switch is operated by tuning assembly motor B1.

*b.* When the vhf navigation receiver is tuned to a channel in the high-level modulation communication band (118.00 mc to 126.90 mc), the drive cam, driven by motor B1, sets S2 to position shown in figure 14, connecting resistor R30 in parallel with resistor R39. Paralleling resistor R39 reduces the output of stage V7 to the level obtained from low-level modulation navigation-band audio signals.

*c.* Resistor R1 and capacitor C1 set the high-frequency rolloff point of the stage at approximately 2,500 cps.

*d.* Capacitor C37 and resistor R40 establish the cathode bias of the stage. Cathode potentials are regulated by Zener diode CR6, which maintains the cathode supply voltage at 100 volts. Capacitor C31 and resistor R43 form a low-pass filter which prevents oscillation in output transformer T4. The audio outputs developed across the primary of transformer T4 are bypassed by capacitors C63 and C38 at pin B of connector J3 (fig. 73①) and pin 2 of connector J4.

## 22. Primary and HV+ Power Distribution (fig. 73)

*a.* Primary power (LV+) is applied through the rack to the vhf navigation receiver when the VOL-OFF power switch on the vhf navigation control unit is operated to ON. Primary power is filtered by choke L2 and capacitor C35C and is applied through current-limiting resistor R42 to the two 3/4-ampere, series-connected branches of the vhf navigation receiver heater circuit. In the filament circuit, LV+ is filtered by coil L11 and capacitors C45 and C41. The filaments are further decoupled by feedthrough capacitors C39, C40, C42, C43, C44, and C46.

Primary power is also applied through pin 2 of J3 to the power supply.

*b.* A +260-volt high-voltage level is applied from the power supply on pin 3 of connector J3 and pin 7 of connector J4 (fig. 69) through either the wired plug, which shorts pins A and E of connector J3, or through the circuits of a vhf transmitter which can be connected at this point. The filters, consisting of choke L1, capacitor C36 and C33 are used to remove ripple voltage from the power supply output. The filtered output of 250 volts dc is applied to the 250-volt bus wire for distribution throughout the vhf navigation receiver and through pin 7 of connector J4, to the rack for application to the converter. The 240-volt line is filtered by resistor R41 and capacitors C34 and C35A and is applied across Zener diode CR6 (fig. 73②) to produce a regulated source of +100 volts. The 100-volt line is connected to the plates of V3, V4, V5, and V7 in rf/if. assembly A1 (fig. 69) through series plate load impedances.

*c.* The LV+ lines in the vhf navigation receiver are bypassed by capacitors C64 (fig. 73①) and C40. The +260-volt power supply line is bypassed by capacitors C62 and C65. The ground line, which is used for connection to a vhf communication transmitter at pin C of connector J3, is bypassed by capacitor C66. Complete distribution of the LV+ line is discussed in paragraph 54.

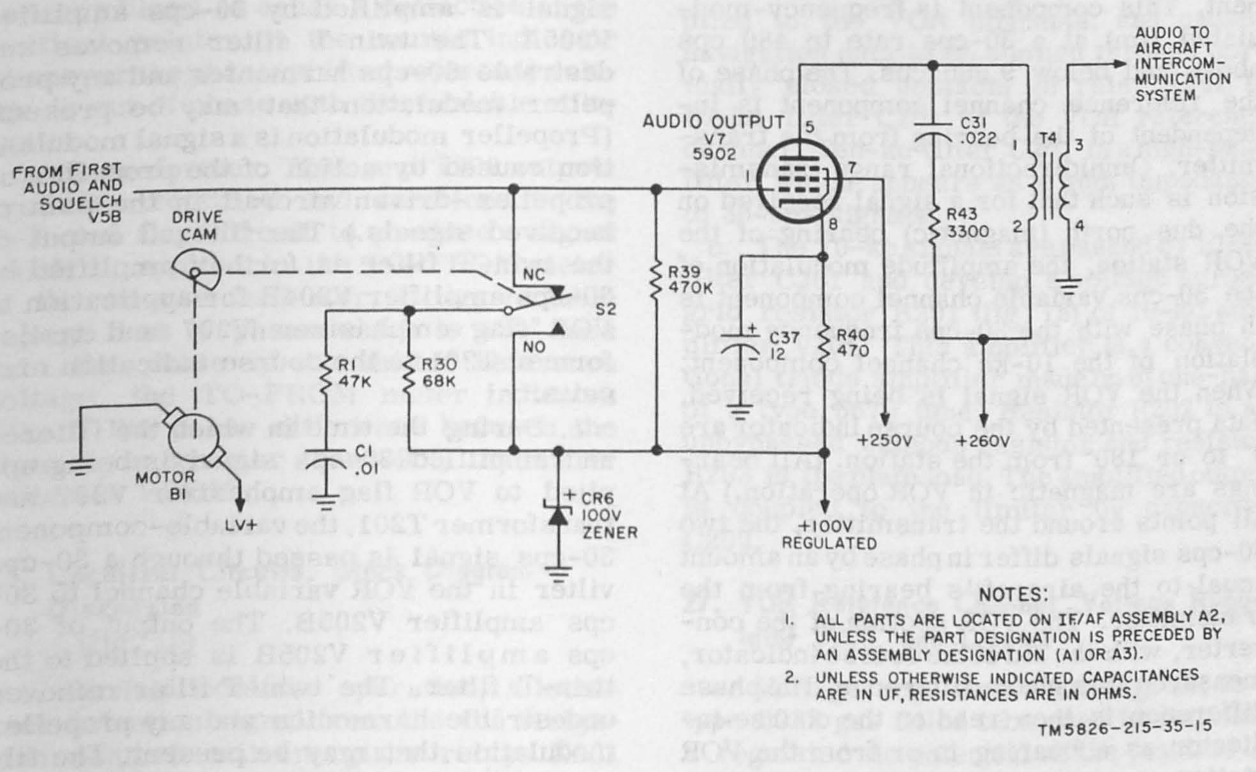


*Figure 14. Audio output V7, partial schematic diagram.*

## Section III. THEORY OF CONVERTER

### 23. General

The converter receives navigational information from the vhf navigation receiver and interprets VOR data in such a way that the bearing of the receiving antenna from the transmitting antenna can be determined. The converter also accepts runway localizer information from the vhf navigation receiver and converts it to a form that is presented visually on the course indicator. A block diagram of the unit is shown in figure 15. For complete circuit details, refer to the overall schematic diagram (fig. 74).

## 24. VOR Circuits, Block Diagram Discussion

*a.* The VOR navigational signal from the vhf navigation receiver consists of two independent signal components (para 2). One has a 30-cps frequency and is known as the *variable channel* component. Its phase in space at any given instant depends upon the bearing of the vhf navigation receiver from the VOR transmitter. The other component has an approximately 10-kc (actually 9,960 cps) frequency and is known as the *reference channel* component. This component is frequency-modulated (fm) at a 30-cps rate to 480 cps above and below 9,960 cps. The phase of the reference channel component is independent of the bearing from the transmitter. Omnidirectional range transmission is such that for a signal received on the due north (magnetic) bearing of the VOR station, the amplitude modulation of the 30-cps variable channel component is in phase with the 30-cps frequency modulation of the 10-kc channel component. When the VOR signal is being received, data presented by the course indicator are 0° to or 180° from the station. (All bearings are magnetic in VOR operation.) At all points around the transmitter, the two 30-cps signals differ in phase by an amount equal to the aircraft's bearing from the transmitter. The VOR section of the converter, with the aid of the course indicator, measures this phase difference. The phase difference is then read on the course indicator as a bearing to or from the VOR station.

*b.* During VOR operation, relays K201 and K202 (fig. 15) are both deenergized. The 10-kc fm signal from the vhf navigation receiver is coupled by 10-kc high-pass filter C201 to 10-kc amplifier V201A. The output of 10-kc amplifier V201A is applied to limiter CR201 and CR202. Limiter CR201 and CR202, operating at a potential established by voltage regulator V202, removes amplitude variations that might be present on the 10-kc fm signal.

*c.* Further amplification of the signal, which has been reduced to approximately one-third of its original amplitude by filter C201 and limiter CR201 and CR202, takes place in second 10-kc amplifier V203A. The output of 10-kc amplifier V203A is applied to the discriminator. The discriminator demodulates the 30-cps signal component and applies it through 30-cps amplifier V203B and cathode follower V204A to the course selector portion of the course indicator.

*d.* The phase of the 30-cps modulation signal is shifted by the combined operation of the course selector in the course indicator and a phase splitter in the converter VOR reference channel. The phase-shifted signal is amplified by 30-cps amplifier V205A. The twin-T filter removes undesirable 60-cps harmonics and any propeller modulation that may be present. (Propeller modulation is a signal modulation caused by action of the propeller on propeller-driven aircraft in the path of received signals.) The filtered output of the twin-T filter is further amplified by 30-cps amplifier V204B for application to VOR flag emphasizer V207 and transformer T201 in the course indication circuits.

*e.* During the time in which the filtered and amplified 30-cps signal is being applied to VOR flag emphasizer V207 and transformer T201, the variable-component 30-cps signal is passed through a 30-cps vilter in the VOR variable channel to 30-cps amplifier V205B. The output of 30-cps amplifier V205B is applied to the twin-T filter. The twin-T filter removes undesirable harmonics and any propeller modulation that may be present. The filtered signal is than applied to 30-cps amplifier V201B. The amplified output of V201B is applied to VOR flag emphasizer V207 and transformer T202 in the indication circuits.

*f.* If either the reference channel 30-cps signal or the variable channel 30-cps signal is of insufficient amplitude to insure proper operation of the vhf navigation set, the VOR flag emphasizer acts to shunt the output circuit of the associated 30-cps amplifier (V204B or V201B, respectively). With either amplifier shunted in this manner, the outputs of transformers T201 and T202 are rectified in cross pointer (C-P) and flag circuits of the indication circuits. The rectified voltages are applied through the normally closed contacts of relay K202 to cause the OFF vertical flag in the course indicator to appear. With the OFF vertical flag visible, the data being received by the vhf navigation set are known to be unusable.

*g.* If the outputs of the two channels, taken from transformers T201 and T202, are sufficient in amplitude, they are combined in the C-P and flag circuits and applied to the course indicator to cause the flag to be removed from view. They also are combined to cause a deflection of the vertical pointer in the course indicator whenever the phase-shifted reference voltage is out of phase with the variable voltage.

*h.* Transformer T201 and T202 outputs are also rectified and combined in the C-P and flag circuit to produce a signal which is applied to the TO-FROM meter in the course indicator. If the variable voltage has a phase which is ±90° less than the phase of the shifted reference voltage, the TO-FROM meter indicates TO. If the phase difference between the signals is greater than ±90°, the meter indicates FROM.

## 25. Localizer Circuits, Block Diagram Discussion

(fig. 15)

*a.* During localizer operation, a localizer selection signal from the vhf navigation control unit energizes relays K201 and K202. Navigation data are then applied to 90/150-cps amplifier V206A. The output of this stage is further amplified by 90/150-cps amplifier V206B. The amplified localizer signal is separated into two components by 90/150-cps filters. These components, whose frequencies are 90 and 150 cps, are rectified and compared by a balanced circuit in the filters.

*b.* If there is a difference in the two components, the resulting output is applied to the vertical pointer in the course indicator to cause the appropriate deflection. If either component is missing, the output of the 90/150-cps filters applied through the normally closed contacts of relay K202 causes the OFF vertical flag to appear.

## 26. VOR Reference Channel, 10-Kc Filter C201 and 10-Kc Amplifier V201A

*a.* Ten-kc filter C201 (fig. 15) and 10-kc amplifier V201A separate the 30-cps component of VOR signals, received from the vhf navigation receiver, from the 10-kc component and amplify the 10-kc component for application to the limiter.

*b.* During VOR operation, selection of a VOR frequency in the vhf navigation control unit causes high voltage (HV+) to be applied to the VOR channels, and causes navigation data to be applied through normally closed contacts of relay K201 to 10-kc filter C201 in the VOR reference channel. Ten-kc filter C201 is a high-pass filter which appears as a high impedance to 30-cps signals.

*c.* The 10-kc signals are passed by 10-kc filter C201 and develop a voltage across grid resistor R201 (fig. 16) of 10-kc amplifier V201. This amplifier is a conventional triode amplifier made up of one-half of a type 5670 tube. Resistor R202 is an unbypassed cathode resistor and resistor R203 is the plate load. The amplified output is coupled to the limiter by capacitor C202.

## 27. VOR Reference Channel, Voltage Regulator V202, and Limiter

*a.* Voltage regulator V202 (fig. 16) is a type 5783 gas filled tube used to maintain a regulated dc potential at the junction of resistors R205 and R206. The limiter is made up of crystal diodes CR201 and CR202 and resistors R204, R205, and R207. The limiter removes any residual amplitude modulation (am.) that may be present on the 10-kc fm signal before the signal is applied to 10-kc amplifier V203.

*b.* Resistor R206 and voltage regulator V202 function as a voltage divider and develop a potential of 95 volts at their

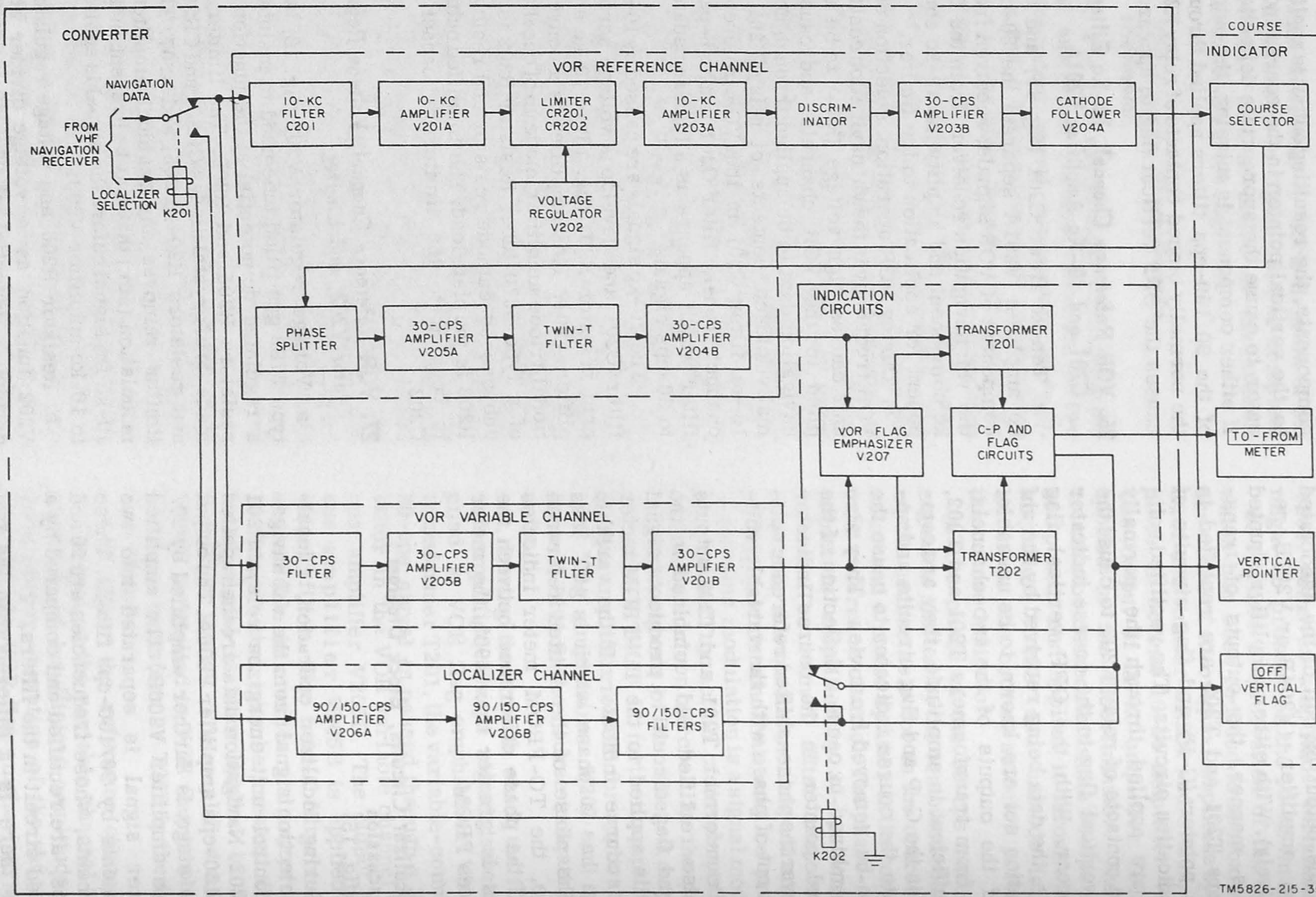


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*Figure 15. Converter, block diagram.*

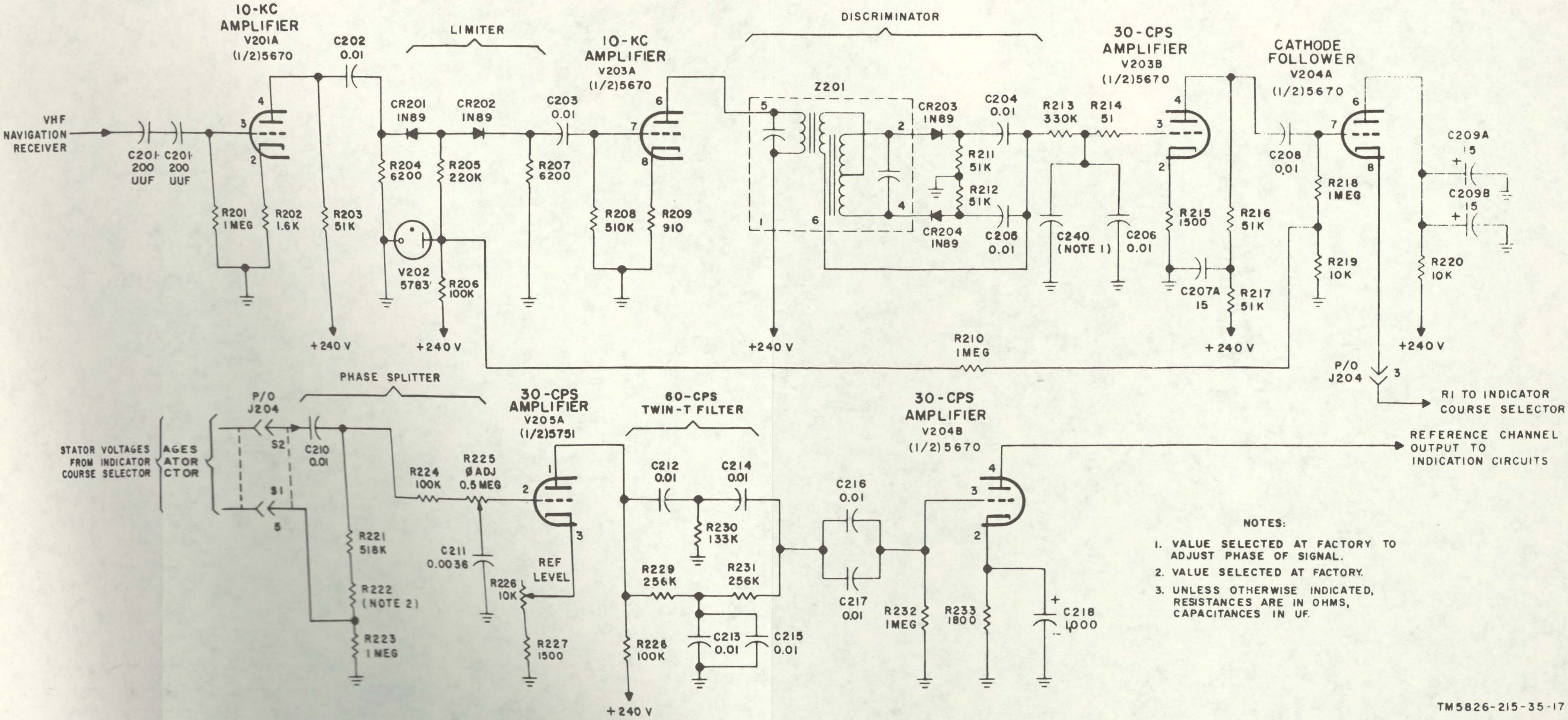
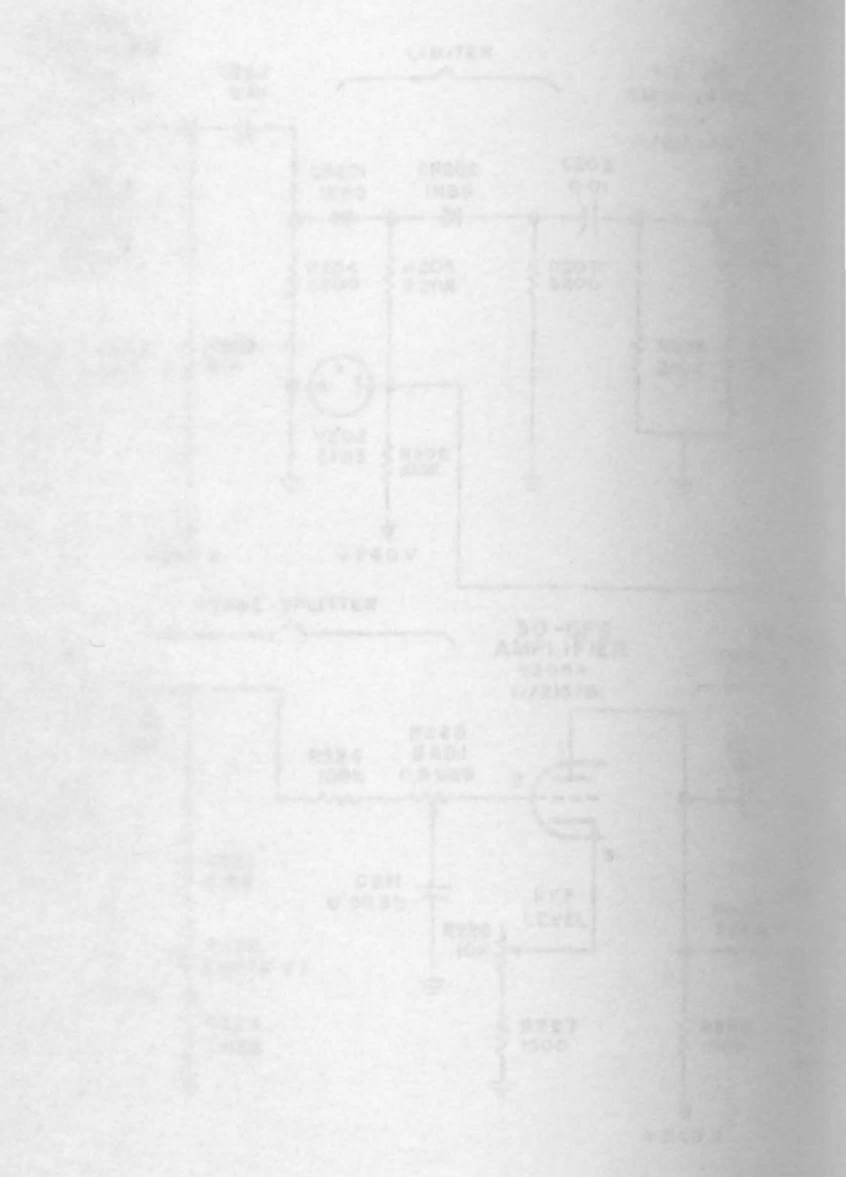



*Figure 16. VOR reference channel circuit, partial schematic diagram.*


LIMITER
CR201
CR202
C203
0.01
VZ02
+240V
PHASE SPLITTER
AMPLIFIER
R224
R226
R227
1500
LEVEL

intersection. This voltage is used as a dc pedestal on which the signal rides. With the signal at a dc reference level of 95 volts, the signal is above the level of most noise signals. The limited flat-topped fm carrier is coupled to the following stage by capacitor C203.

### 28. VOR Reference Channel, 10-Kc Amplifier V203A

Outputs of the VOR reference channel limiter (para 27) are amplified by 10-kc amplifier V203A (fig. 16). Stage V203A is connected as a triode amplifier using one-half of a type 5670 tube. Resistor R208 is the grid dc return resistor. Cathode bias is developed by tube current through resistor R209. The output of V203A is transformer coupled to the discriminator.

### 29. VOR Reference Channel, Discriminator

*a.* The discriminator (fig. 16) uses crystal diodes CR203 and CR204 connected as a ratio detector to convert the frequency variations developed across the secondary of the double-tuned transformer in plug-in assembly Z201 to amplitude variations of the 30-cps carrier. The outputs of the discriminator are applies to 30-cps amplifier V203B. Diodes CR203 and CR204 rectify the voltages appearing at the secondary of the Z201 transformer. The resulting voltages at the output of the two diodes are added across load resistors R211 and R212.

*b.* Because of the amplitude-stabilizing action of the limiter (para 27), the sum of the voltages across resistors R211 and R212, and therefore across capacitors C204 and C205, is effectively constant. When the 10-kc carrier frequency shifts with modulation, the sum of the voltages across C204 and C205 remains constant, but the voltage across each individual capacitor changes. If the frequency increases, the charge across capacitor C204 is greater than the charge across capacitor C205. If the frequency decreases, capacitor C204 partially discharges through capacitor C205. Thus, the voltage dropped across resistor R213 and the parallel combination of capacitors C240 and C206 varies at the same rate as the ratio of the voltage charges across capacitors C204 and C205.

*c.* Resistors R213 and R214 and capacitors C240 and C206 make up a phase-shift network which compensates for phase shift in the discriminator. The value of capacitor C240 is selected at the factory to provide the compensating shift.

*d.* The transformer winding of Z201 that is connected between the center tap of the secondary winding and the intersection of capacitors C204 and C205 is essentially a low-impedance (untuned) source. Use of this low-impedance source permits the use of a high-impedance primary; thereby establishing an impedance matching action which produces higher gain than would otherwise be possible.

*e.* The amplitude-modulated 30-cps signal, at the output of the discriminator phase-shift compensation network, is applied to 30-cps amplifier V203B.

### 30. VOR Reference Channel, 30-Cps Amplifier V203B

Amplifier V203B (fig. 16) amplifies the 30-cps am. output of the discriminator for application to cathode follower V204A. The amplifier is a standard triode amplifier using one-half of a type 5670 tube. Cathode bias is developed by current flow through resistor R215. The signal output voltage of V203B is developed across resistor R216. Resistor R217 and capacitor C207A make up the plate decoupling network. The voltage drop appearing across the tube is coupled to cathode follower V204A by capacitor C208.

### 31. VOR Reference Channel, Cathode Follower V204A

*a.* Cathode follower V204A (fig. 16), couples the output of 30-cps amplifier V203B to the course selector circuit of the course indicator. Resistor R220 is the plate (voltage dropping) resistor, which is decoupled by the parallel combination of capacitor C209A and C209B.

*b.* The cathode load, represented by the course indicator, maintains the cathode at a dc level of 6.6 volts. Since this potential would present excessive bias for the tube, compensation is provided by connecting the control grid through resistor R218 to the 1.0-volt point on voltage divider R219, R210, and R206 at the output of voltage regulator V202. The load, represented by the course indicator, is connected at pin 3 of connector J204 (fig. 73).

## 32. VOR Reference Channel, Phase Splitter, and 30-Cps Amplifier V205A

The phase splitter and 30-cps amplifier V205A (fig. 16) receive the output voltages from the course indicator. The phase splitter performs a vector addition of the output voltages to produce an input to the amplifier which is directly proportional to the amplitude of the cathode follower V204A outputs. However, the phase of the amplifier input is shifted by an amount that is proportional to the angular displacement of the course selector in the course indicator. The resulting signal is amplified by 30-cps amplifier V205A for application to the twin-T filter.

*a.* The phase splitter in the VOR reference channel consists of a phase-shift circuit, made up of resistors R221 and R222 and capacitor C210; and a phase compensation circuit, made up of resistors R223, R224, and R225 and capacitor C211.

*b.* Voltage inputs to the phase-shifting circuit are taken from the stators of a resolver in the course indicator (fig. 40). These inputs, appearing at pins 4 and 5 of connector J204 (fig. 16), are at values which are sine and cosine functions of the voltage output of cathode follower V204A. If stator No. 1 (S1) has maximum inductive coupling to the rotor when the winding of the resolver rotor is at a position designated as 0, the output of that stator is a cosine function of the rotor input. Under the same rotor positioning conditions, the output of S2 is a sine function of the input to the rotor. The value of the sine and cosine at any given time is dependent upon the positioning of the rotor. Thus, assuming that 1 volt is applied to the rotor, positioning the rotor at the 0 position produces a 1-volt output at S2 (cosine of 0°=1) and 0-volt output at S1 (sine of 0°-0.0). Rotation of the rotor through 90° produces a 0-volt output at S2 (cosine of 90° =0) and a 1-volt output at S1 (sine of 90°-1). Rotation of the rotor through 30° produces a 0.866-volt output at S2 (cosine of 30° = -0.866) and a 0.5-volt output at S1 (sine of 30°-0.5).

*c.* The S1 and S2 outputs are applied across the series combination of resistors R221 and R222 through capacitor C210. Resistor R222 has a value between 0 and 20 kilohms. The final value is selected to compensate for differences in the impedances of the two stators and for slight variations in the 90° mechanical difference between the two stators. Capacitor C210 has an impedance, at the 30-cps operating frequency of the resolver and phase splitter, that is approximately equal to the total resistance of R221 and R222.

*d.* Stator outputs applied at the S1 and S2 inputs of the phase-shifting circuit are vectorially added at the intersection of capacitor C210 and resistor R221. Since the resistive and capacitive impedances have the same value, the vector addition produces an output which is shifted 45° from the input to the rotor. The amplitude of this output is equal to the amplitude of the rotor input.

*e.* Rotation of the course selector knob on the course indicator rotates the rotor of the resolver. Rotation of the rotor causes the amplitude of the S1 and S2 voltages to change at rates that are functions of the cosine and sine of the rotor angle (*b* above). Vector addition of these two voltages at the intersection of C210 and R221 still produces a voltage the amplitude of which is the same as the amplitude of the rotor input voltage. Since the addition is vectorial, the phase of the sum voltage is shifted 45°, plus the number of degrees that the rotor (course selector knob) is displaced.

*f.* The outputs of the phase-shifting circuit are applied to the phase compensation circuit. The phase compensation circuit is similar to the resistor capacitor portion of the phase-shifting circuit. The impedance of capacitor C211 (at the 30-cps operating frequency) is effectively equal to the resistive impedance of resistors

R221 through R224 and the selected portion of R225. As a result, another 45° phase shift is introduced, which is opposite in polarity to the original 45° phase shift. Thus, the signal applied to 30-cps amplifier V205A has an amplitude which is directly equivalent to the amplitude of the cathode follower V204A output, but which is shifted in phase by the same amount that the course selector knob of the course indicator is rotated.

*g.* Amplifier V205A is connected as a triode amplifier, using one-half of a type 5751 tube. The conducting level of the tube is established by adjustment of reference (ref) level potentiometer R226. Resistor R227 forms a fixed portion of the cathode resistance and resistor R228 is the plate load.

## 33. VOR Reference Channel, Twin-T Filter

The twin-T filter (fig. 16) receives the output of 30-cps amplifier V205A. Any 60-cps signal components present in this output are removed by this filter, and the resulting voltage is applied to 30-cps amplifier V204B. Twin-T filter C212, C213, C214, C215, and R229, R230, and R231 is a parallel-T network which rejects any 60-cps signal component or propeller modulation present on the reference channel signal. The filtered output is coupled by the parallel combination of capacitors C216 and C217 to 30-cps amplifier V204B.

## 34. VOR Reference Channel, 30–Cps Amplifier V204B

The final 30-cps amplifier in the VOR reference channel (fig. 16), stage V204B, amplifies the signals received from the twin-T filter and applies them to the indication circuits in the converter. The amplifier uses one-half of a 5670 tube. Resistor R232 is the grid return and resistor R233 the cathode bias resistor. Capacitor C218 is a cathode bypass for R233.

## 35. VOR Variable Channel, 30–Cps Filter and 30–Cps Amplifier V205B

During VOR operation, the same signal applied to the VOR reference channel is applied to 30-cps filter and 30-cps amplifier V205B in the VOR variable channel (fig. 17). This circuit passes the 30-cycle variable phase component of the VOR signal, rejects the 10-kilocycle reference phase component, and amplifies the 30-cps signal. The amplified signal is applied to a 60-cps twin-T filter in the VOR variable channel.

*a.* The 30-cps filter consists of resistors R241 through R244 and capacitors C221 through C225. This low-pass filter offers low impedance to frequencies near 30 cycles, but attenuates any residual carrier frequency voltage in the signal.

*b.* The 30-cps amplifier, V205B, is a conventional triode amplifier which uses one-half of a type 5751 tube. Resistor R245 is the cathode resistor and resistor R246 is the plate-load resistor. Outputs of this amplifier are applied through the 60-cps twin-T filter to 30-cps amplifier V201B.

## 36. VOR Variable Channel, 60–Cps Twin–T Filter and 30–Cps Amplifier V201B

The 60-cps twin-T filter and 30-cps amplifier V201B, in the VOR variable channel (fig. 17), filter and amplify, respectively, the 30-cps variable-phase output of 30-cps amplifier V201B for application to the indication circuits in the converter. Operation of these circuits is identical with that of the twin-T filter and 30-cps amplifier V204B in the VOR reference channel (para 34). The circuits are similar. Only two differences exist between the 60-cps twin-T filter and 30-cps amplifier in the two channels other than reference designations. One difference is that three 0.01-microfarad capacitors (C230, C231, and C232) are used by the variable channel in place of the two corresponding capacitors (C216 and C217) in the reference channel. The second difference is that the grid of the variable channel amplifier (V201B) is connected to the tap of variable level potentiometer R250, rather than being taken across a 1-megohm resistor as in the case of resistor R232 in the grid circuit of the reference channel amplifier (V204B).

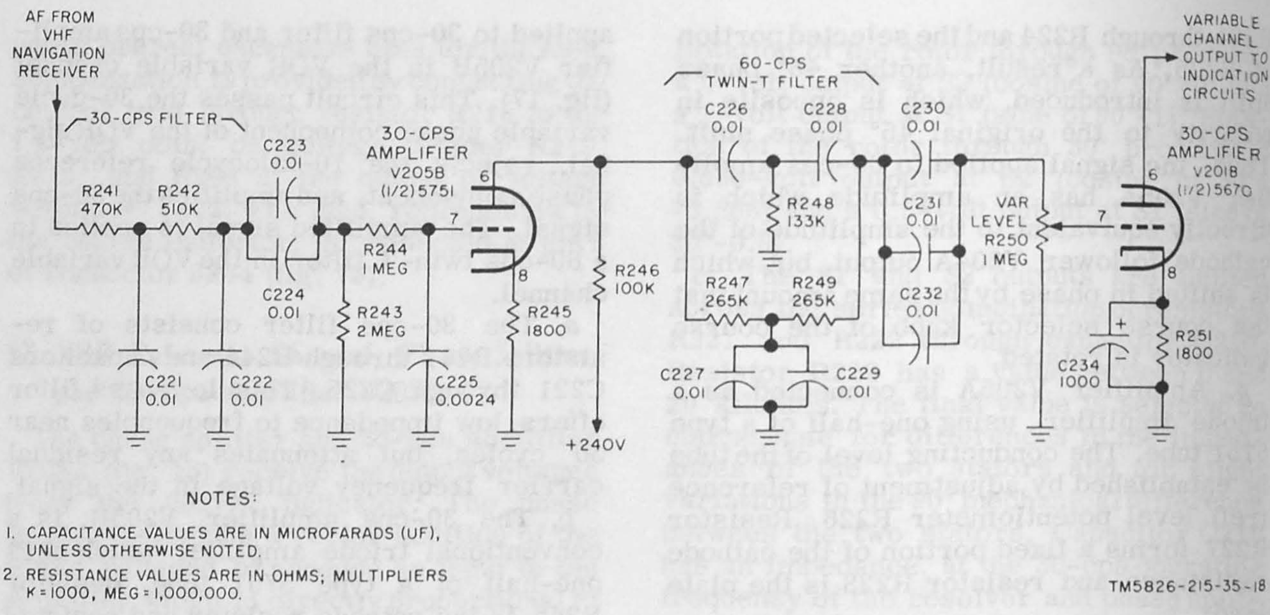



*Figure 17. VOR variable channel circuit, partial schematic diagram.*

## 37. Amplifiers V206A and V206B

Amplifiers V206A and V206B (fig. 18), in the localizer channel of the converter, amplify 90/150-cps localizer signals received from the vhf navigation receiver and apply the amplified signal to 90-cps filter Z202 and 150-cps filter Z-203.

*a.* The two amplifiers are similar amplifiers using the two halves of a type 5814A tube. During localizer operation, selection of a localizer frequency causes a vhf navigation control unit developed localizer selection to be applied from pin 2 of connector J205 (fig. 74) to the coils of relays K201 and K202. Energizing relay K201 causes navigation data at pin 2 of connector J204 and 240-volt high voltage (HV+) at pin 7 of connector J204 to be switched to the localizer channel amplifiers. The navigation signal is coupled by capacitor C236 (fig. 18) to voltage divider R254 and R255.

*b.* The navigation signal reduced to one-half of its original amplitude is amplified by V206A. Resistor R256 is the cathode resistor for this stage and SENS control R257 is the plate-load resistor. Adjustment of this control determines the amplitude of the signal applied to V206B.

*c.* Amplifier V206B is essentially the same as amplifier V206A. The difference is in the reference designations. The value of one resistor in the voltage divider network at the control grid (R259), the value of cathode resistor R260, and plate-load resistor R261 is not variable and has a different value. The output taken at the plate of the second amplifier stage is applied to both the 90-cps filter and the 150-cps filter.

## 38. Localizer Channel, 90–Cps Filter Z202 and 150–Cps Filter Z203
(fig. 18)

Localizer channel 90-cps filter Z202 and 150-cps filter Z203 are similar filters, each of which is tuned to the frequency specified by its name. These filters couple navigation signals, at their respective frequencies, to the indication circuits in the converter. Balance control R264 provides an adjustment which enables the outputs of both filters to be set at the same amplitudes when the inputs are at the same amplitude.

## 39. Indication Circuits, Vertical Pointer Portion

The vertical pointer portion of the indication circuits in the converter compares the phases of the VOR variable channel

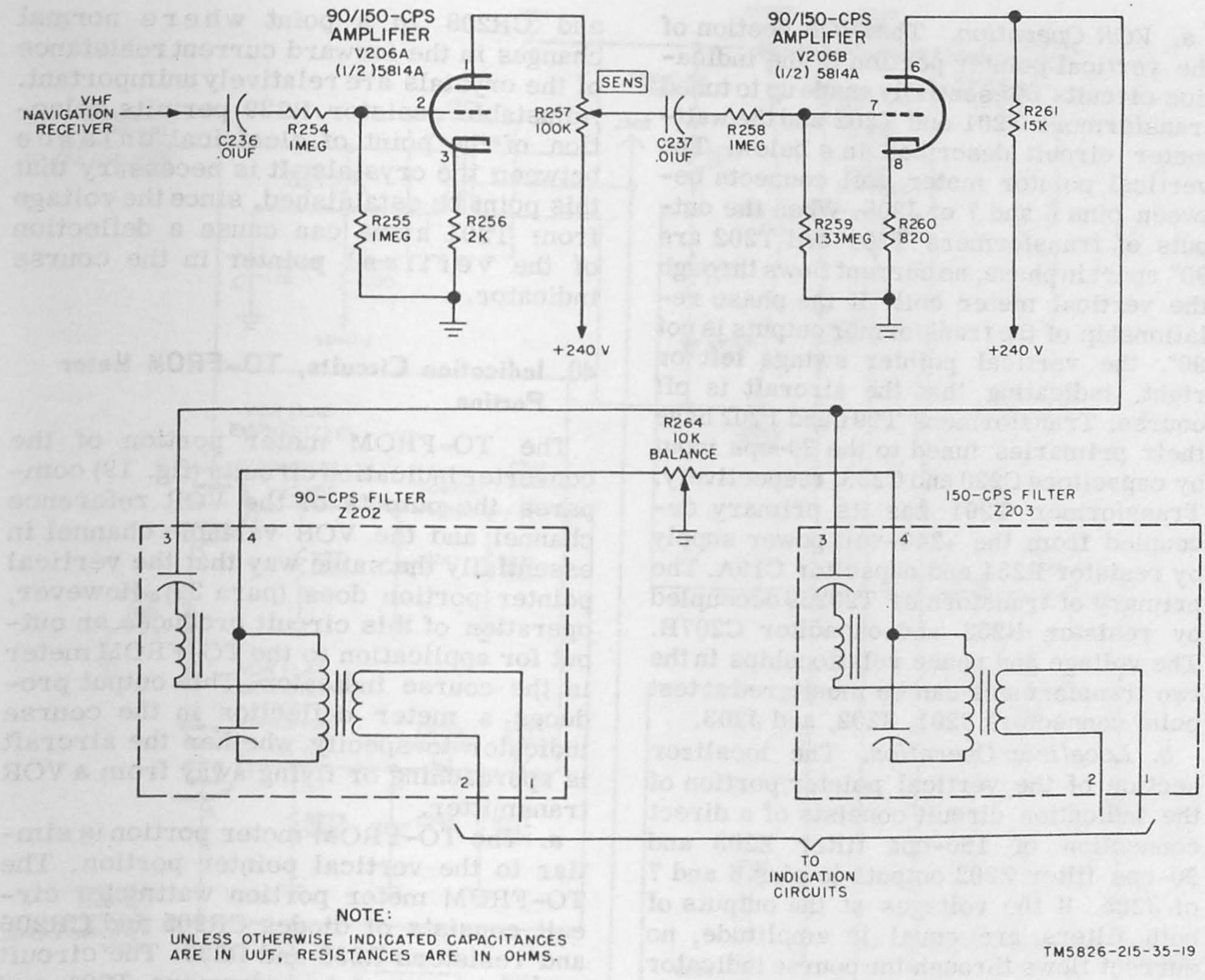



*Figure 18. Localizer channel circuit, partial schematic diagram.*

output from 30-cps amplifier V201B (fig. 19) and the VOR reference channel output from 30-cps amplifier V204B during VOR operation (*a* below). During localizer operation (*b* below), it compares the voltage amplitudes at the output of localizer filters Z202 and Z203. If the VOR phases are 90° apart or the inputs to Z202 and Z203 are the same in amplitude, there is no effective output between pins 4 and 5 of J205, and the course indicator will not deflect. If, however, there is a variance from the 90° phase difference between the two VOR channel outputs, or if the voltage amplitudes of the two localizer components differ, the vertical pointer in the course indicator deflects. The 90° phase difference between the VOR variable and VOR reference channel outputs is not due to a phase difference in the VOR signal components, but to electrical characteristics of the two channels. As such, the 90° phase difference indicates that the aircraft is at the VOR bearing specified by the positioning of the course selector knob on the course indicator. Vacuum tube stages V207A and V207B are a part of the VOR flag emphasizer (para 42) circuit. This circuit is used to provide a definite flag indication when either the VOR reference output signal from the 30-cps amplifier V204B or VOR variable channel output signal from 30-cps amplifier V201B is unreliable.

*a. VOR Operation.* The VOR section of the vertical pointer portion of the indication circuits is esentially made up to tuned transformers T201 and T202 and the wattmeter circuit described in *c* below. The vertical pointer meter coil connects between pins 6 and 7 of J205. When the outputs of transformers T201 and T202 are 90° apart in phase, no current flows through the vertical meter coil. If the phase relationship of the transformer outputs is not 90°, the vertical pointer swings left or right, indicating that the aircraft is off course. Transformers T201 and T202 have their primaries tuned to the 30-cps input by capacitors C220 and C233, respectively. Transformer T201 has its primary decoupled from the +240-volt power supply by resistor R234 and capacitor C19A. The primary of transformer T202 is decoupled by resistor R252 and capacitor C207B. The voltage and phase relationships in the two transformers can be monitored at test point connectors J201, J202, and J203.

*b. Localizer Operation.* The localizer section of the vertical pointer portion of the indication circuit consists of a direct connection of 150-cps filter Z203 and 90-cps filter Z202 outputs to pins 6 and 7 of J205. If the voltages at the outputs of both filters are equal in amplitude, no current flows through the course indicator meter which is connected between pins 6 and 7 of J205 through the rack. With no current flow, there is no deflection of the vertical pointer. However, if the aircraft is either to the right or left of the centerline of approach on the localizer beam (para 2), one filter output is greater than the other. This difference in filter voltages produces current flow through the vertical pointer meter coil (not shown). As a result, the vertical pointer deflects to indicate which beam component is greater.

*c. Wattmeter Circuit.* The wattmeter circuit is made up of diodes CR207 and CR208 and resistors R238, R239, and R240. The circuit is uded to convert the reference channel output signal from 30-cps amplifier V204B to direct current. Resistors R238 and R240, in series with diodes CR207 and CR208, respectively, increase the forward resistance of CR207 and CR208 to a point where normal changes in the forward current resistance of the crystals are relatively unimportant. Adjustable resistor R239 permits selection of the point of electrical balance between the crystals. It is necessary that this point be established, since the voltage from T201 alone can cause a deflection of the vertical pointer in the course indicator.

## 40. Indication Circuits, TO–FROM Meter Portion

The TO-FROM meter portion of the converter indication circuits (fig. 19) compares the outputs of the VOR reference channel and the VOR variable channel in essentially the same way that the vertical pointer portion does (para 39). However, operation of this circuit produces an output for application to the TO-FROM meter in the course indicator. This output produces a meter deflection in the course indicator to specify whether the aircraft is approaching or flying away from a VOR transmitter.

*a.* The TO-FROM meter portion is similar to the vertical pointer portion. The TO-FROM meter portion wattmeter circuit consists of diodes CR205 and CR206 and resistors R235 and R236. The circuit is fed by output transformers T201 and T202, with the output of transformer T202 shifted approximately 90° by resistor R253 and capacitor C235.

*b.* This additional phase shift shifts the TO-FROM meter output of transformer T202 to put the output approximately in phase with the output of transformer T201 during an on-course TO indication and approximately 180° out of phase with the output of T201 for an on-course FROM indication.

*c.* The 180° phase difference for TO and FROM signals causes a corresponding change in the direction of current flow through pins 2 and 3 of connector J205. These pins are connected to the meter coil in the course indicator through the rack. The direction of current flow determines the direction of meter movement (TO or FROM).

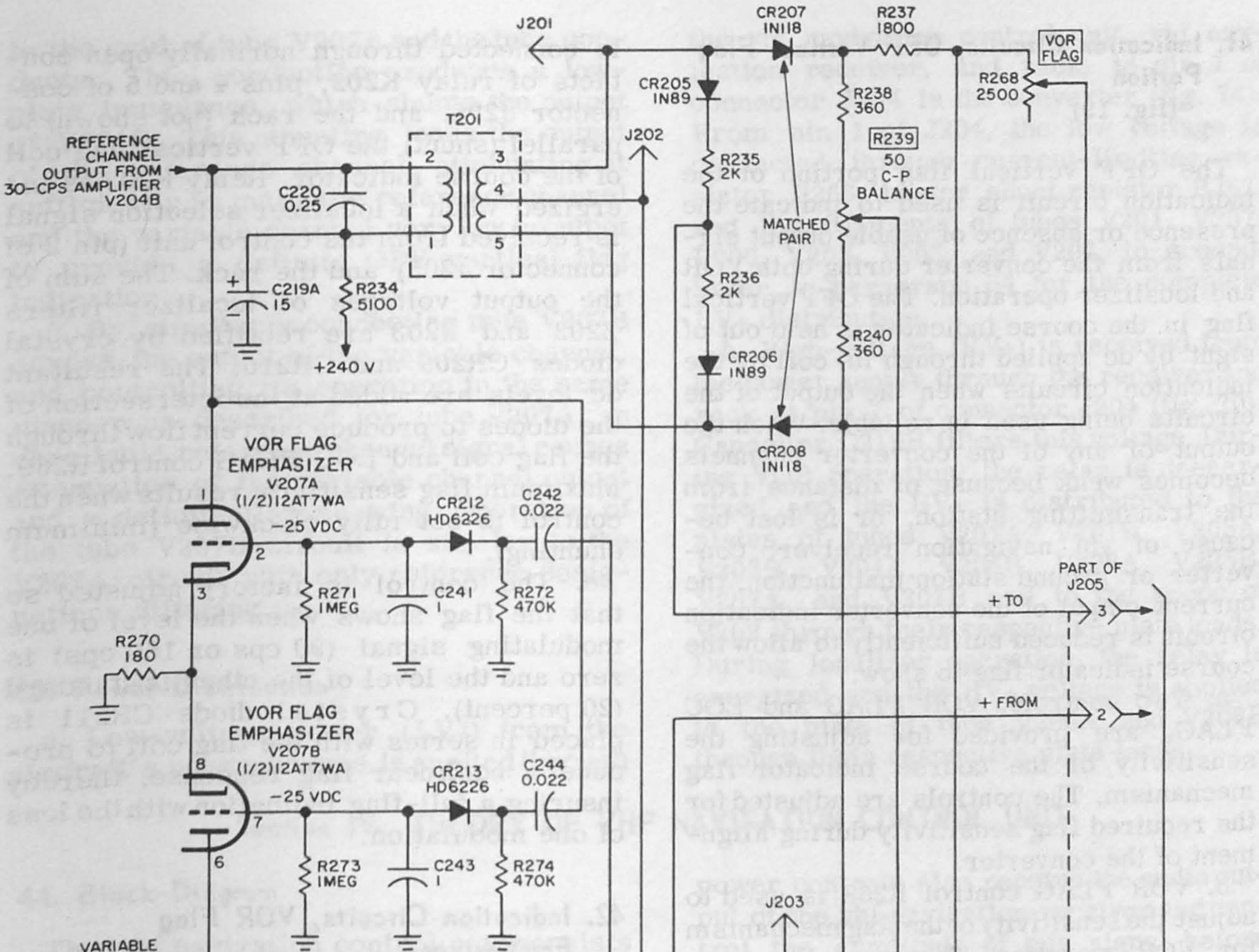



*Figure 19. Indication circuits, simplified partial diagram.*

## 41. Indication Circuits, OFF Vertical Flag Portion
(fig. 19)

The OFF vertical flag portion of the indication circuit is used to indicate the presence or absence of usable output signals from the converter during both VOR and localizer operation. The OFF vertical flag in the course indicator is held out of sight by dc applied through its coil by the indication circuits when the output of the circuits being used is reliable. When the output of any of the converter channels becomes weak because of distance from the transmitting station, or is lost because of vhf navigation receiver, converter or ground station malfunction, the current output of the converter indication circuit is reduced sufficiently to allow the course indicator flag to show.

*a.* Two controls, VOR FLAG and LOC FLAG, are provided for adjusting the sensitivity of the course indicator flag mechanism. The controls are adjusted for the required flag sensitivity during alignment of the converter.

*b.* VOR FLAG control R268 is used to adjust the sensitivity of the flag mechanism for VOR operation. The control is connected through the normally closed contacts of relay K202, pins 4 and 5 of connector J205, and the rack (not shown) to parallel the flag coil of the course indicator. The control functions as a variable shunt across the coil. The sum of the outputs of VOR reference channel transformer T201 and VOR variable channel transformer T202 is applied to this parallel circuit, producing a current flow through it.

*c.* Maximum flag sensitivity results when VOR FLAG control R268 is set fully clockwise. The control is factory adjusted so that part of the flag shows when the level of both the reference and variable channel modulating signals is 15 percent (one-half standard value). Resistor R237, in series with R268 and the coil of the flag, is used as a current-limiting device.

*d.* LOC FLAG control R269 is used to adjust the sensitivity of the flag mechanism for localizer operation. The control is connected through normally open contacts of relay K202, pins 4 and 5 of connector J205, and the rack (not shown) to parallel (shunt) the OFF vertical flag coil of the course indicator. Relay K202 is energized when a localizer selection signal is received from the control unit (pin 2 of connector J205) and the rack. The sum of the output voltages of localizer filters Z202 and Z203 are rectified by crystal diodes CR209 and CR210. The resultant dc levels are added at the intersection of the diodes to produce current flow through the flag coil and LOC FLAG control R269. Maximum flag sensitivity results when the control is set fully clockwise (minimum shunting).

*e.* The control is factory adjusted so that the flag shows when the level of one modulating signal (90 cps or 150 cps) is zero and the level of the other is standard (20 percent). Crystal diode CR211 is placed in series with the flag coil to produce a nonlinear flag response, thereby insuring a full-flag indication with the loss of one modulation.

## 42. Indication Circuits, VOR Flag Emphasizer

The VOR flag-emphasizer circuit is used to provide a definite flag indication when either the VOR reference channel or VOR variable channel output signal is unreliable. This circuit consists of a twin triode used essentially as two identical switches. The sections of the triodes are cross-connected between the VOR reference channel and VOR variable channel output circuits.

*a.* In normal operation, the VOR variable channel output voltage from tube V201B (fig. 19) is coupled by capacitor C242, developed across resistor R272, rectified by crystal diode CR212, and filtered by capacitor C241 and resistor R271. The resultant dc voltage (-25 volts) is applied to the control grid of tube V207A to hold the tube at cutoff. At cutoff, the plate impedance is essentially infinite and does not shunt the output of tube V204B. If the variable signal output drops below a usable level, the cutoff bias is not applied to the grid of tube V207A and the tube conducts. This conduction produces a low-plate impedance, which shunts the output of V204B. This shunting loads the output of the reference channel, attenuating it sufficiently to make the reference channel and the variable channel very low in output to provide a definite OFF vertical flag indication.

*b.* By similiarly connecting tube V207B across the output of the variable channel, and controlling its operation in the same manner as described for tube V207A, an unreliable reference channel signal causes attenuation of the variable channel output and a definite flag showing. Operation of the tube V207B circuit is similar to the V207A circuit with only reference designations differing.

### 43. Power Distribution

*a.* Low-voltage power (LV+) from the aircraft's power source is applied through the vhf navigation control unit, vhf navigation receiver, and rack, to pin 1 of connector J204 in the converter (fig. 74). From pin 1 of J204, the low voltage is connected through current-limiting resistor R266, heater shunt resistor R267, and the filaments of tubes V201, V207, V206, V203, V205, and V204, to ground. Refer to paragraph 54 for the complete LV+ distribution.

*b.* High-voltage (HV+) is received from the power supply through the receiver and rack at pin 7 of connector J204 (fig. 70). Capacitor C219B filters this voltage. During VOR operation, the relay is deenergized and the HV+ is distributed to the plates of tubes V201A, V201B, V203A, V203B, V204A, V204B, V205A, V205B, V207A, and V207B and to the anode of V202 through their respective plate loads. During localizer operation, the relay is energized and the HV+ voltage is applied to the plate of tube V206A and V206B through their respective plate loads.

## Section IV. THEORY OF VHF NAVIGATION CONTROL UNIT

### 44. Block Diagram

The vhf navigation control unit consists of three basic functioning groups: the audio and power controls (fig. 20), which control the distribution of primary power and the level of the signals applied to the aircraft intercommunication system by the vhf navigation set; megacycle channel selection switch S1A, which produces megacycle channel selection outputs; and fractional megacycle channel selection switch S1B, which produces fractional megacycle channel selection outputs and an indication of the mode (VOR or localizer) in which the vhf navigation set is operating. For complete circuit details, refer to the overall schematic diagram (fig. 61).

*a.* The audio and power controls (fig. 20) receive low voltage (LV+) from the aircraft primary power source. When the switch portion of the VOL-OFF control knob on the vhf navigation control unit is operated to their on positions, LV+ voltage is applied as a power relay voltage to the vhf navigation receiver. The audio and power controls also receive the audio output of the vhf navigation receiver and control the amplitude of this signal before distributing it to the aircraft intercommunication system. Illumination for the controls and indicators of the vhf navigation control unit are supplied by lamps which operate as the result of a panel light control lever from the aircraft panel light control system.

*b.* Positioning of megacycle channel selection switch S1A establishes ground and insulated-from-ground interconnections of megacycle channel selection lines MC1 through MC5. These lines are connected to the vhf navigation receiver. In the vhf navigation receiver, they tune the receiver to the selected whole-megacycle frequency.

*c.* Positioning of fractional megacycle channel selection switch S1B performs the same function for the fractional megacycle frequencies as megacycle channel selection switch S1B performs for megacycle frequencies. The output lines, in the case of fractional megacycle frequency selections, are described as fractional MC1 through fractional MC5. When the fractional megacycle frequency selection is for a localizer frequency, as opposed to a VOR frequency, an LV+ in signal from the vhf navigation receiver is applied to the converter as a localizer selection signal.

### 45. Audio and Power Controls

*a.* Clockwise rotation of the control knob of R1 on the vhf navigation control unit (fig. 61) closes switch S3. Closing this switch connects the LV+ source line at pin A of connector J2 to the power relay line at pin F of the connector. The power relay line applies the 28-volt low voltage to the vhf navigation receiver to permit distribution of LV+ to the filaments of the vhf navigation receiver, the rack, the converter, and the power supply.

*b.* Further rotation of the VOL-OFF knob operates potentiometer R1, determining the amount of resistance placed in series with the audio input at pin B of connector J2 and the audio output at pin E of the same connector. As clockwise rotation is continued, the amount of resistance decreases, producing greater signal strength in the audio signals applied to the aircraft intercommunication system.

*c.* Operation of SQUELCH control R2 determines the amount of resistance between ground and the squelch line connected at pin F of connector J1. This control quiets the receiver during no-signal conditions (para 19). The ground at pin G of connector J1 makes connection with the vhf receiver's local SQUELCH control to permit utilization of that control if certain wiring changes are to be made as authorized by applicable Modification Work Order (MWO).

*d.* The VOL-OFF, SQUELCH, and channel selection controls and the MC dials on the vhf navigation control unit are illuminated by panel lamps DS1 and DS2. These lamps are powered by a panel lights control line which is connected to the aircraft panel lights control during installation.

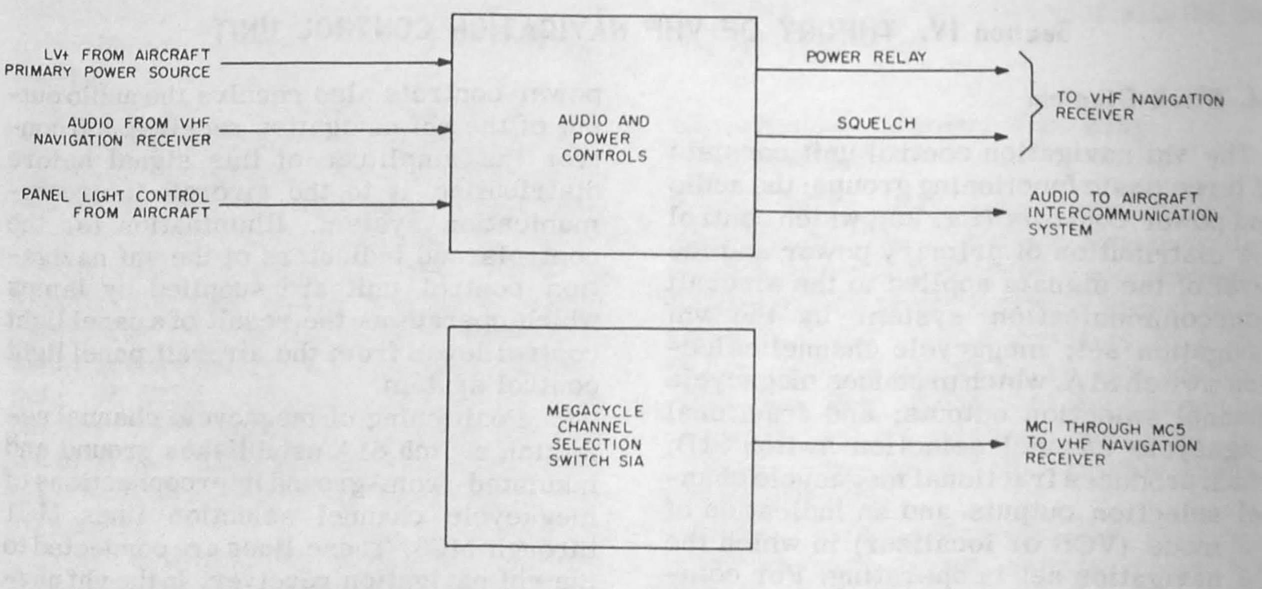



*Figure 20. Vhf navigation control unit, functional block diagram.*

## 46. Megacycle Channel, Selection Switch S1A

Positioning of megacycle channel selection switch S1A (fig. 61) causes the MC1 through MC5 lines at pins H through L of connector J1 to produce combinations of grounds and/or shorted, but insulated-from-ground, wire pairs. The particular combination produced at any given time causes the vhf navigation receiver to tune to the whole-megacycle frequency determined by the positioning of the switch. This frequency is displayed on a MC dial which is located on the outer portion of the switch. For a complete discussion of the operation of this switch, in combination with the circuits of the vhf navigation receiver, refer to paragraph 8.

## 47. Fractional Megacycle Channel Selection Switch S1B

*a.* Positioning of fractional megacycle channel selection switch S1B (fig. 61) causes fractional MC1 through fractional MC5 lines at pins N through R of connector J2 to produce a combination of grounds and/or shorted, but insulated-from-ground, wire pairs. The combination produced causes tuning of the vhf navigation receiver to fractional megacycle frequencies within the whole-megacycle frequency range selected by megacycle frequency selection switch S1A (para 46). The fractional megacycle frequency is displayed on a MC dial which is located on the outer portion of switch S1B. For a complete discussion of the operation of this switch, in combination with the circuits of the vhf navigation receiver, refer to paragraph 12.

*b.* When the position of the fractional megacycle frequency selection switch corresponds to a localizer frequency, the LV+ in level at pin M of connector J1 is connected through the switch and insulated from ground to the localizer selection line at pin H of connector J2. This line is connected through the rack to the converter to permit selection of the appropriate portion (VOR or localizer) of the converter.

# Section V. THEORY OF MINOR UNITS

## 48. Antenna

*a.* The vhf navigation set antenna (TM 11-5826-215-12) is mounted on the aircraft surface to detect the electromagnetic radiation produced by vhf transmitters. Antenna outputs are applied to an input tuning circuit associated with rf cascode amplifiers A1V1 and A1V2 in the vhf navignation receiver (para 6). The antenna consists of two broad-band dipole antennas. The forward dipole of the ramshorn V-type assembly is for use with glide-slope receivers when such equipment is installed in the aircraft. The angular rear dipole antenna is tuned to the frequencies produced by VOR and localizer stations.

*b.* The two antennas are terminated in individual UG-291/U connectors located in the base of the antenna pedestal. Both antennas are set in a rubber block which, in turn, is fastened to an aluminum support.

## 49. Course Indicator

The course indicator (TM 11-5826-215-12) provides displays that indicate the bearing of the aircraft relative to a VOR station, whether the aircraft is flying to or from a transmitter, whether an aircraft is to the right or left of the centerline of a localizer beam, and whether signals received from a vhf transmitter are of sufficient strength to permit correct interpretation.

*a.* The resolver in the course indicator (fig. 40) establishes a desired phase shift in the (VOR) reference channel output of the converter. An explanation of the operation of the resolver is contained in paragraph 32. Resistor R1601 (fig. 62), connected at pin P of connector J1601, is a current-limiting resistor for the rotor of the resolver. The ground return for the resolver rotor is at pin 0 of the connector. Stators S1 and S2 are connected at pins L and N of the connector. A common ground return for them is provided at pin K of the connector.

*b.* The coil connected across pins I and J of connector J1601 is associated with the TO-FROM meter. When the signal at pin J is larger than the signal at pin I, a FROM indication is seen in the course indicator window. Conversely, when the signal at pin I is larger, a TO indication is seen. The circuits producing deflection of this meter are described in paragraph 40.

*c.* The coil connected across pins G and H is associated with the operation of a glide-slope indicator which may be used with the course indicator of the vhf navigation set.

*d.* The coil connected across pins E and F of connector J1601 is associated with the OFF vertical flag. During operation in which the received signal at the input of the vhf navigation set is of sufficient amplitude to permit display of its significance, a potential (para 41) appears across the coil. This potential, positive at pin E with respect to pin F, causes deflection of the associated meter so that the OFF indication is not visible. If the signal does not have sufficient strength, the potential does not appear across the coil, the meter does not deflect, and the OFF indication is visible.

*e.* The coil connected across pins C and D of connector J1601 is associated with the horizontal pointer meter. This meter is used for glide-slope operation.

*f.* The coil connected across pins A and B of connector J1601 is associated with the vertical pointer meter. This meter deflects to indicate whether the aircraft is to the right or left of the centerline of localizer beams or the bearing selected by positioning of the course selector knob (resolver rotor) of the course indicator. If the potential (para 39) at pin A is larger than the potential at pin B, the pointer deflects into the yellow portion of the associated meter face to indicate that the aircraft is to the right of the chosen bearing or localizer center. If the potential at B is larger, the pointer deflects into the yellow area to indicate that the aircraft is to the left. If the potentials at the two pins are equal, the pointer centers indicating that the aircraft is on-course.

## 50. Rack

*a.* The rack serves as a support for the vhf navigation receiver and converter and contains shunt resistors for the meters in the course indicator and some power control circuits.

*b.* Resistors R301 and R302 (fig. 75) in the rack electronic circuits serve as shunt resistors for the course indicator vertical pointer meter. If more than one course indicator is used, one of these shunt resistors must be disconnected. Capacitor C301 provides a smoothing action for the meter coil, protecting it from rapid changes. Resistors R303 and R304 and capacitor C302 duplicate, for the OFF vertical flag, the functions provided for the vertical pointer by resistors R301 and R302 and capacitor C301.

*c.* Filter network Z301 attenuates unwanted frequencies in the audio line. Relay K301 is energized when the VOL-OFF control on the vhf navigation control unit is placed in the on position. Energizing the relay causes low voltage (LV+) to be applied from the aircraft primary power source to the vhf navigation receiver. Capacitor C303 smoothes the operation of the TO-FROM meter in the course indicator.

## 51. Mounting

The mounting (TM 11-5826-215-12) provides a shock-mounted support for the rack. During installation, ground straps on the rack are connected to the mounting which, in turn, is connected to the aircraft surface. As a result, the mounting provides a source of *frame* ground for the equipment.

## 52. Power Supply

The theory of operation for the power supply is contained in TM 11-5826-220-35.

## Section VI. INTERUNIT CIRCUIT DETAILS

### 53. Extent of Instructions

*a.* Interunit theory covers the interrelations of the several units in the various operation of the vhf navigation set.

*b.* Detailed circuit theory of individual units is discussed in the preceding sections of this chapter. This section covers only those circuits which are contained in more than one unit; that is, the low-voltage power control and distribution circuit (para 54) and the mode selection circuit (para 55). The interconnection diagram (fig. 76) shows all connections between vhf navigation set units.

### 54. Low-Voltage Power Control and Distribution
(fig. 21)

*a.* Low-voltage power used in the vhf navigation set is obtained from the aircraft's 28-volt primary power source. Application and distribution of this power is controlled by separate units of the vhf navigation set.

*b.* The input low-voltage power (LV+) from the aircraft's power source is applied at pins A and B of connector J305 in the rack. The powerlines are connected through the rack to be taken at pins A and D of connectors J304 and ARC-14050. The output of the rack, designated as LB+ source and ground, is applied to pins A and D of connector J2 of the vhf navigation control unit.

*c.* In the vhf navigation control unit, the LV+ source line is applied to the contact of the switch S3 portion of the OFF-VOL control. When the switch S3 portion is operated to its on position, the LV+ source line is applied to relay K304 in the rack as a power relay line. This line is connected through pin F of vhf navigation control unit connector J2 and pin F of rack connector J304 through the cable interconnecting the vhf navigation control unit and the rack.

*d.* Application of voltage to relay K304 closes the relay contacts and connects the low-voltage supply to the converter, vhf navigation receiver, and power supply.

*e.* The LV+ applied to the converter is taken from the closed contacts of relay K304 and applied to pin 1 of connector J302. Pin 1 of connector J302 on the rack plugs into terminal 1 of connector J204 in the converter. In the converter, the LV+ line is connected to the heaters of the converter tubes (para 43*a*). The ground return for the heaters is connected through terminal 6 of connector J204 and pin 6 of connector J302.

*f.* Low voltage for the vhf navigation receiver is connected through pin 6 of connector J301 on the rack, and terminal 6 of connector J4 on the vhf navigation receiver. The 1 and 3 terminations of these two connectors provide two ground returns for the supply. The LV+ line is bypassed by capacitor C40 and then distributed as follows:

(1) To the power supply for production of high voltage (HV+) through pin 2 of connector J3 on the vhf navigation receiver and terminal 2 of connector J101 on the power supply. The ground return is provided by the corresponding pin and terminal 1.

(2) To the vhf navigation receiver heaters (para 22*a*) through filter circuit L2 and C35C.

(3) To the mode selection circuits through the interunit connection provided by pin 14 of connectors A2J1 and A1P1 (para 55).

(4) To tuning circuit A3 assembly relays (para 8) through pin 10 of connectors A2J1 and A1P1.

(5) To terminal D of connector J3 of the vhf navigation receiver. This connector pin can be left open, or, in those cases in which a vhf communication transmitter is used with the vhf navigation receiver for communication purposes, it can be connected to the vhf communication transmitter LV+ load.

### 55. Mode Selection Circuits
(fig. 22)

*a.* The mode selection circuits are used

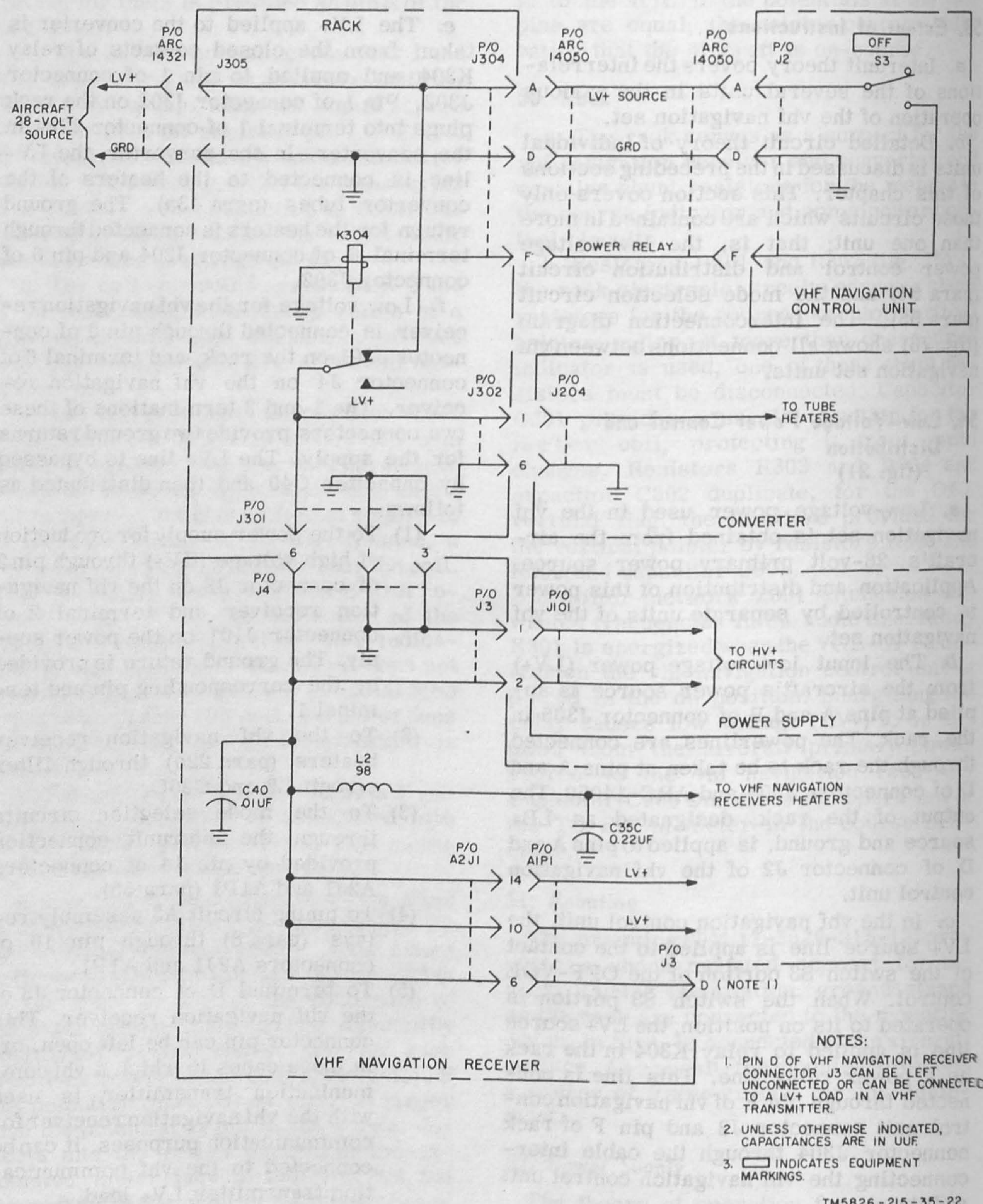



*Figure 21. Low-voltage power control and distribution.*

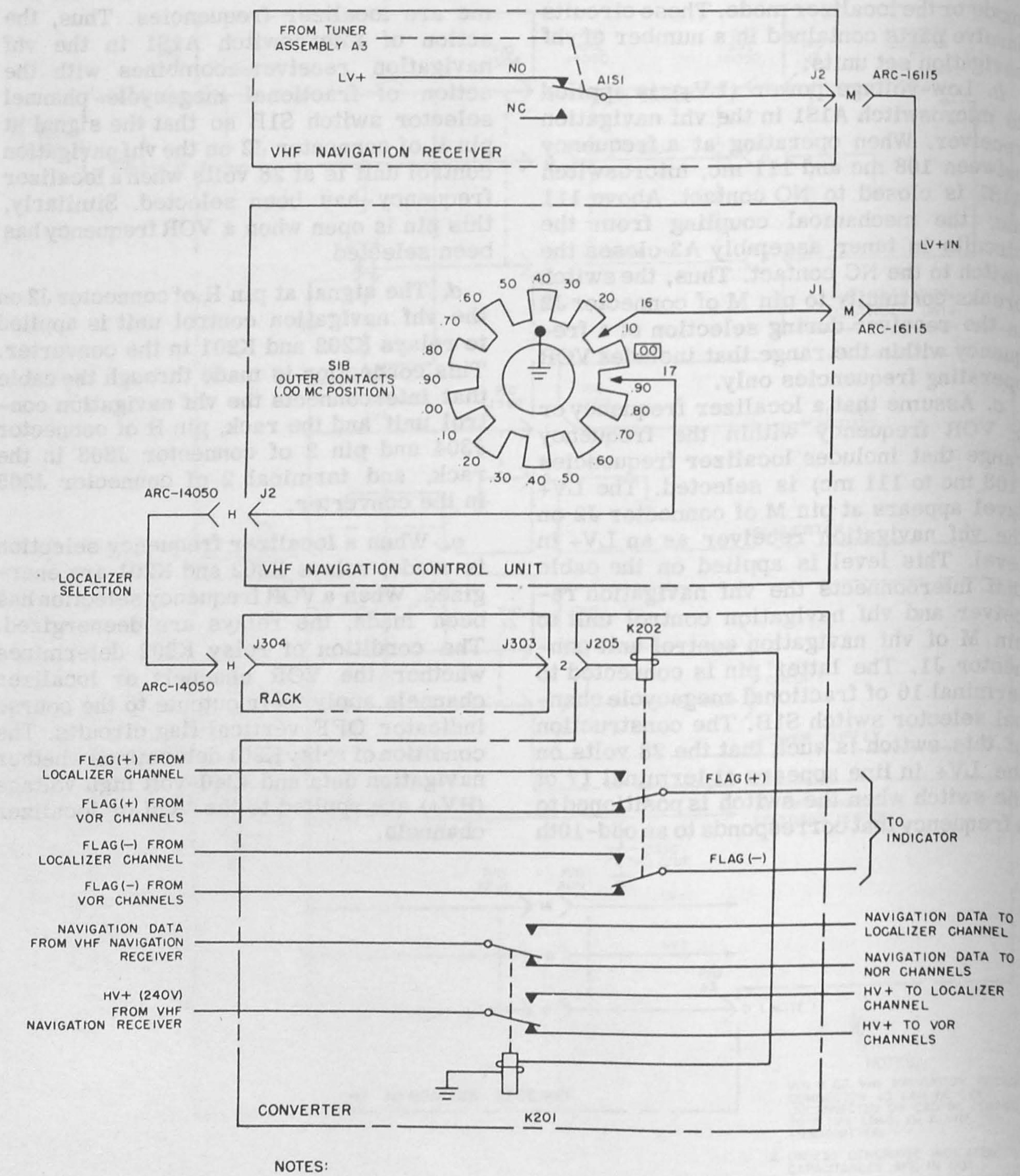
to determine whether the vhf navigation set is to be used in the VOR (omni) navigation mode or the localizer mode. These circuits involve parts contained in a number of vhf navigation set units.

*b.* Low-voltage power (LV+) is applied to microswitch A1S1 in the vhf navigation receiver. When operating at a frequency between 108 mc and 111 mc, microswitch A1S1 is closed to NO contact. Above 111 mc, the mechanical coupling from the circuits in tuner assembly A3 closes the switch to the NC contact. Thus, the switch breaks continuity to pin M of connector J2 in the receiver during selection of a frequency within the range that includes VOR operating frequencies only.

*c.* Assume that a localizer frequency or a VOR frequency within the frequency range that includes localizer frequencies (108 mc to 111 mc) is selected. The LV+ level appears at pin M of connector J2 on the vhf navigation receiver as an LV+ in level. This level is applied on the cable that interconnects the vhf navigation receiver and vhf navigation control unit to pin M of vhf navigation control unit connector J1. The latter pin is connected to terminal 16 of fractional megacycle channel selector switch S1B. The construction of this switch is such that the 28 volts on the LV+ in line appears at terminal 17 of the switch when the switch is positioned to a frequency that corresponds to an odd-10th megacycle (0.10, 0.30, 0.50, etc). Odd-10th frequencies between 108 mc and 111 mc are localizer frequencies. Thus, the action of microswitch A1S1 in the vhf navigation receiver combines with the action of fractional megacycle channel selector switch S1B so that the signal at pin H of connector J2 on the vhf navigation control unit is at 28 volts when a localizer frequency has been selected. Similarly, this pin is open when a VOR frequency has been selected.

*d.* The signal at pin H of connector J2 on the vhf navigation control unit is applied to relays K202 and K201 in the converter. This connection is made through the cable that interconnects the vhf navigation control unit and the rack, pin H of connector J304 and pin 2 of connector J303 in the rack, and terminal 2 of connector J205 in the converter.

*e.* When a localizer frequency selection is made, relays K202 and K201 are energized. When a VOR frequency selection has been made, the relays are deenergized. The condition of relay K202 determines whether the VOR channels or localizer channels apply their outputs to the course indicator OFF vertical flag circuits. The condition of relay K201 determines whether navigation data and +240-volt high voltage (HV+) are applied to the VOR or localizer channels.




NOTES:

1. FREQUENCY MARKINGS APPEAR ON MC DIALS LOCATED ON PERIPHERY OF SWITCH SIA AND SIB DRUMS. MARKING SHOWN IN BOX (▭) IS MARKING THAT IS VISIBLE WITH SWITCH IN POSITION SHOWN.
2. PINS M OF J1 AND H OF J2 ON CONTROL UNIT.

TM5826-215-35-23

*Figure 22. Mode selection circuits.*

# CHAPTER 2
# TROUBLESHOOTING

## Section I. GENERAL TROUBLESHOOTING TECHNIQUES

***Warning:*** **When servicing the vhf navigation set, be extremely careful. High voltages of 240, 250, and 260 volts are contained in the vhf navigation receiver, converter, rack, and power supply.**

### 56. General Instructions

The field and depot maintenance procedures in this manual *supplement* the procedures described in the operator's and organizational maintenance manual (TM 11-5826-215-12). The systematic troubleshooting procedure, which begins with the operational and sectionalization checks that can be performed at an organizational level, is carried to a higher level in this manual. Section II provides interunit troubleshooting procedures to be performed by field maintenance facilities; section III through VII describe *intraunit* (within the unit) field maintenance localizing and isolating procedures. Troubleshooting for the power supply is described in TM 11-5826-220-35.

### 57. Organization of Troubleshooting Procedures

*a. General.* The first step in servicing a defective vhf navigation set is to sectionalize the fault. Sectionalization means tracing the fault to a major component such as the converter or course indicator. The second step is to localize the fault. Localization means tracing the fault to a defective part, such as a resistor or tube, responsible for the abnormal condition. Some faults, such as burned-out resistors, arcing and shorted transformers can often be located by sight, smell, and hearing. The majority of faults, however, must be isolated by checking voltages and resistances.

*b. Sectionalization.* Listed below is a group of tests arranged to reduce unnecessary work, and to aid in tracing trouble in a defective vhf navigation set. The first step is to locate the unit or units at fault by the following methods:

(1) *Visual inspection.* The purpose of visual inspection is to locate faults without testing or measuring circuits. All meter indications (or absence of indications), frequency readings, or other visual sights should be observed and an attempt made to sectionalize the fault to a particular unit.

(2) *Operational tests.* Operational tests frequently indicate the general location of trouble. In many instances, the tests will help in determining the exact nature of the fault. The operator's checks and equipment performance checklist (TM 11-5826-215-12) are good operational tests. Additional operational tests are given in paragraph 59.

(3) *Interunit troubleshooting chart.* When troubles are detected during performance of the operational tests described in (2) above, or during any other procedure that does not identify the faulty unit, the symptom observed should be referenced in the interunit troubleshooting chart (para 60). This chart will aid in sectionalizing the trouble to a specific vhf navigation set unit.

*c. Localization.* The tests listed below can aid in isolating troubles. First, localize a trouble to a single stage or circuit, and then isolate the trouble within that circuit by voltage, resistance, and continuity measurements. Use the following methods of trouble localization:

(1) *Voltage and resistance measurements.* These measurements will help locate the individual component part at fault. Use resistor and capacitor color codes (fig. 59 and 60) to find the value of the components. Use voltage and resistance diagrams (fig. 37 and 72) to find normal readings and compare them with readings taken.

(2) *Troubleshooting chart.* The trouble symptoms listed in the chart contained in each of the following sections of this chapter will aid in localizing trouble to a component part.

(3) *Stage-gain chart.* Stage-gain charts (para 65) will help to locate hard-to-find troubles in the individual stage or circuit of the vhf navigation receiver.

(4) *Intermittent troubles.* In all these tests, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble may often be made to appear by tapping or jarring the equipment. Check the wiring and connections to the units of the set.

(5) *Signal substitution.* Signal substitution (para 64 and 71) procedures enable the repairman to localize a trouble quickly to a stage. An rf signal generator, audio oscillator, and if. signal generator are units of test equipment that may be used in signal substitution procedures.

### 58. Tools, Test Equipment, and Materials Required for Troubleshooting

*a. Tools Required.* The tools required are contained in Tool Kits TK-87/U and TK-88/U.

*b. Test Equipment Required.* The following chart lists test equipment required for troubleshooting the vhf navigation set. Also listed are the associated technical manuals and the assigned common names.

| Test equipment | Technical manual | Common name |
|---|---|---|
| Audio Oscillator TS-382/U. | TM 11-2684A | Audio oscillator |
| Multimeter ME-26B/U. | TM 11-6625-200-12 | Multimeter |
| Signal Generator AN/URM-25. | TM 11-5551 | AN/URM-25 |
| Signal Generator AN/USM-44. | | AN/USM-44 |
| Signal Generator SG-66/ARM-5. | TM 11-518 | Test set generator |
| Power Supply PP-1104A/G. | TM 11-5126 | Test power supply |
| Test Set, Electron Tube TV-7/U. | TM 11-6625-274-12 | Tube tester |
| Frequency Meter AN/URM-32 | TM 11-5120 | Frequency meter |
| Headset HS-33.... | | Headset |

*c. Materials Required.*

(1) Resistor, fixed, 300-0hm, 1 watt.

(2) Cleaning Compound (Federal stock No. 7930-395-9542).

(3) Grease, Aircraft and Instrument (GL).

## Section II. INTERUNIT TROUBLESHOOTING

### 59. Operational Tests

*a. General.* Troubles in the vhf navigation set will normally be detected during operator or organizational maintenance tests, equipment performance checks, or normal operation. When a failure symptom has been noted as the result of these procedures, refer to the interunit troubleshooting chart (para 60). If, however, a vhf navigational set is known to be defective, but the trouble symptoms are unknown, perform the operational tests described in *b* and *c* below. If the specified results are not obtained during any step of these procedures, refer to the symptom column of the interunit troubleshooting chart to determine the sectionalization procedure to be followed. When the defective unit has been determined, refer to the appropriate section for the localization and isolation procedure.

*b. Preliminary.*

(1) Remove the top cover, bottom, and sideplates from the vhf navigation

receiver by removing the four screws on the top cover, the four screws on the bottom plate, and the eleven screws on the sideplate.

(2) Remove the top cover and bottom plate from the converter by removing the fourteen screws on the bottom plate and the four screws on the top plate.

(3) Connect the equipment as shown in figure 71.

(4) Connect the headset between pin D and pin E of connector J2 on the vhf navigation control unit.

(5) Energize the test power supply (TM 11-5126) and the test set generator (TM 11-518).

(6) Set up the multimeter to measure 30 volts dc. Connect the positive lead of the multimeter to pin A of J305 (on the rack), and the negative lead to pin B of J305.

c. *Procedure.*

(1) Adjust the test power supply to produce a 28-volt reading on the multimeter. Check the dc ammeter on the test power supply for excessive current output (7-amperes or more).

*Caution:* **Stop the test immediately if the dc ammeter on the test power supply indicates excessive current.**

(2) Allow a 15-minute warmup period. During the warmup period, check the vhf navigation receiver and converter for lighted tube filaments and the vhf navigation control unit for lighted panel lamps. Check all components for overheated parts.

(3) Unscrew the cover from connector A1J3 on the front panel of the vhf navigation receiver.

(4) Set up the multimeter to measure 300 volts dc. Connect the multimeter between ground negative and the jumper between pins E and A on plug A1P6 (the plug connected to jack A1J3 on the vhf navigation receiver). The multimeter should indicate 260 ±10 volts dc. Compare the reading in the frequency window on the right-hand side of the vhf navigation receiver with the reading on the MC dials of the vhf control unit. The frequency window readings should coincide with the MC dial readings.

(5) Adjust the test set generator controls as outlined in TM 11-518, and then set the controls as follows: OMNI TRACK to 0°, MC to position B (114.9 mc), FUNCTION to OMNI, and ATTENUATOR to 2.5 microvolts.

(6) Set the vhf navigation control unit megacycle and fractional megacycle channel selector switches to 114.90 mc.

(7) Set the SQUELCH control, on the vhf navigation control unit, maximum counterclockwise.

(8) Turn the VOL-OFF switch and control knob clockwise until the signal is clearly audible on the headset. Tap the receiver and listen to the signal.

(9) Set the ATTENUATOR control of the test set generator to 5K microvolts.

(10) Set the course selector knob on the course indicator to the position that points the course pointer on the course indicator to 0°. On the course indicator, the vertical pointer should center, the OFF vertical flag should not be visible, and the TO-FROM meter should indicate TO.

(11) Observe the vertical pointer on the course indicator, while slowly decreasing the test set generator output to 5 microvolts. The vertical pointer should not move out of the circle in the center of the course indicator, and the course indicator OFF vertical flag should remain hidden.

(12) Replace the "B" crystal (114.9 mc) in the test set generator with a 110.8-mc crystal, set the vhf navigation control unit channel selector switches to 110.8 mc and repeat the procedure given in (9), (10), and (11) above.

(13) Set the test set generator MC switch to A (110.9 mc), the FUNCTION switch to the AMP LOC pointer centered position, and the ATTENUATOR control to 5K microvolts.

(14) Set the vhf navigation control unit channel selector switches to 110.90 mc. The OFF vertical flag on the course indicator should not be visible, and the vertical pointer should center.

(15) Observe the vertical pointer on the course indicator, while slowly decreasing the test set generator output to 5 microvolts. The vertical pointer should not move out of the circle in the center of the course indicator, and the course indicator OFF vertical flag should remain hidden.

(16) Set the FUNCTION switch on the test set generator to the AMP LOC pointer left position.

(17) Set the ATTENUATOR control to 500 microvolts. The vertical pointer on the course indicator should swing to within one pointer width of the outer edge of the yellow sector.

(18) Rotate the SQUELCH control on the vhf navigation control unit maximum counterclockwise.

(19) Decrease the test set generator output until the vhf navigation receiver is muted. At this point, the output indicated on the ATTENUATOR dial should be between 2 and 3 microvolts.

(20) Deenergize all equipment.

## 60. Interunit Troubleshooting Chart

Unless trouble has already been localized, perform the operations given in the equipment performance checklist (TM 11-5826-215-12) before using this chart. Connect the equipment as shown in figure 71. For location of component parts, refer to figures 23 through 42.

*Caution:* **For all resistance measurements and continuity checks, make sure that the test power supply is disconnected and all filter capacitors are discharged.**

| Item | Symptom | Probable cause | Sectionalization procedure |
|---|---|---|---|
| 1 | Test power supply draws excessive current when 28 volts is applied to vhf navigation set.<br>*Note.* When test power supply is used, excessive current drain will be indicated by a high (7 amperes or more) dc ammeter reading or by tripping of the test power supply circuit breaker. | Defective test power supply, vhf navigation receiver, converter, vhf control unit, or rack. | *a.* Disconnect the test power source from the vhf navigation receiver; apply low-voltage input power again. If current drain is reduced, replace test power supply; if not, perform *b* below.<br>*b.* Reconnect the test power supply supply to the vhf navigation receiver and disconnect the converter from the rack. Apply low-voltage input power again. If current drain is reduced, replace the converter; if not, perform *c* below.<br>*c.* Reconnect the converter to the rack and disconnect the vhf navigation receiver from the rack. Apply low voltage again. If current drain is reduced, replace the vhf navigation receiver; if not, perform *d* below.<br>*d.* Reconnect the vhf navigation receiver to the rack and disconnect the cable at connector J2 of the vhf navigation receiver. Apply low-voltage power again. If current drain is reduced, replace the vhf navigation control unit; if not replace the rack. |

| Item | Symptom | Probable cause | Sectionalization procedure |
| --- | --- | --- | --- |
| 2 | No audio is heard on aircraft intercommunication system for any VOR or localizer channel or no audio is heard on headset during operational test (para 59). | Defective vhf navigation receiver, vhf control unit, cabling, rack, or power supply. | *a*. Change settings of megacycle channel selector switch and fractional megacycle channel selector switch on the vhf navigation control unit to frequency of another vhf station. If audio is heard on second vhf station, perform *b* below; if not, perform *e* below<br>*b*. Remove the converter from the rack and check the frequency windows on the right side of the vhf navigation receiver. If the crystal drum frequency settings are the same as the vhf navigation control unit MC dial frequency setting, reconnect the converter and replace the vhf navigation receiver; if not, reconnect the converter and perform *c* below.<br>*c*. Use the multimeter (ohms scale) to check continuity at terminals H through L, and through R of connector J1 of vhf navigation control unit to insure that terminals are grounded or are shorted together (para 8*h*). If continuity measurements are incorrect, replace the vhf navigation control unit. If continuity measurements are correct, perform *d* below.<br>*d*. Use the multimeter (ohms scale) to check continuity of conductors in cable interconnecting the vhf navigation receiver and the vhf navigation control unit. If cable continuity is correct, replace the vhf navigation receiver; if not, repair or replace the cable.<br>*e*. Use the multimeter (ohms scale) to check continuity of cable interconnecting terminal E (not shown) of connector J2 on the vhf navigation control unit and the aircraft intercommunication system. If cable is defective, repair or replace as required; if good, proceed to *f* below.<br>*f*. Use the headset to check for audio across terminals B and C of connector J3 of the vhf navigation receiver. If audio is heard, perform *g* below; if not, perform *h* below.<br>*g*. Use the headset to check for audio across terminals B and D of connector J304 of rack. If audio is heard, replace the vhf navigation control unit; if not, replace the rack.<br>*h*. Check the course indicator to see if the OFF vertical flag is visible. If it is, replace the vhf navigation receiver; if not, use the multimeter (ohms scale) to |

| Item | Symptom | Probable cause | Sectionalization procedure |
| --- | --- | --- | --- |
| | | | check continuity of the antenna coaxial cable. If cable continuity is not present, repair or replace as required; if present, perform *i* below.<br>*i*. Check the antenna visually. If defective, replace; if not, perform *j* below.<br>*j*. Use the multimeter (+100 V dc scale) to check from the jumper between terminals E and A on plug A1P6 (A1J3) on the vhf navigation receiver to ground for the presence of +260 volts. If present, replace the vhf navigation receiver. If voltage is incorrect, replace power supply. If no voltage is correct, perform *k* below.<br>*k*. Use the multimeter (ohms scale) to check continuity from terminal A to terminal F of connector J2 on the vhf navigation control unit. If continuity is measured, perform *l* below; if not, replace the vhf navigation control unit.<br>*l*. Use the multimeter (+30 V dc scale) to check from terminal 1 of connector J302 of rack to ground for the presence of 28 volts. If 28 volts is not measured, replace the rack. If 28 volts is measured, perform *m* below.<br>*m*. Use the multimeter (+30 V dc scale) to check terminal 2 between connector A2J3 on the vhf navigation receiver and chassis ground for 28 volts. If 28 volts is measured, replace the power supply; if not, replace the vhf navigation receiver. |
| 3 | Audio is heard on aircraft intercommunication system (or on headset during operational test (para 59)), but on indicator: OFF vertical flag is visible, TO-FROM meter remains in neutral position, and vertical pointer does not deflect. | Defective vhf navigation receiver, rack, or converter. | *a*. Use the multimeter (ac scale) to check for voltage between terminal 4 of connector J4 of the vhf navigation receiver and chassis ground. If voltage is not measured, replace the vhf navigation receiver. If voltage is measured, perform *b* below.<br>*b*. Use the multimeter (ac scale) to check for voltage between terminal 2 of connector J302 of the rack and chassis ground. If voltage is measured, replace the converter; if not, replace rack. |
| 4 | VOR channel operation (A crystal operation during operational tests (para 59)) produces vertical pointer TO-FROM meter and OFF vertical flag deflections on the course indicator, but localizer channel operation (B crystal operation during operational tests) does not. | Defective vhf navigation receiver, vhf navigation control unit, or converter. | *a*. Set the megacycle channel selector switch and the fractional megacycle channel selector switch on the vhf navigation control unit so that the MC dials indicate the localizer frequency.<br>*b*. Use the multimeter (ohms scale) to check continuity from terminal M of connector J1 to terminal J2 of the vhf navigation con- |

| Item | Symptom | Probable cause | Sectionalization procedure |
|---|---|---|---|
| | | | trol unit. If continuity is measured, perform *c* below; if not, replace the vhf navigation control unit.<br>*c*. Adjust the output of the test set generator to produce the localizer frequency established in vhf navigation control unit (*a* above). Check to see that the test set generator output is connected to ANT connector J1 on the vhf navigation receiver; proto *d* below.<br>*d*. Use the multimeter (ac scale) to check for voltage between terminal 4 of connector J4 of the vhf navigation receiver and chassis ground. If voltage is measured, replace the converter; if not, replace the vhf navigation receiver. |
| 5 | Localizer channel operation (B crystal operation during operational tests (para 59)) produces vertical pointer and OFF vertical flag deflection on the course indicator, but VOR operation does not. | Defective converter ........... | Replace the converter. |
| 6 | No audio is heard on the aircraft intercommunication system and deflection of the course indicator meters is produced for one but not all frequencies of VOR or localizer operation. | Defective vhf navigation receiver. | Replace the vhf navigation receiver. |
| 7 | No audio is heard on the aircraft intercommunication system and no course indicator display is produced for a group of VOR and/or localizer frequencies. | Defective vhf navigation control unit or vhf navigation receiver. | *a*. Remove the converter and check frequency windows on right-hand side of the vhf navigation receiver. If crystal drum dials indicate the same frequency as the MC dials on the vhf navigation control unit for each position of the megacycle channel selector switch and the fractional megacycle channel selector switch, reconnect the converter and replace the vhf navigation receiver; if not, reconnect the converter and perform *b* below.<br>*b*. Perform continuity checks at terminals H through L, and N through R of connector J1 of vhf navigation control unit to insure that terminals are grounded or are shorted together (para 8*h*). If continuity measurements are correct, replace the vhf navigation receiver; if not, replace the vhf navigation control unit. |
| 8 | Noise level with no signal input cannot be adjusted by operation of SQUELCH control on the vhf navigation control unit. | Defective vhf navigation control unit or vhf navigation receiver. | *a*. Use the multimeter (ohms scale) to check resistance between terminals F and S of connector J1 on the vhf navigation control unit with the SQUELCH control in both extreme counterclockwise position and extreme clockwise position. In extreme |

| Item | Symptom | Probable cause | Sectionalization procedure |
|---|---|---|---|
| | | | counterclockwise position, resistance should be zero; in extreme clockwise position, resistance should be 100 kilohms. If either position is incorrect, replace the vhf navigation control unit. If both positions are correct, perform *b* below.<br>*b.* Use the multimeter (ohms scale) to check continuity of cable connector between terminal F of the vhf navigation control unit connector J1 and terminal F of the vhf navigation receiver connector J2. If continuity is measured, replace the vhf navigation receiver; if not, repair or replace cable. |
| 9 | TO-FROM meter on course indicator remains at neutral, although the OFF vertical flag is not in view during VOR operation (A crystal operation during operational tests (para 59)). | Defective course indicator or rack. | *a.* Use multimeter (ohms scale) to check resistance measurement between terminals I and J of connector J1601 on course indicator. If reading is between 262 and 412 ohms, perform *b* below; if not, replace course indicator.<br>*b.* Use the multimeter (ohms scale) to check continuity between terminals E and C of connector J306 of the rack. If continuity is indicated, replace the rack; if not, replace converter. |
| 10 | TO-FROM meter on course indicator does not produce correct deflection. | Defective course indicator or converter. | Use the multimeter (ohms scale) to check resistance measurement between terminals I and J of connector J1601 on the course indicato. If reading is between 262 and 412 ohms, replace converter; if not, replace the course indicator. |
| 11 | Vertical pointer does not deflect, but TO-FROM meter and OFF vertical flag operate properly and audio can be heard. | Defective rack, course indicator, or converter. | *a.* Use the multimeter (ohms scale) to check resistance measurement between terminals A and B of connector J1601 on the course indicator. If resistance is between 997 and 1,030 ohms, perform *b* below; if not, replace the course indicator.<br>*b.* Use the multimeter (ohms scale) to check for a short between terminals H and G on connector J306 of the rack. If short is measured, replace the rack; if not, replace the converter. |
| 12 | Vertical pointer produces incorrect deflection. | Defective rack, course indicator, or converter. | *a.* Use the multimeter (ohm scale) to check resistance measurement between terminals A and B of connector J1601 on the course indicator. If resistance is between 997 and 1030 ohms, perform *b* below; if not, replace the course indicator.<br>*b.* Use the multimeter (ohms scale) to check resistance between terminals H and G of connector J306 of the rack. If one course indicator is connect to the rack, resistance read should be 500 ohms. If two course indicators |

| Item | Symptom | Probable cause | Sectionalization procedure |
|---|---|---|---|
| | | | are connected to the rack, resistance read should be 1,000 ohms. If resistance read is correct, perform *c* below; if not, replace the rack.<br>*c*. Check the mechanical operation of the course indicator course selector knob and shaft. If operative, perform *d* below, if not, replace the course indicator.<br>*d*. Use the multimeter (ohms scale) to check resistance measurements between terminals K and L, K and N, and O and P of connector J1601 on the course indicator. If first two measurements are between 915 and 1,165 ohms and third measurement is between 2,350 and 3,200 ohms, replace the converter; if any resistance measurement is incorrect, replace the course indicator. |
| 13 | OFF vertical flag visible at all times although audio can be heard, vertical pointer deflects, and TO-FROM meter indicates TO and FROM during VOR operation. | Defective course indicator, rack, or converter. | *a*. Use the multimeter (ohms scale) to check resistance measurement between terminals F and E on connector J1601. If reading is between 997 and 1,030 ohms, perform *b* below; if not, replace the course indicator.<br>*b*. Use the multimeter (ohms scale) to check resistance measurement between terminals C and E of connector J304 on the rack. If reading is 500 ohms, replace the converter; if not, replace the rack. |

## Section III. TROUBLESHOOTING VHF NAVIGATION RECEIVER

**Caution:** Do not attempt removal or replacement of parts before reading the instructions in paragraphs 84, 85, and 89 through 92.

### 61. Checking Filament and B+ Circuits for Shorts

*a. When to Check.* When any of the following conditions apply, use the multimeter to check for short circuits and clear the troubles before applying power to the vhf navigation receiver.

(1) When the vhf navigation receiver is being serviced apart from the other units of the vhf navigation set and the nature of the abnormal symptoms is not known.

(2) When power supply troubles repeat after service of the power supply.

(3) When the test power supply draws excessive current during operational tests (para 59*b* and *c*).

(4) When the vhf navigation receiver is being returned to operation after servicing.

*b. Conditions for Tests.* Prepare for the short-circuit tests as follows:

(1) Remove the vhf navigation receiver from the rack (TM 11-5826-215-12).

(2) Remove the power supply from the rear of the vhf navigation receiver.

(3) Allow the vhf navigation receiver

to cool with no power applied for at least 15 minutes.

c. *Measurements.* Make the resistance measurements indicated in the following chart. If abnormal results are obtained, make the additional isolating checks outlined. When the faulty part is found, repair the trouble before applying power to the unit. The parts of the vhf navigation receiver are shown in figures 23 through 32.

Short-circuit tests

| Point of measurement | Normal indication | Isolating procedure |
| --- | --- | --- |
| From terminal 3(-) of connector A2J3 (fig. 28) to terminal 1(+) of connector A2J3. | Resistance reading of 100,000 ohms or more. | If resistance is zero, check for shorted filter capacitor A2C36 (fig. 23) or A2C35B or for short-circuited wiring associated with these capacitors, and with the jumper connected between terminals A and E of plug P6 in connector A1J3 (fig. 28).<br>If resistance is approximately 350 ohms, disconnect connector A2J1 from connector A1P1. Repeat repeat resistance measurement. If approximately 350 ohms is measured, check for shorted filter capacitor A2C33 (fig. 23) or short-circuited associated wiring. If, however, 100,000-ohm or greater resistance reading is obtained, check for shorted capacitors A1C47 (fig. 26), A1C12, A1C4A, A1C5A (fig. 27), A1C7, or short-circuited associated wiring.<br>If resistance is between 5,000 and 6,000 ohms, disconnect connector A1P1 from A2J1 (fig. 24). Repeat resistance measurement. If resistance is between 5,000 and 6,000 ohms, check for shorted capacitor A2C34 (fig. 23), A2C35A, A2C37, A2C12, A2C13, A2C14 (fig. 24), crystal diode A2CR6, or short-circuited wiring associated with these capacitors and diode. If, however, 100,000-ohm or greater resistance is measured, check for shorted capacitor A1C13 (fig. 26), A1C31, A1C34, A1C35 (fig. 27), or short-circuited wiring associated with these capacitors.<br>If resistance is between 7,000 and 8,000 ohms, disconnect connector A1P1 from connector A2J1 (fig. 24). Repeat resistance measurement. If resistance between 7,000 and 8,000 ohms is measured again, check for shorted capacitor A2C5 (fig. 25) or A2C8. If, however, 100,000-ohm or greater resistance is obtained, check for shorted capacitor A1C24 (fig. 28), A1C17, or short-circuited wiring associated with these capacitors.<br>If resistance is between 9,000 and 10,000 ohms, check for shorted capacitor A2C4 (fig. 25) or A2C7 or short-circuited wiring associated with these capacitors.<br>If resistance is between 25,000 and 35,000 ohms, check for shorted capacitor A2C11 (fig. 25), short-circuited wiring associated with this capacitor, or short from conductor to shield of coaxial cable at connector A1P5 (fig. 28).<br>If resistance is approximately 45,000 ohms, disconnect connector A1P1 from connector A2J1 (fig. 24). Repeat resistance measurement. If resistance of approximately 45,000 ohms is measured, check for shorted crystal diode A2CR4 (fig. 24), or short-circuited associated wiring. If, however, 100,000-ohm or greater resistance is obtained, check for shorted capacitor A1C38 (fig.28) or short-circuited associated wiring.<br>If resistance is approximately 50,000 ohms, check for shorted capacitor A1C27 or short-circuited wiring associated with this capacitor. |

| Short-circuit tests | | |
|---|---|---|
| Point of measurement | Normal indication | Isolating procedure |
| | | If resistance is approximately 80,000 ohms, check for shorted capacitor A2C26 (fig. 24) or short-circuited wiring associated with this capacitor. |
| From terminal 6(+) of connector A2J4 (fig. 23) to terminal 1(-) of connector A2J4. | Resistance reading of 80 ohms or more. | If resistance is zero, check for shorted capacitor A2C35 (fig. 23), A1C40 (fig. 26), A1C42, A1C43, A1C44, A1C39 (fig. 27), A1C46, A1C41 (fig. 29), A1C45, or short-circuited filament or LV+ wiring.<br>If resistance is less than 80 ohms, check for shorted tube filaments in tube A1V1 (fig. 72), A1V2, A1V3, A1V4, A1V5, A1V6, A1V7, A2V1, A2V2, A2V3, A2V4, A2V5, A2V6, or A2V7. |

## 62. Test Setup

Troubleshooting tests for the vhf navigation receiver require connection to a low-voltage and high-voltage power source and to various test equipments. The test equipment connections vary from test to test. Remove the vhf navigation receiver from the rack (TM 11-5826-215-12) and make a test setup as shown in figure 33 and outlined below.

a. *Power-Source Connections.*

(1) *Low-voltage source.* A power source capable of delivering 28 volts at 1.8 amperes dc is required. If available, use the test power supply. Connect the positive output lead to terminal 6 of connector A2J4 on the vhf navigation receiver and the negative output lead to terminal 1 of connector A2J4.

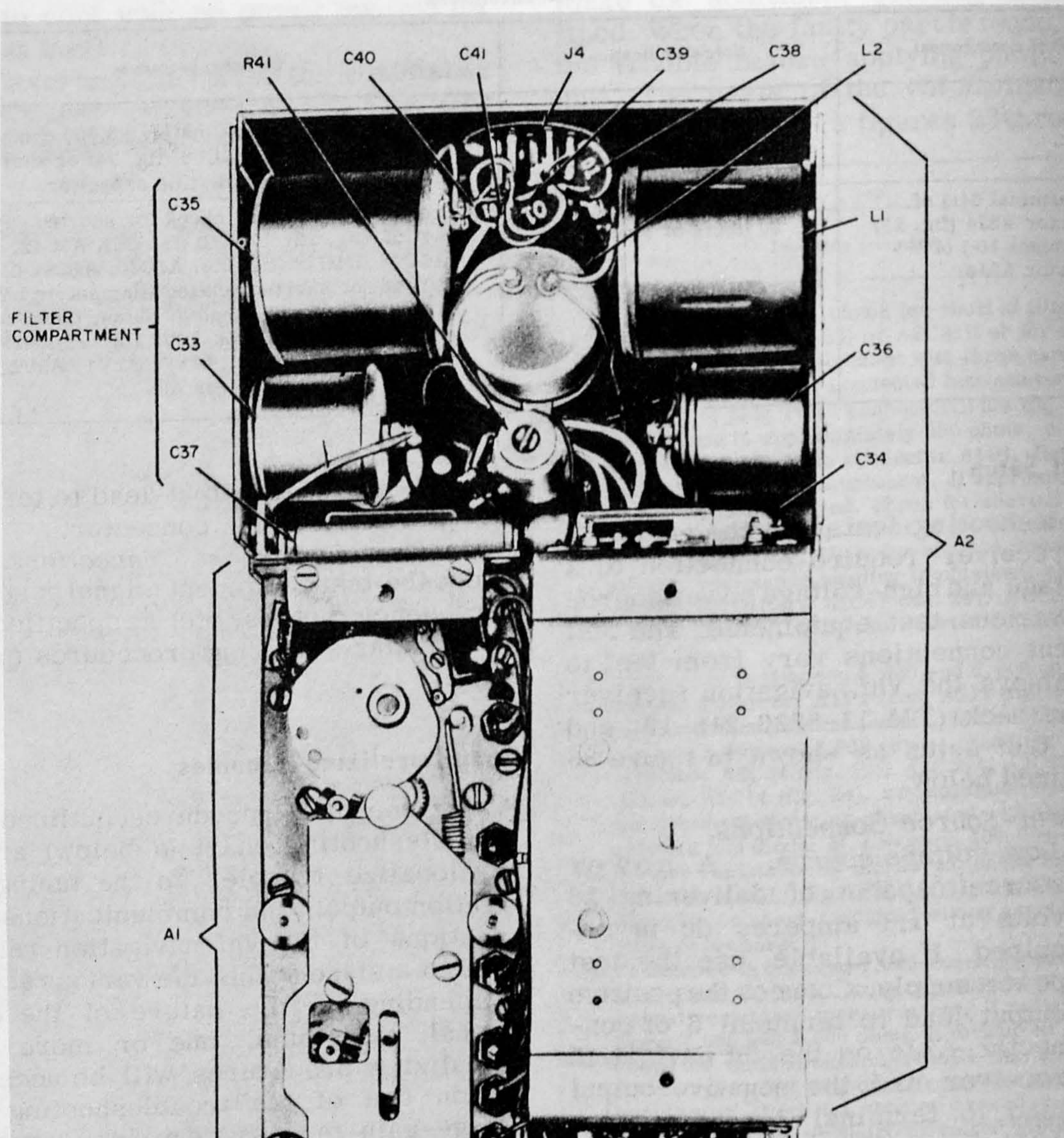
(2) *High-voltage source.* A power source capable of delivering 260 volts at 85 milliamperes (ma) dc is also required. If available, the power supply for the vhf navigation set can be used by connecting it in place on the rear of the vhf navigation receiver. If the vhf navigation set power supply is not available, a substitute power supply, capable of delivering 260 volts dc at 85 ma, can be used. Connect the positive output lead of the substitute high-voltage power source to terminal 3 of connector A2J3 on the rear of the vhf navigation receiver and the negative output lead to terminal 1 of the same connector.

b. *Test Equipment Connections.* Connect the test equipment (signal generators, frequency meters, etc) as specified for the particular servicing procedures (para 63-67).

## 63. Localizing Troubles

a. *General.* Procedures outlined in the troubleshooting chart (*d* below) are used to localize troubles to the tuning, navigation output, and communications output sections of the vhf navigation receiver, and to a stage within the various sections. Depending on the nature of the operational symptoms, one or more of the localizing procedures will be necessary. When use of the troubleshooting chart, stage-gain measurements or signal-substitution procedures results in localization of trouble to a particular stage, use the techniques outlined in paragraph 66 to isolate the trouble to a particular part.

b. *Use of Troubleshooting Chart.* The troubleshooting chart supplements the equipment performance checks (TM 11-5826-215-12), operational tests (para 59), and interunit troubleshooting chart (para 60). If no operational symptoms are known, proceed with the operational test until the trouble symptom is located. If reference to the interunit troubleshooting chart indicates that the trouble symptom is caused by a malfunction of the vhf navigation receiver, look for the indicated




NOTE:
REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION A2.

TM5826-215-35-47

*Figure 23. Vhf navigation receiver, bottom interior view.*

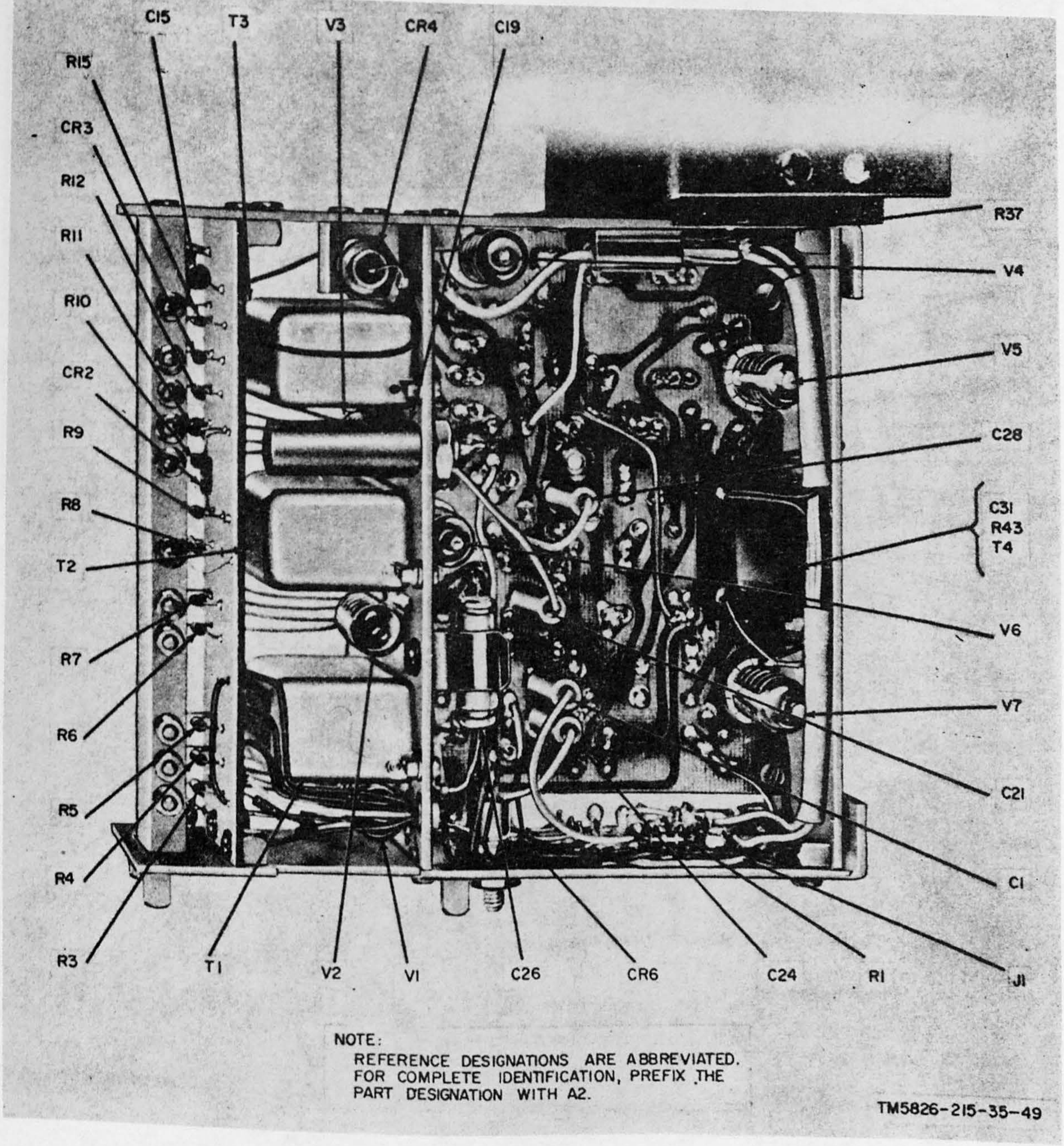



*Figure 24. Vhf navigation receiver, right side view.*

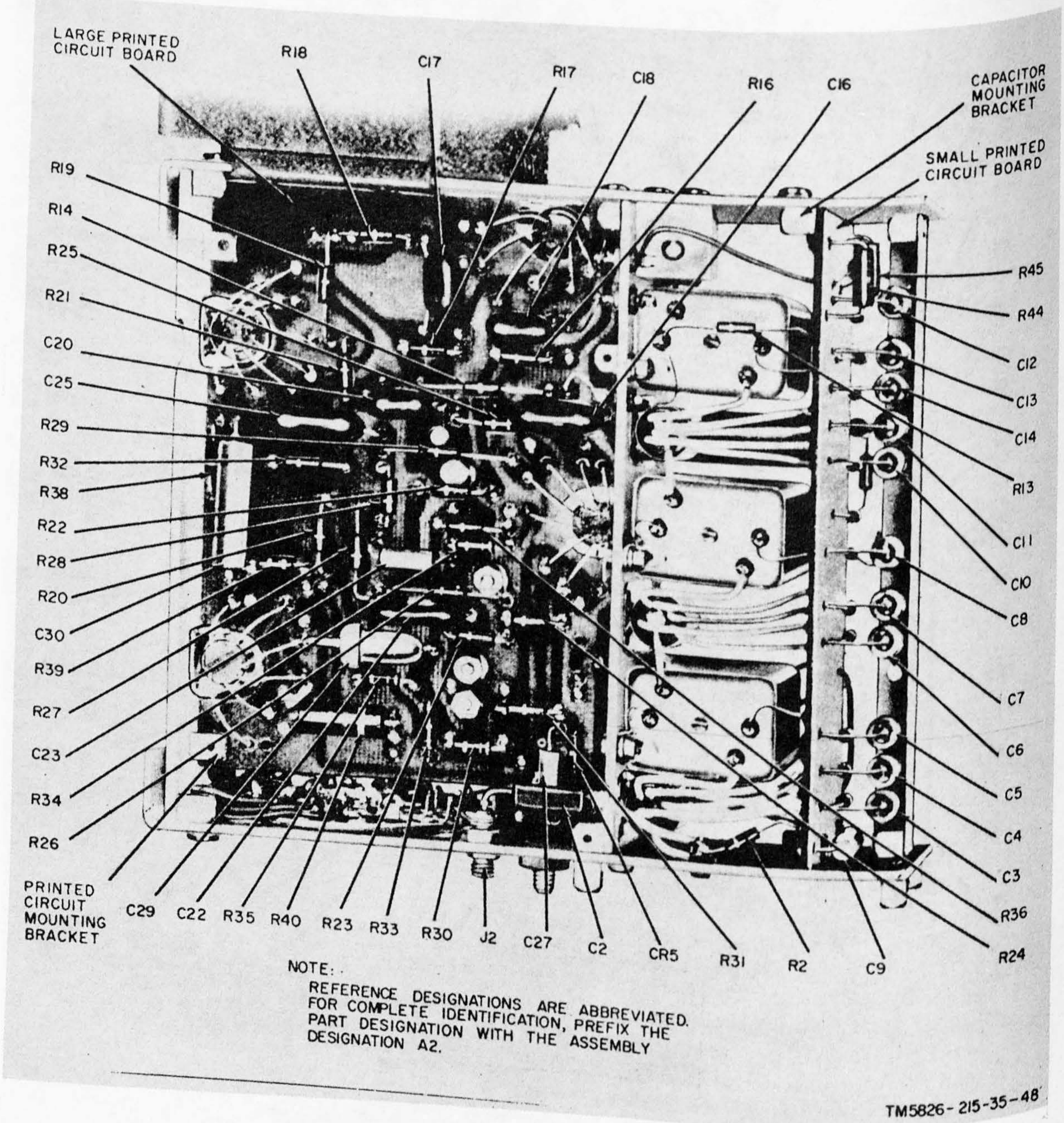



*Figure 25. Vhf navigation receiver, if./af assembly, left side view.*

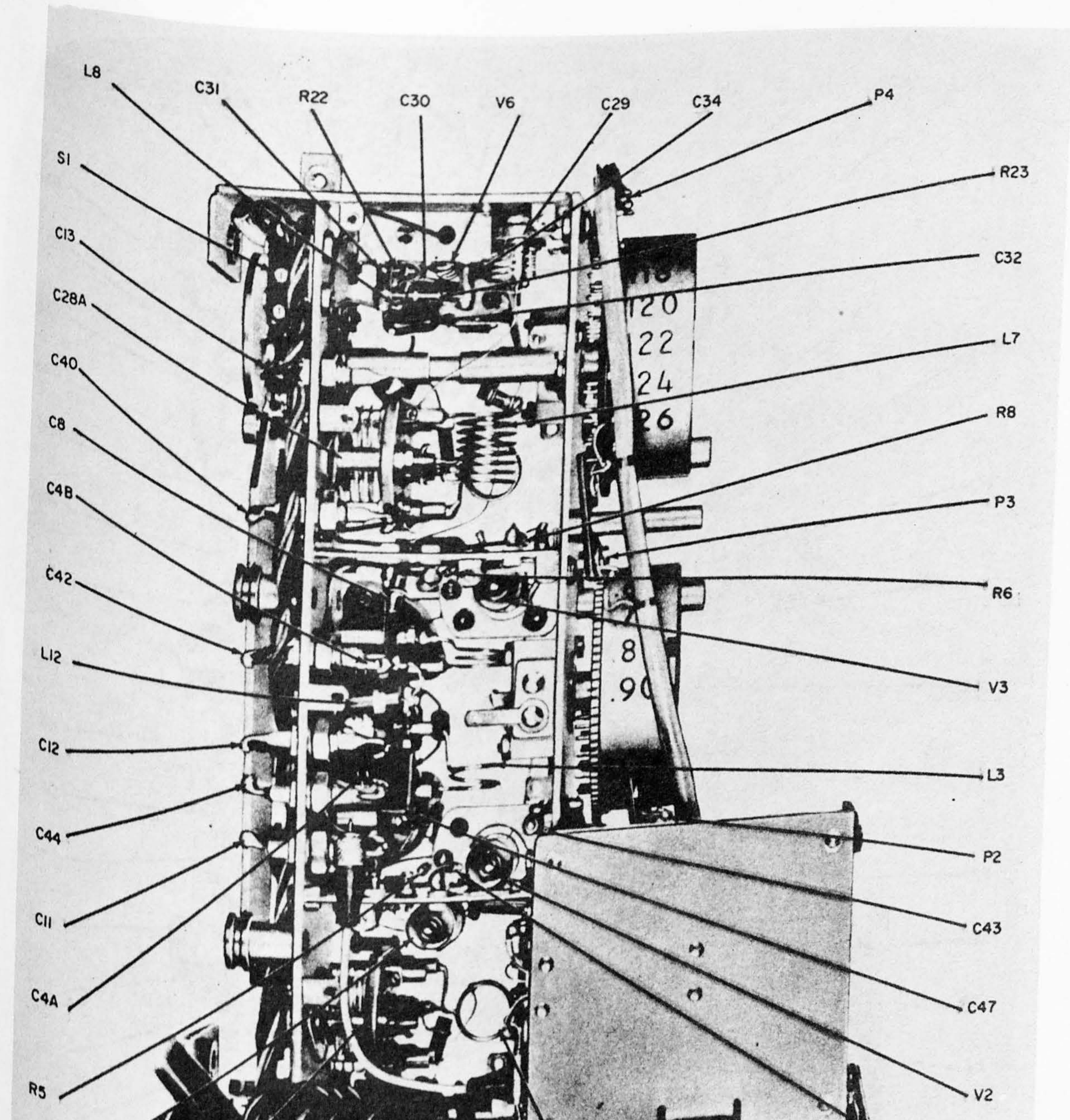



*Figure 26. Vhf navigation receiver, rf/if. assembly, left side view.*

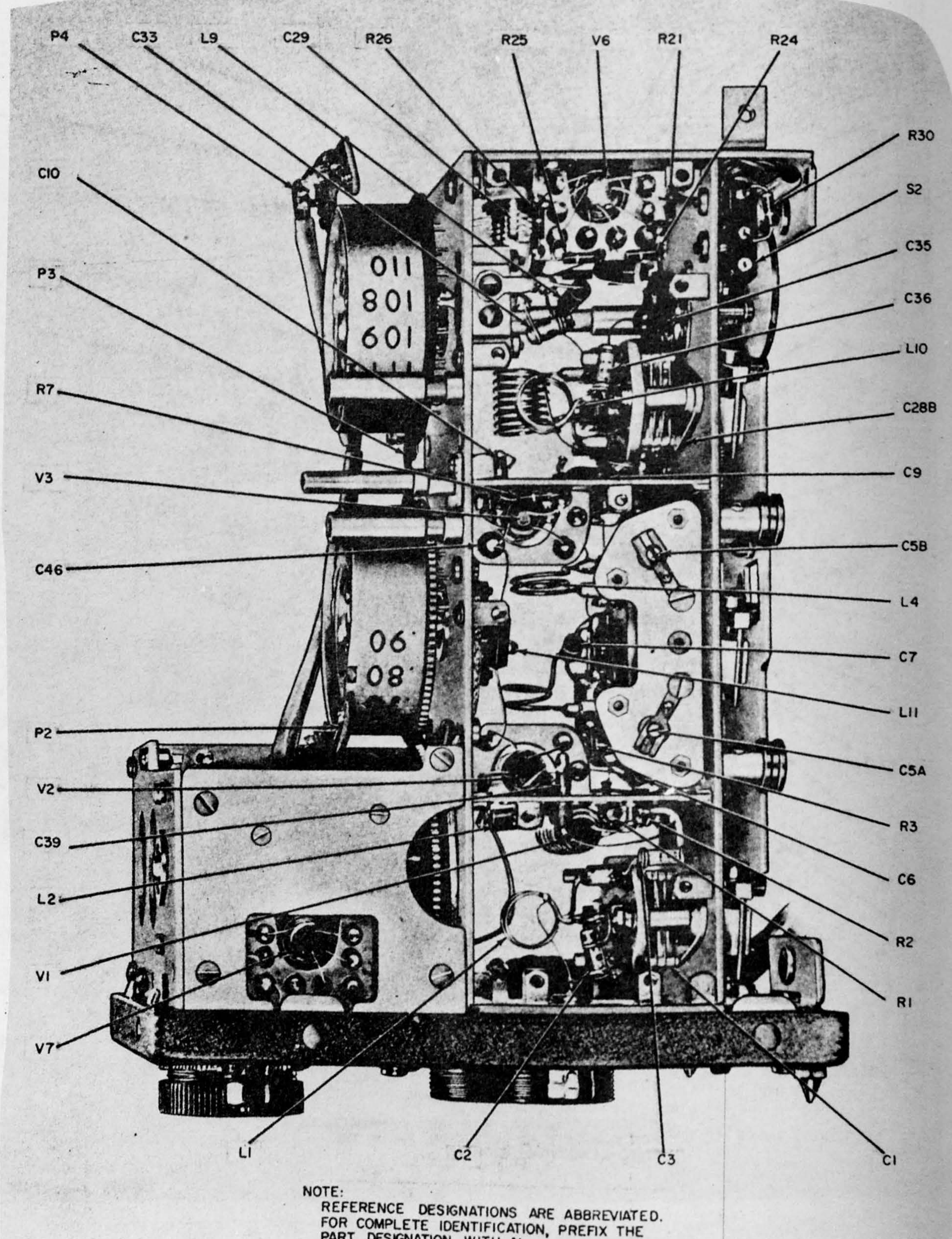



*Figure 27. Vhf navigation receiver, rf/if. assembly, right side view.*

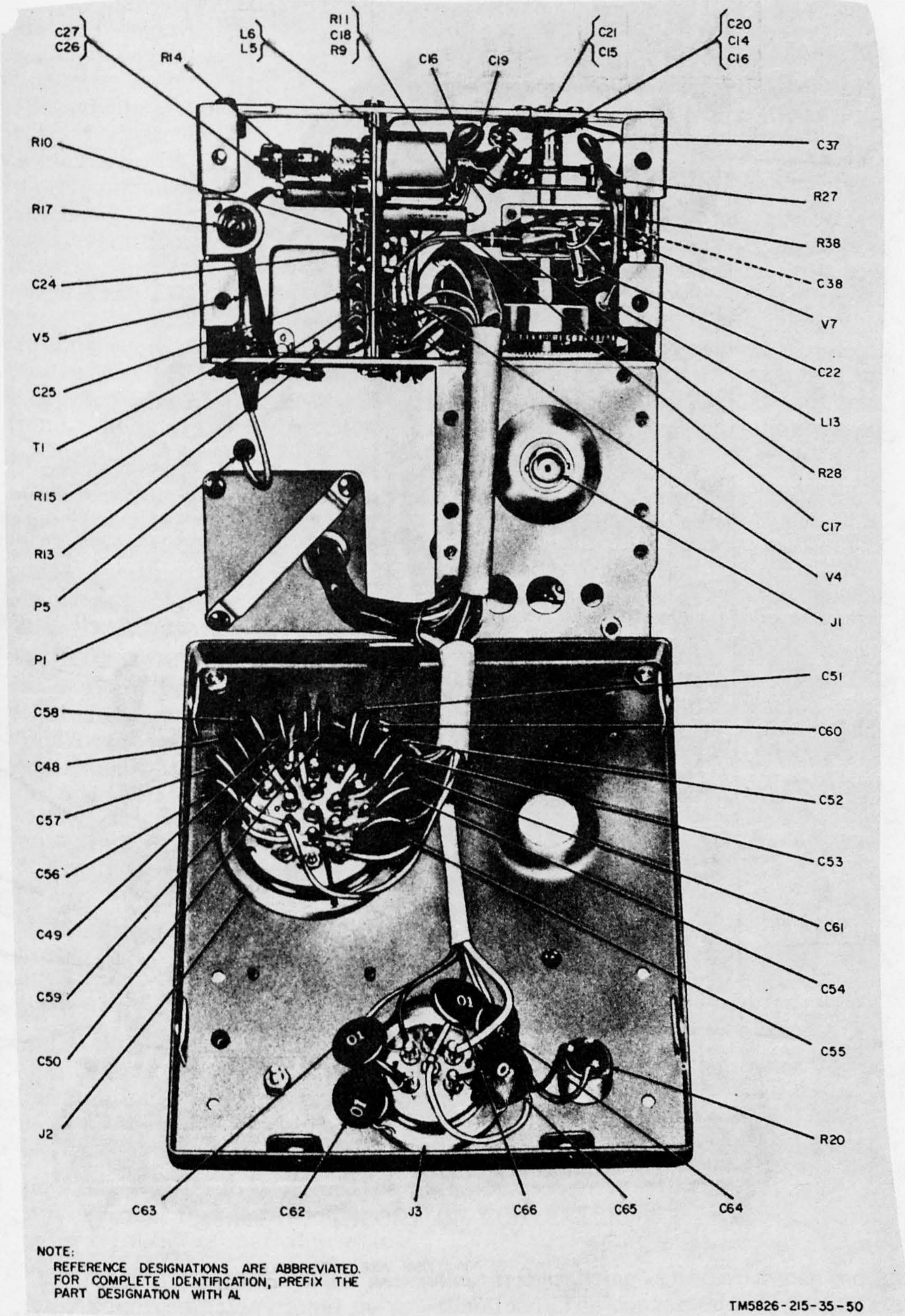



*Figure 28. Vhf navigation receiver, rf/if. assembly, front view.*

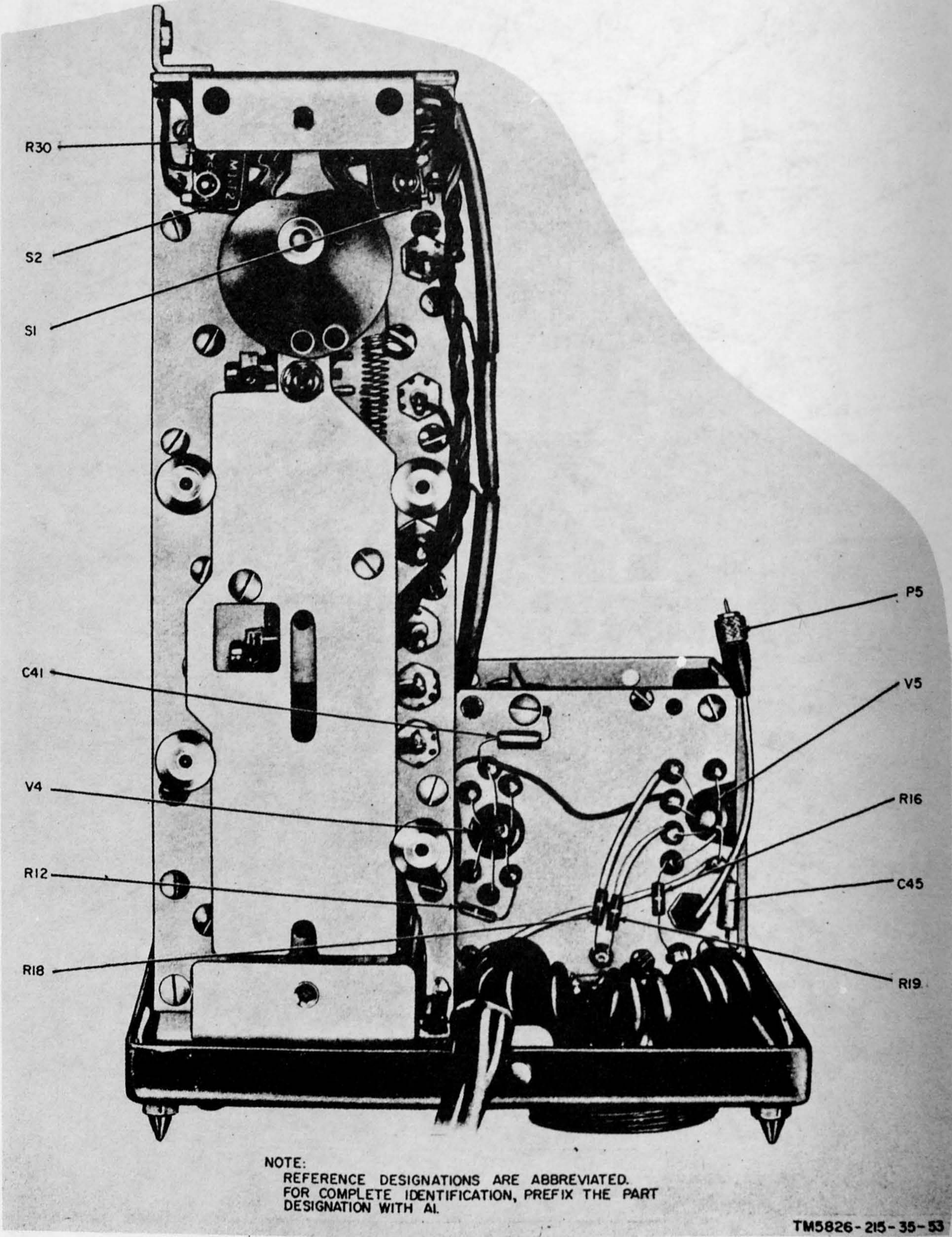



*Figure 29. Vhf navigation receiver, rf/if. assembly, bottom view.*

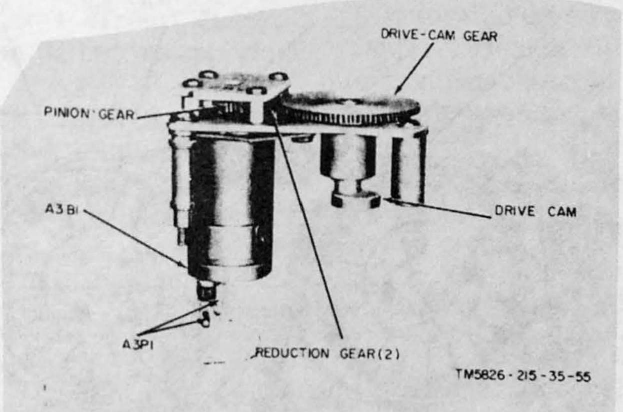



*Figure 30. Vhf navigation receiver, gearing assembly.*

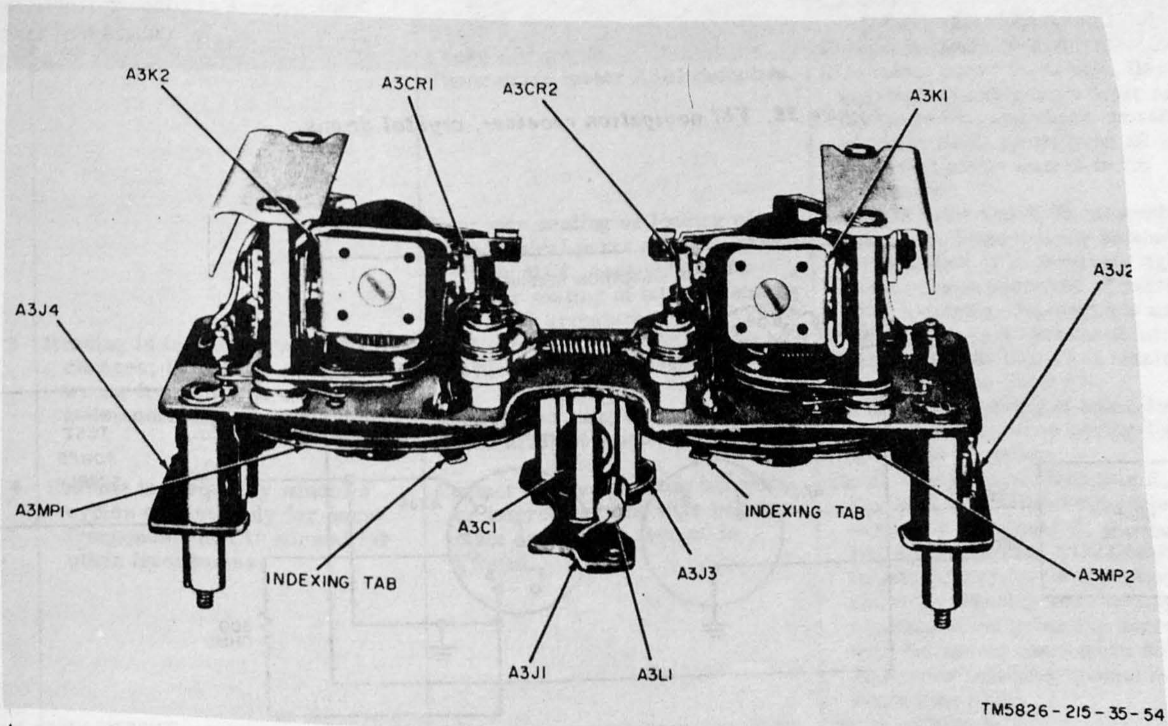



*Figure 31. Vhf navigation receiver, tuner assembly, right side view.*

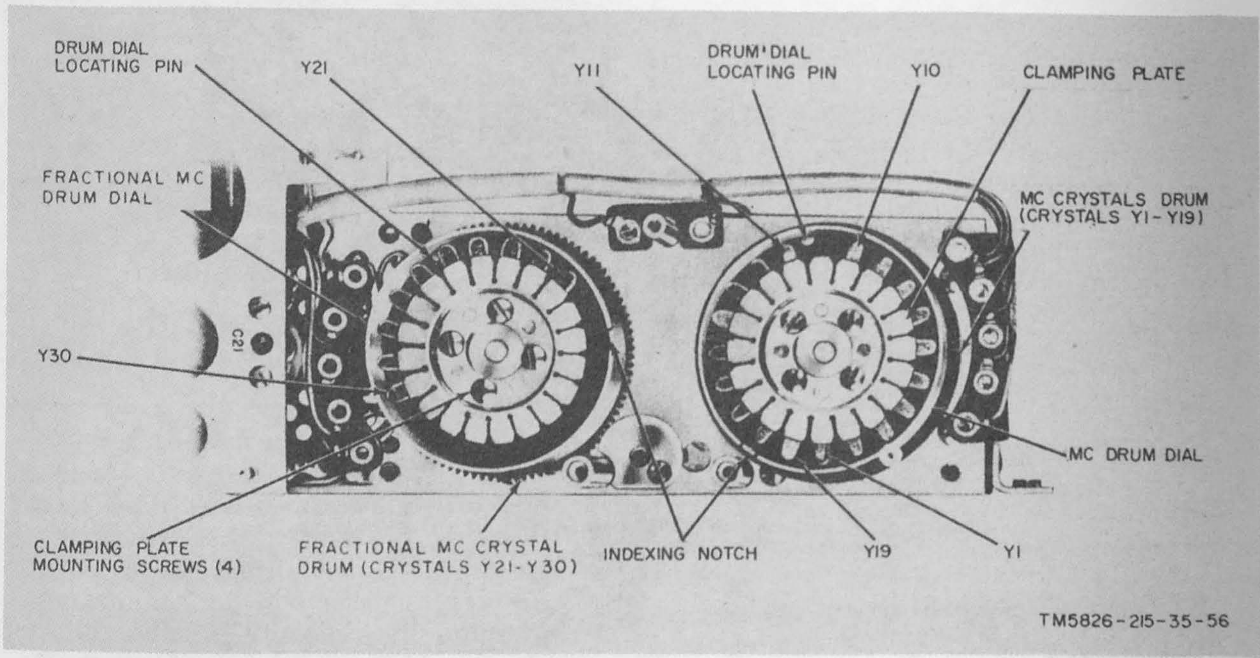



*Figure 32. Vhf navigation receiver, crystal drums.*

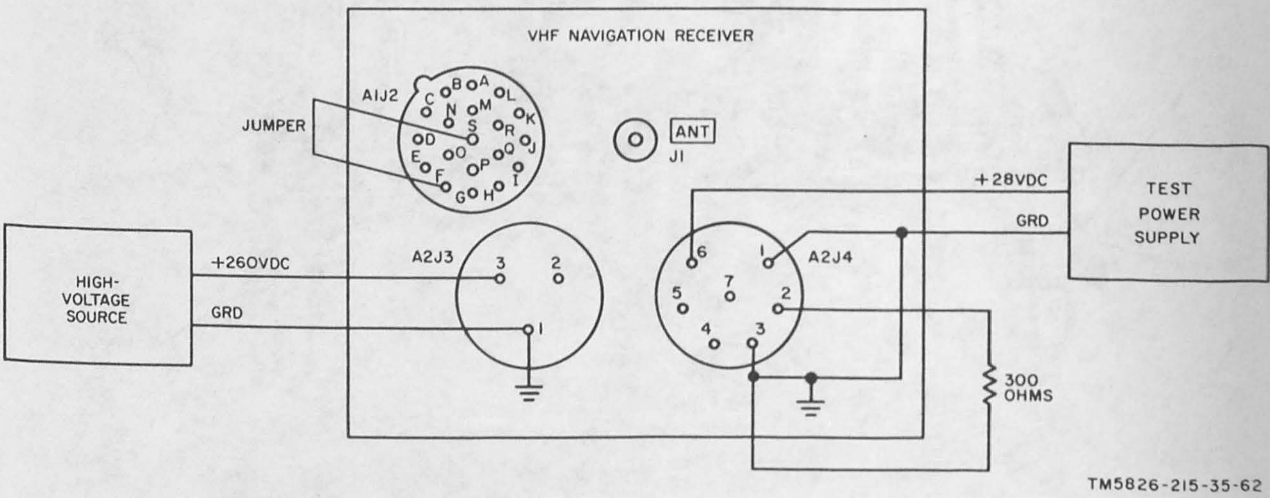



*Figure 33. Test setup for vhf navigation receiver troubleshooting.*

symptom in the troubleshooting chart (*d* below).

*Caution:* **If operational symptoms are not known, or they indicate the possibility of short circuits within the vhf navigation receiver, make the short-circuit checks described in paragraph 61 before applying power to the unit.**

*c. Conditions for Tests.* All dynamic checks outlined in the troubleshooting chart (*d* below) are to be performed with the vhf navigation receiver connected to the low-voltage and high-voltage sources (para 62), unless otherwise indicated. For location of component parts, refer to figures 23 through 32. Voltage and resistance measurements are made with a multimeter. Unless otherwise indicated, all measurements are made with respect to chassis ground.

*d. Troubleshooting Chart.*

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| 1 | Potential measured at terminal A or E on plug A1P6 (connected to connector A1J3) is not 260 ±10 when 260 volts is applied to terminal 3 of connector A2J4. | Filter capacitor A2C36 shorted. | Disconnect power from unit and check capacitor A2C36 (fig. 23) for short. |
| 2 | Reading in frequency windows does not change when vhf navigation control unit channel selector controls are operated. | Filter capacitor A2C35 shorted. | Disconnect power from unit and check capacitor A2C35 for short. |
| | | Relay A3K1 or A3K2 defective. | Disconnect power from unit and check resistance of coils of relays (fig. 31) A3K1 and A3K2 (para 67). |
| | | Choke A3L1 open. | Check continuity of choke A3L1. |
| | | Tuner drive motor A3B1 defective. | Disconnect power from unit. Remove gearing assembly from tuner assembly (para 88*a*) and check operation of motor A3B1 by applying 28 volts from test power source to its terminals. |
| | | Improper seating or loading of mechanical parts on tuner assembly or rf/if. assembly or improper seating of latching spring on relay armature. | Separate tuner and rf/if. assemblies (para 87). Inspect tuner assembly for damaged or excessively tight parts. Check operation of parts on each assembly. Reassemble unit. |
| 3 | Reading in frequency windows changes, but either cycles to wrong frequency or stops between normal frequency stops. | Applicable tuning assembly latching lever improperly adjusted. | Check for correct overlap of latching pin when drive cam is in maximum-throw position (para 93). |
| | | Applicable tuning assembly index-lock arm not functioning. | Check loading spring of index-lock arm. Arm should be spring-loaded to "home" position. |
| 4 | Reading in frequency windows cycles continuously for some frequencies and is normal for other frequencies. | Contact on crystal drum top plate or interconnecting wire between plate and switch shorted to ground. | Check continuity at terminals H, I, J, K, and L (defective megacycle operation) and terminals N, O, P, Q, and R of connector A1J2 (defective fractional megacycle operation) for correct grounding and shorting together above ground in accordance with entries on chart (para 8*h*) to determine defective contact or interconnecting wire. |
| 5 | Reading in frequency windows is correct for less than half-complete frequency range. | Contact on crystal drum top plate open, or interconnecting wire between plate and switch broken. | Same as item 4. |
| 6 | Audio is not heard at receiver output, but course indicator produces correct indications. | Defective audio stage. | Make voltage and resistance measurements (fig. 71) of audio stages A2V4B, A2V6, and A2V7. |
| | | | Make signal-substitution tests (para 64). |
| | | | Make stage-gain measurements (para 65). |
| | | A +100-volt dc line shorted to ground. | Check plate of tube A2V7 (fig. 72) visually to see if it glows red. Disconnect HV+ power supply and feel |

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| | | | power supply filter compartment in rear of vhf navigation receiver (fig. 23). If tube A2V7 plate glows red and power supply filter parts are overheating, check for shorts to ground in diode A2CR6 (fig. 24), and in capacitors A2C34 (fig. 23), A1C13 (fig. 25), and A1C31 (fig. 24). |
| 7 | First syllables of voice signals garbled or missing. | Diode A2CR2 defective. | Check front-to-back resistance of diode A2CR2. Forward resistance should be less than 1,000 ohms; back resistance should be 10,000 times front resistance. |
| 8 | Receiver noisy in flight and when vibrated or tapped. | Microphonic circuit caused by defective tube or loose solder joint. | Start with tube A1V1 (fig. 72) and tap each in turn to find a microphonic tube.<br>Make signal-substitution tests (para 64) grounding output of stage preceding point of signal injection and tapping unit at each point of signal substitution. |
| 9 | Squelch operation sluggish. Audio output distorted and excessively loud. | Defective crystal diode CR4. | Measure agc voltage at plate (collector) of crystal diode A2CR3 (fig. 24) with a 5-millivolt rf signal applied at ANT connector J1 by the test set generator. If voltage measured is not between -4.5 and 0.5 volts, check crystal diode A2CR4. |
| 10 | SQUELCH control has no effect. Audio output distorted and excessively loud. Overall gain very low. | Agc and squelch reference voltage low or missing. | Check for +68 volts at junction of crystal diode A2CR4 (fig. 24) and resistor A2R37. If voltage is low or zero, check resistance measurements of A2CR4 and A2R37. If voltage is normal, check resistance of resistors A2R15 and A2R45 (fig. 25). |
| 11 | No muting operation during change of channel. | Defective muting diode A2CR5. | Check front-to-back resistance of crystal diode A2CR5 (fig. 25). Forward resistance should be less than 1,000 ohms; back resistance should be 10,000 times front resistance. |
| 12 | Audio operation is intermittent on one or more channels. | Misaligned crystal contacts. | Remove cover of unit. Tune to intermittent channel and manually rock crystal drums. If this produces trouble symptom, check alignment of applicable crystal contacts. |
| 13 | No audio heard for one frequency only. | Defective crystal. | Remove and check applicable crystal (para 84 c). |
| 14 | Course indicator operates normally during VOR reception, but does not operate for localizer stations. | Localizer microswitch A1S1 improperly aligned or defective. | Check microswitch A1S1 adjustment (para 94). If adjustment is normal, set crystal drums to frequency of 108.10 mc and check for 28 volts dc on center terminal of switch. If voltage is not present, replace switch. If voltage is present, check wiring between switch and terminal M of connector A1J2 (fig. 28). |
| 15 | Vertical pointer on course indicator deflects erroneously during both VOR and localizer operation. Amount of error is proportional to distance from transmitter. | 30-cps modulation on agc or 100-volt lines. | Check for 30-cps modulation at intersection of resistors A1R1 (fig. 27) and A1R6 by using the frequency meter. If modulation is greater than 0.4 volt, check capacitors A2C9 (fig. 25), A2C15 (fig. 24), and crystal diode A2CR2.<br>Check for 30-cps modulation at intersection of resistors A2R4 (fig. 24) and A2R5. If modulation is greater than 1.0 volt, check capacitor A2C34 (fig. 25) or A2C37. |

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| | | Capacitor A2C29, A2C15, or A2C34 or diode A2CR1 or A2CR2 causes incorrect phase shift. | Check phase shift (para 102) and replace defective capacitors and/or diodes. |
| 16 | Audio is heard, but OFF vertical flag is visible and TO-FROM meter is neutral. | Defective cathode follower stage A2V5A. | Make voltage and resistance measurements of cathode follower A2V5A (fig. 72). |
| 17 | Audio is not heard or is too low, and OFF vertical flag is visible and TO-FROM meter is neutral for all frequencies. | Defective rf stage, if. stage, mc crystal oscillator-doubler A1V16, fractional mc crystal oscillator A1V7, or detector and agc A2V4. | Make voltage and resistance measurements of all stages in unit. Make signal-substitution tests (para 64). Make stage-gain measurements (para 65). |
| 18 | Audio is interrupted by noise bursts. | Defective noise limiter A2V6A. | Make voltage and resistance measurements of tube A2V6 (fig. 72). |

## 64. Signal Substitution

The charts in *a* through *d* below will aid in localizing trouble to a stage of the vhf navigation receiver. The equipment is connected as shown in figure 33 for the tests listed in the charts. For location of component parts, refer to figures 23 through 32.

*a. Audio Chart.* Adjust the audio oscillator to produce a 1-kc output at 5 volts (rms) and connect it to the points indicated in the *connection* column. Connect the multimeter between terminals 2 and 3 of connector A2J4 for ac voltage indications of 7 to 14 volts (rms). The common lead of the audio oscillator is connected to chassis ground.

| Connection | Probable trouble |
|---|---|
| A2V7 pin 5 (plate) | Defective transformer A2T4 (fig. 24); capacitor A2C31, A2C38 (fig. 23), or A1C63 (fig. 28); resistor A2R43 (fig. 24); or connector A2J4. |
| A2V7 pin 1 (control grid) | Defective resistor A2R38 (fig. 28), A2R39, or A2R40; capacitor A2C37 (fig. 23); crystal diode A2CR6 (fig. 24); or tube A2V7. |
| A2V5 pin 8 (plate of B section) | Defective capacitor A2C30 (fig. 25). |
| A2V5 pin 7 (control grid o. B section) | Defective tube A2V5 (fig. 24); resistor A2R35 (fig. 25) or A2R37 (fig. 24); capacitor A2C29 (fig. 25); or crystal diode A2CR4 (fig. 24). |

*b. If. Chart.* Perform the signal-substitution procedures to localize troubles within the if. stages of the vhf navigation receiver only after it is determined that there are no troubles in the audio stages (*a* above). Connect the 1.7-mc signal frequency carrier (modulated with 1,000 cps) output of the AN/URM-25 to the points indicated. Connect the multimeter between terminals 2 and 3 of connector A2J4 (fig. 33) for ac voltage indications of 7 to 14 volts (rms). During the first signal-substitution procedure in the following chart, connect the multimeter between terminals 5 and 3 of connector A2J4 as soon as a reading is obtained between terminals 2 and 3. Following the measurements at terminal 5, reconnect the multimeter to terminal 2 for the other signal-substitution procedures in the chart.

| Connection and signal level | Probable trouble |
|---|---|
| A2V4 pin 5 (plate of B section), 0.800 volt | Defective stage A2V6A or A2V6B (fig. 24); capacitor A2C18 (fig. 25), A2C19 (fig. 24), A2C22 (fig. 25), A2C23 (fig. 25), or A2C25; or resistor A2R22, A2R27, or A2R28. Terminal 5 of connector A2J4 (fig. 23): defective stage A2V4B (fig. 24) or A2V5A. |
| A2V3 pin 5 (plate), 0.800 volt | Defective if. transformer A2T3 (fig. 24); capacitor A2C12 (fig. 25), A2C13, or A2C14. |
| A2V3 pin 1 (control grid), 0.800 volt | Defective stage A2V3 (fig. 24) or resistor A2R12. |
| A2V2 pin 5 (plate), 0.800 volt | Defective if. transformer A2T2 (fig. 24) or capacitor A2C8 (fig. 25). |

| Connection and signal level | Probable trouble |
|---|---|
| A2V2 pin 1 (control grid), 44.00 millivolts | Defective stage A2V2 (fig. 24) or resistor A2R8 or A2R7. |
| A2V1 pin 5 (plate), 44.00 millivolts | Defective if. transformer A2T1 (fig. 24) or capacitor A2C5 (fig. 25). |
| A2V1 pin 1 (control grid), 2.80 millivolts | Defective stage A2V1 (fig. 24) or resistor A2R4 or A2R5. |
| A1V5 pin 5 (plate), 2.80 millivolts | Defective resistor A1R19 (fig. 29), A1R30, or A2R2 (fig. 27), capacitor A2C2, microswitch A1S2, or coaxial cable at connector A1P5 (fig. 28). |
| A1V5 pin 1 (control grid), 320 microvolts | Defective stage A1V5 (fig. 28). |
| A1V4 pin 5 (plate), 320 microvolts | Defective if. transformer A1T1 (fig. 28) or capacitor A1C24 or A1C25. |

*c. Mixer and Oscillator Chart.* Perform the signal-substitution procedures that localize troubles within the mixer and oscillator stages of the vhf navigation receiver only after it is determined that there are no troubles in the audio or if. stages (*a* and *b* above). Connect the specified output of the AN/USM-44 to the points indicated with 1,000-cps modulation applied. Connect the multimeter to terminals 2 and 3 of connector A2J4 (fig. 33) for ac voltage indications of 7 to 14 volts (rms).

| Signal frequency (mc) | Connection and signal level | Probable trouble |
|---|---|---|
| 12.2 | A1V4 pin 1 (control grid), 30 millivolts | Defective tube A1V4 (fig. 28) or A1V7 (fig. 27); resistor A1R13 (fig. 28), A1R14, A1R12 (fig. 29), A1R15 (fig. 28), A1R28, or A1R27; capacitor A1C22, A1C38, or A1C37; or one or more of crystals Y21 through Y30 (fig. 32). |
| 12.2 | A1V3 pin 5 (plate), 30 millivolts | Defective resistor A1R9 (fig. 28), A1R10, or A1R11; capacitor A1C14, A1C15, A1C16, A1C17, A1C18, A1C19, A1C20, or A1C21; or choke A1L5 or A1L6. |
| 117 | A1V3 pin 1 (control grid), 5 millivolts | Defective tube A1V3 (fig. 27) or A1V6; resistor A1R7, A1R8 (fig. 26), A1R21 (fig. 27), A1R22 (fig. 26), A1R23, A1R24 (fig. 27), A1R25, or A1R26; capacitor A1C9, A1C10, A1C28A (fig. 26), A1C28B (fig. 27), A1C29, A1C30 (fig. 26), A1C31, A1C32, A1C33 (fig. 27), A1C34 (fig. 26), A1C35 (fig. 27), or A1C36; choke A1L7 (fig. 26), A1L8, A1L9 (fig. 27), or A1L10; or one or more of crystals Y1 through Y19 (fig. 32). |

*d. Rf Chart.* Perform the signal-substitution procedures that localize troubles within the rf stages of the vhf navigation receiver only after it is determined that there are no troubles in the mixer, oscillator, if., or audio stages (*a*, *b*, *c*, above). Connect the 117-mc signal frequency carrier output of the AN/USM-44 to the points indicated with 1,000-cps modulation applied. Connect the multimeter between terminals 2 and 3 of connector A2J4 (fig. 33) for ac voltage indications of 7 to 14 volts (rms).

| Connection and signal level | Probable trouble |
|---|---|
| A1V2 pin 8 (plate), 3 to 12 millivolts | Defective resistor A1R3 (fig. 27), A1R5 (fig. 26), or A1R6; capacitor A1C4A, A1C4B, A1C5A (fig. 27), A1C5B, A1C6, A1C7, A1C8 (fig. 26), or A1C48 (fig. 28); or choke A1L3 (fig. 26), A1L4 (fig. 27), or A1L12 (fig. 26). |
| A1V2 pin 5 (cathode), 3 to 12 millivolts | Defective tube A1V2 (fig. 27). |
| A1V1 pin 8 (plate), 3 to 12 millivolts | Defective choke A1L2 (fig. 27). |
| A1V1 pin 1 (control grid), 1 millivolt | Defective tube A1V1 (fig. 27) or resistor A1R2. |
| ANT connector A1J1, 1 millivolt | Defective choke A1L1 (fig. 27), resistor A1R1; capacitor A1C1, A1C2, or A1C3; or defective coaxial connector A1J1 (fig. 28). |

## 65. Stage-Gain Measurements

Use the techniques outlined in *a* through *e* below when the output of the vhf navigation receiver is abnormally low or distorted (para 59).

*a. General.* Connect the vhf navigation receiver to the high-voltage and low-voltage sources described in paragraph 62 as shown in figure 33. Operate if. sensitivity control R17, on the front panel of the vhf navigation receiver, fully clockwise.

*b. Audio Stages.* Adjust the crystal drums to tune the vhf navigation receiver to the indicated frequency setting. Connect the audio oscillator between the intersection of resistor A2R27 and capacitor A2C22 (fig. 28) and chassis ground. Adjust the audio generator to produce a 1,000-cps output with the input voltage amplitude as indicated in the following chart. Use the multimeter to measure the ac voltage at the points indicated. The voltage measured should be within 20 percent of the value indicated. If the voltage is not within tolerance, use further isolating techniques (para 66) to determine the defective part within the stage.

| Frequency setting (mc) | Input voltage (volts, rms) | Output voltage (volts, rms) with respect to chassis ground | | | | |
|---|---|---|---|---|---|---|
| | | A2V6 pin 7 | A2V6 pin 5 | A2V5 pin 7 | A2V7 pin 1 | Terminal 2 of connector A2J4 |
| 126.00 | 2.0 | 0.82 | 0.75 | 0.1 | 2.5 | 7 |
| 126.00 | 5.0 | 2.6 | 2.0 | 0.45 | 7.5 | 15 |
| 108.00 | 2.0 | 0.82 | 0.75 | 0.1 | 6.5 | 14 |

*c. If. Stages.* Connect the common clip of the multimeter to the intersection of resistor A2R27 (fig. 28) and capacitor A2C22. Connect the dc probe to chassis ground on the vhf navigation receiver. Connect the output of the AN/URM-25 to pin 1 of the if. stage tube listed below and shown in figure 72. Adjust the AN/URM-25 output amplitude to produce a 4.0-volt dc reading on the multimeter. The AN/URM-25 output (signal input to stage under test) should be between half and twice the value indicated in the signal input column.

| Tube | Signal input |
|---|---|
| A2V3 | 0.800 volts |
| A2V2 | 44.00 millivolts |
| A2V1 | 2.80 millivolts |
| A1V5 | 320 microvolts |

*d. Mixer Stages.* Connect the common clip of the multimeter to the intersection of resistor A2R24 (fig. 28) and capacitor A2C22. Connect the dc probe to chassis ground on the vhf navigation receiver. Connect the output of the AN/URM-25 to pin 1 of the mixer stage tube listed below and shown in figure 72. Adjust the AN/URM-25 output (signal input to stage under test) to produce a 4.0-volt dc reading on the multimeter. The input signal should be between half and twice the value indicated.

| Tube | Signal input (mv) |
|---|---|
| A1V4 | 30 |
| A1V3 | 5 |

*e. Rf Stages.* Adjust the crystal drums to tune the vhf navigation receiver to 126.00 mc and set the AN/USM-44 to produce a frequency of 126 mc. Connect the common clip of the multimeter to the intersection of resistor A2R27 (fig. 25) and capacitor A2C22. Connect the dc probe to chassis ground on the vhf navigation receiver. Connect the output of the AN/USM-44 to the test connection point indicated in the chart below. Adjust the AN/USM-44 output (signal input to stage under test) to produce a 4.0-volt dc reading on the multimeter.

| Test connection | Input voltage (mv) |
|---|---|
| A1V3 | 3 to 12 |
| ANT connector A1J1 | 1.05 |

## 66. Isolating Troubles Within Stages

When trouble has been localized to a stage, either through troubleshooting procedures, signal substitution, or stage-gain measurements, use the following techniques to isolate the defective part:

*a.* Take voltage measurements at the tube sockets (fig. 72).

*b.* If voltage readings are abnormal, take resistance readings (fig. 71) to isolate open and short circuits. Refer also to the dc resistances of transformers and coils (para 67).

*c.* If signals are weak and all checks fail to indicate a defective part, check the alignment of the vhf navigation receiver (para 98 through 102).

*d.* Use the wiring diagrams (fig. 63, 64, 77, 78, and 79) to circuit trace and isolate the faulty component.

*e.* If circuit tracing or other troubleshooting techniques indicate a faulty tube, remove that tube (para 84) and check it with the tube tester.

### 67. Dc Resistance of Transformer Windings and Coils

The dc resistance of transformer windings and choke and relay coils in the vhf navigation receiver are as follows:

| Transformer or coil | Terminals | Dc resistance (ohms) |
|---|---|---|
| A1T1 (L1 and L2) | | Less than 1 |
| A1L1 | | Less than 1 |
| A1L2 | | Less than 1 |
| A1L3 | | Less than 1 |
| A1L4 | | Less than 1 |
| A1L5 | | Less than 1 |
| A1L6 | | Less than 1 |
| A1L7 | | Less than 1 |
| A1L8 | | Less than 1 |
| A1L9 | | Less than 1 |
| A1L10 | | Less than 1 |
| A1L11 | | 1.5 |
| A1L12 | | 1.2 |
| A1L13 | | 1 |
| A2T1 (L1 and L2) | | 1 |
| A2T2 (L1 and L2) | | 1 |
| A2T3 (L1 and L2) | | 1 |
| A2T4 | 1-2 | 173 ±15% |
| | 3-4 | 30 ±15% |
| A2L1 | | 350 ±12% |
| A2L2 | | 0.126 ±10% |
| A3K1 | | 140 ±10% |
| A3K2 | | 140 ±10% |
| A3L1 | | 1.2 |

## Section IV. TROUBLESHOOTING CONVERTER

### 68. Checking Filament and B+ Circuits for Shorts

*a. When to Check.* When any of the following conditions apply, use the multimeter to check for short circuits and clear the troubles before applying power to the converter.

(1) When the converter is being serviced apart from the other units of the vhf navigation set and the nature of the abnormal symptoms is not known.

(2) When power supply troubles repeat after service of the power supply and vhf navigation receiver.

(3) When the test power source draws excessive current during operational tests (para 59*b*) and power supply and vhf navigation receiver are not short circuited.

(4) When the converter is being returned to operation after servicing.

*b. Conditions for Tests.* Prepare the converter for short-circuit tests as follows:

(1) Remove the converter from the rack (TM 11-5826-215-12).

(2) Allow the converter to cool with no power applied for at least 15 minutes.

*c. Measurements.* Make the resistance measurements indicated in the following chart. If abnormal results are obtained, make the additional isolating checks outlined. When the faulty part is found, repair the trouble before applying power to the unit. The parts of the converter are shown in figures 34, 35, and 36.

| Point of measurement | Normal indication | Isolating procedure |
|---|---|---|
| From terminal 7 (+) of connector J204 to terminal 6 (-) of connector J204 (fig. 35). | Resistance reading of 180,000 ohms or more. | If resistance is zero, check for shorted capacitor C219B (fig. 35) or associated wiring. |

| Point of measurement | Normal indication | Isolating procedure |
|---|---|---|
| | | If resistance is approximately 5,100 ohms, check for shorted capacitor C219A (fig. 35) or C207B or associated wiring.<br>If resistance is approximately 10,000 ohms, check for shorted capacitor C208A (fig. 35) or C209B or associated wiring.<br>If resistance is approximately 51,000 ohms, check for shorted capacitor C207A (fig. 35) or associated wiring.<br>If resistance is approximately 57,200 ohms, check for shorted capacitor C202 (fig. 36) or associated wiring. |
| From terminal 1 (+) of connector J204 to terminal 6 (-) of connector J204 (fig. 35) | Resistance reading of 120 ohms or more. | If resistance is zero, check for short-circuited terminals 1 and 6 of connector J204 (fig. 35).<br>If resistance is 4.1 ohms, check for short-circuited wiring between resistor R266 (fig. 35) and pin 4 of tube V204 and between resistor R266 and pin 1 of tube V201.<br>If resistance is between 4.1 and 120 ohms, check for short-circuited tube filaments or associated wiring. |

## 69. Test Setup

Troubleshooting tests for the converter require connection to a low-voltage and high-voltage power source and to various test equipments. The test equipment connections vary from test to test. Remove the converter from the rack (TM 11-5826-215-12) and make a test setup as outlined below.

*a. Power-Source Connections.*

(1) *Low-voltage source.* A power source capable of delivering 28 volts at 0.52 ampere dc is required to perform dynamic servicing of the converter. If available, use the test power supply with the output adjusted to produce the rated voltage. The power supply used must have its positive output lead connected to terminal 1 of connector J204 (fig. 35) on the converter and its negative output lead connected to terminal 6 of connector J204.

(2) *High-voltage source.* A power source capable of delivering 240 volts at 22 milliamperes dc is also required to perform dynamic servicing. If available, the power supply supplied with the vhf navigation set can be used in conjunction with the vhf navigation receiver and the rack. If the vhf navigation set power supply is not available, a substitute power supply, capable of delivering the required power (TM 11-5826-215-12), can be used. Connect the positive output lead of the substitute high-voltage power source to terminal 7 of connector J204 (fig. 35) on the rear of the converter and the negative output lead to terminal 6 of the same connector.

*b. Test Equipment Connections.* Connect the test equipment (signal generators, multimeters, etc.) as specified for the particular servicing procedures (para 70 through 73).

## 70. Localizing Troubles

*a. General.* The procedures outlined in the troubleshooting chart (*d* below) are used to localize troubles to the VOR reference channel, VOR variable channel, localizer channel, and course indication circuit stages of the converter, and to a stage within the various channels. Depending on the nature of the operational symptoms, one or more of the localizing

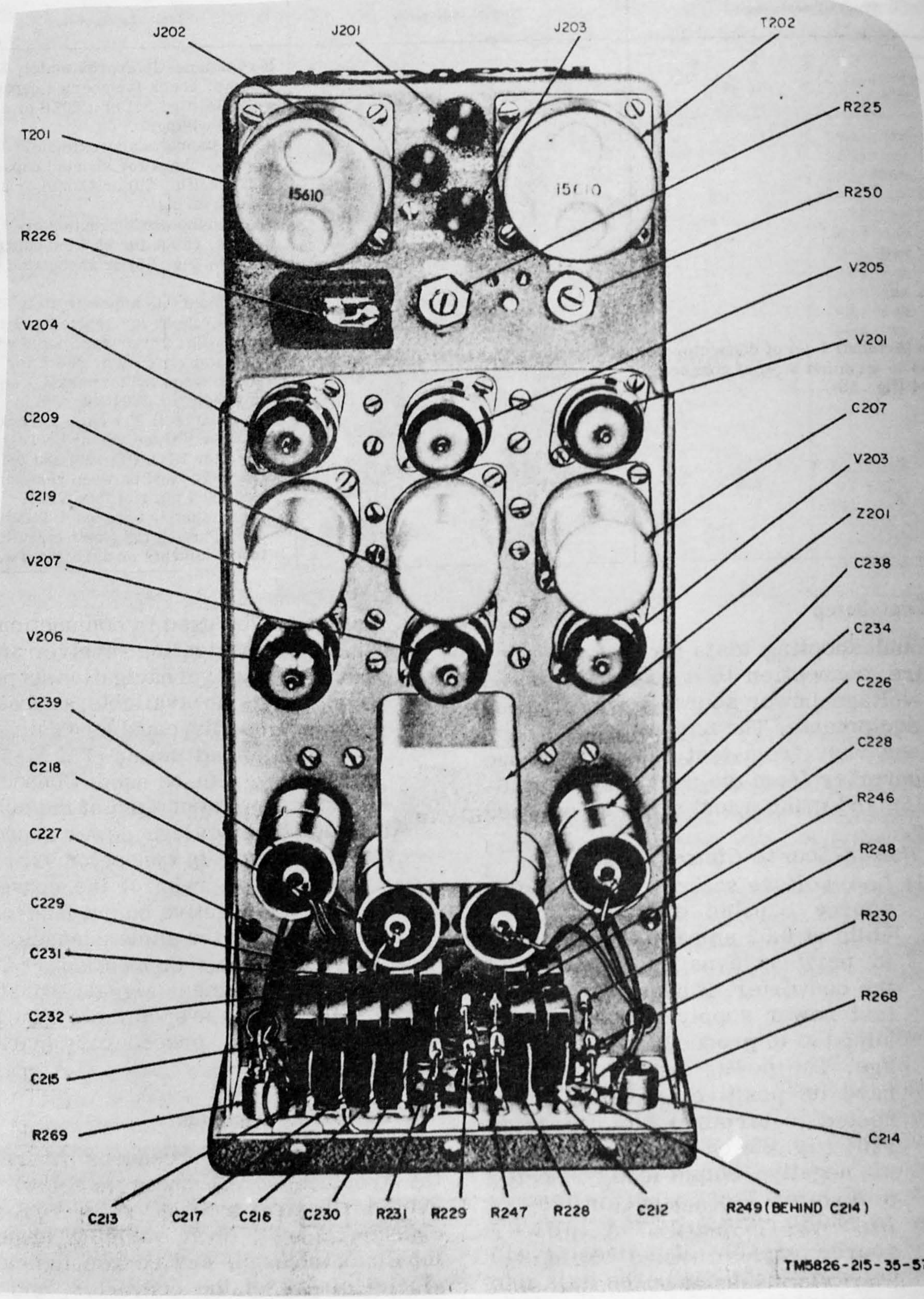



*Figure 34. Converter, top interior view.*

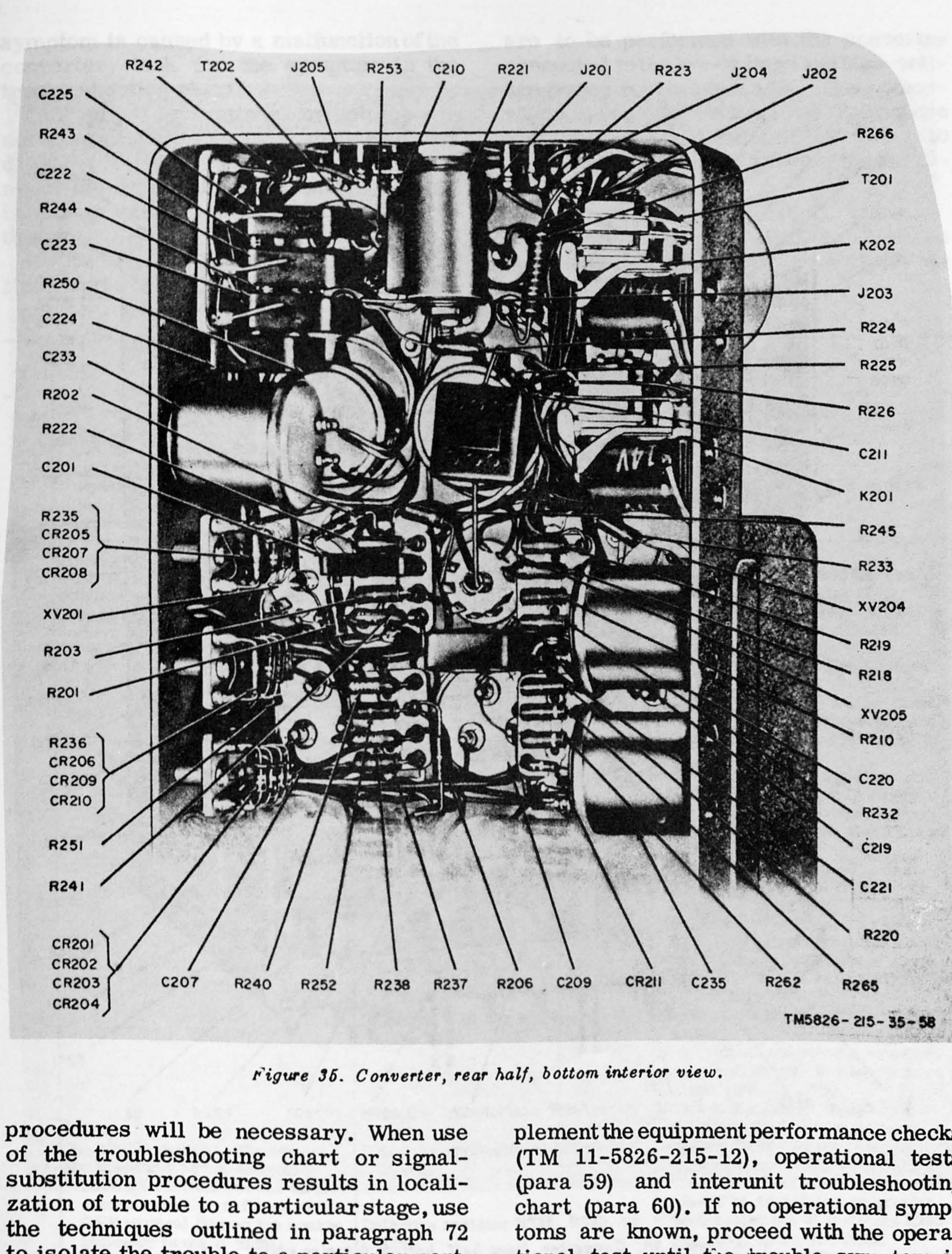
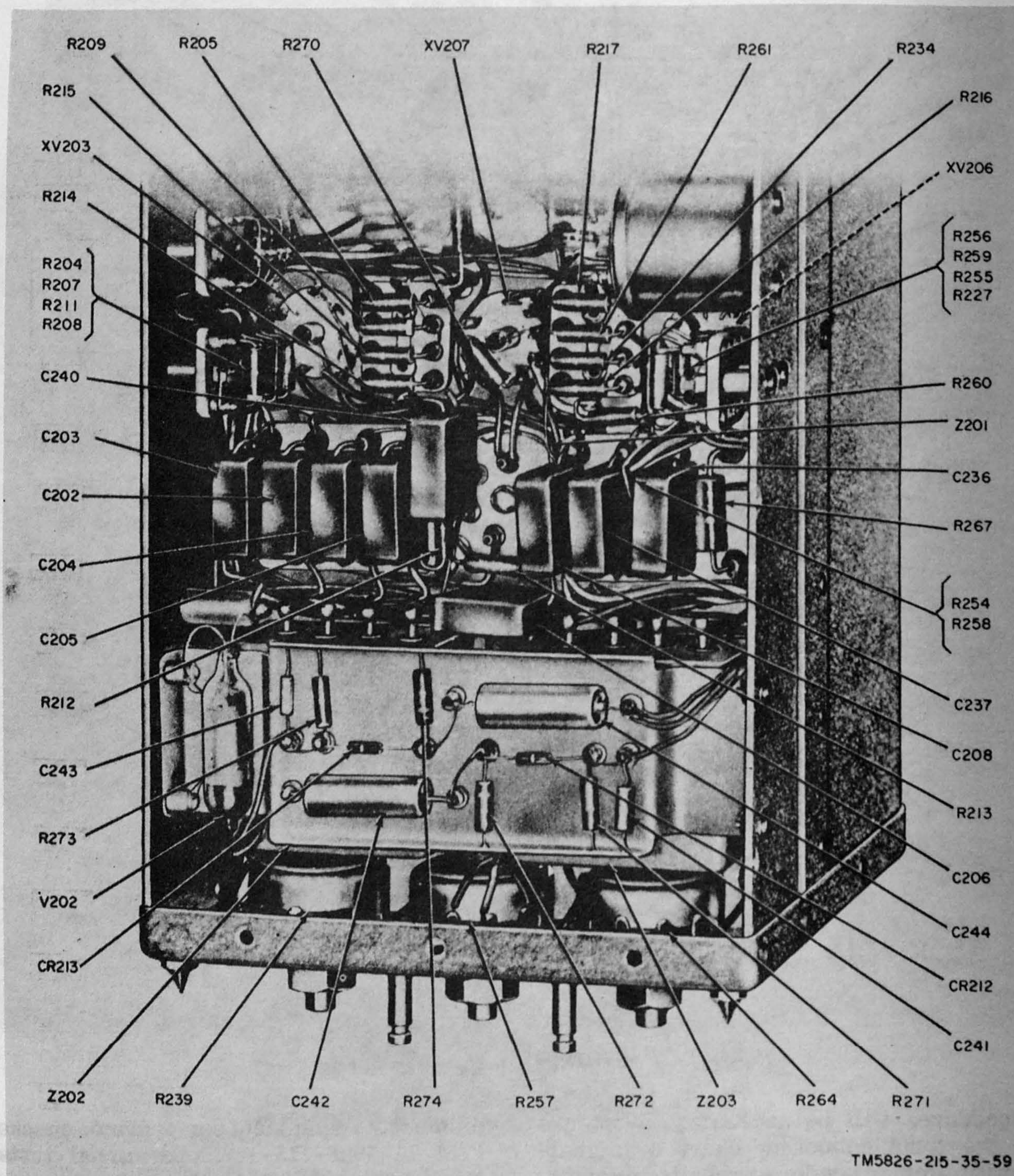



*Figure 35. Converter, rear half, bottom interior view.*

procedures will be necessary. When use of the troubleshooting chart or signal-substitution procedures results in localization of trouble to a particular stage, use the techniques outlined in paragraph 72 to isolate the trouble to a particular part.

*b. Use of Troubleshooting Chart.* The troubleshooting chart is designed to supplement the equipment performance checks (TM 11-5826-215-12), operational tests (para 59) and interunit troubleshooting chart (para 60). If no operational symptoms are known, proceed with the operational test until the trouble symptom is located. If reference to the interunit troubleshooting chart indicates that the trouble




TM5826-215-35-59

*Figure 36. Converter, front half, bottom interior view.*

symptom is caused by a malfunction of the converter, look for the symptom in the troubleshooting chart.

*Caution:* **If operational symptoms are not known, or they indicate the possibility of short circuits within the converter, make the short-circuit checks described in paragraph 68 before applying power to the unit.**

*c. Conditions for Tests.* All checks outlined in the troubleshooting chart (*d* below) are to be performed with the converter connected to the low-voltage and high-voltage power sources (para 69), unless otherwise indicated. Voltage and resistance measurements and continuity checks are to be made with the multimeter on the appropriate scale.

*d. Troubleshooting Chart.*

*Note:* Perform the operations in the operational test before using this chart, unless trouble has already been localized.

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| 1 | OFF vertical flag on the course indicator is visible at all times and the TO-FROM meter on the course indicator is always at neutral, even though audio can be heard on both VOR and localizer channels. | Defective tube filament in VOR reference channel, VOR variable channel, or flag emphasizer stage V207. | Visually check tubes (fig. 34) to see that all light. |
| | | Capacitor C219B (fig. 35) shorted to ground. | Check for short circuit (para 68*c*). |
| 2 | OFF vertical flag on the course indicator is visible and the TO-FROM meter on the course indicator is at neutral during localizer, but not during VOR operation. | Defective localizer channel. | Check tube V206 (fig. 34) by substitution.<br>Make signal-substitution tests on localizer channel (para 71*a*).<br>Make voltage and resistance measurements on localizer stages (fig. 37). |
| | | Defective relay K201 (fig. 49) or K202. | Check operation of relays K201 and K202 (para 97).<br>Check coil resistance measurement for relays K201 and K202 (para 73). |
| 3 | OFF vertical flag on the course indicator is visible and the TO-FROM meter on the course indicator is at neutral during VOR, but not during localizer operation. | Defective VOR variable channel. | Check tubes V205 (fig. 37) and V201 by substitution.<br>Make signal-substitution tests on VOR variable channel (para 71*c*).<br>Make voltage and resistance measurements on VOR variable channel stages (fig. 37). |
| | | Defective VOR reference channel. | Check tubes V201 (fig. 37), V202, V203, V204, and V205 by substitution.<br>Make signal-substitution tests on VOR reference channel (para 71*b*).<br>Make voltage and resistance measurements of VOR reference channel stages (fig. 37). |
| | | Defective VOR flag emphasizer stage V207. | Check tube V207 (fig. 37) by substitution.<br>Make voltage and resistance measurements of VOR flag emphasizer stage V207 (fig. 37). |
| | | Defective transformer T201 or T202. | Check resistance of transformers T201 and T202 windings (para 73). |
| 4 | TO-FROM meter on the course indicator does not deflect, although vertical pointer on the course indicator deflects and OFF vertical flag on the course indicator is out of sight. | Defective crystal diode CR205 or CR206. | Measure front-to-back resistance of crystal diodes CR205 (fig. 35) and CR206; ratio of resistance readings should be 10,000 to 1 or greater. |
| | | Defective resistor R235, R236, or R253. | Check resistance of resistors R235 (fig. 35), R236, and R253. |
| | | Defective capacitor C235. | Check capacitor C235 (fig. 35) for shorted condition. |
| 5 | OFF vertical flag on the course indicator is visible during VOR | VOR FLAG control R268 out of alignment. | Check alignment of VOR FLAG control R268 (para 107). |

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| | operation, but not during localizer operation, although the TO-FROM meter deflects and VOR signal strength is reliable enough for vhf navigation set operation. | Defective crystal diode CR207 or CR208.<br>Defective resistor R237, R238, R239, or R240. | Measure front-to-back resistance of crystal diodes CR207 (fig. 35) and CR208. Resistance ratio should be 10,000 to 1 or greater.<br>Check resistance of resistors R237 (fig. 35), R238, R239 (fig. 36), and R240 (fig. 35). |
| 6 | Vertical pointer on the course indicator does not indicate correctly and the TO-FROM meter on the course indicator operates erratically (deflects correctly part of the time and incorrectly other times) during VOR operation. | VOR reference channel and/or course indication circuits out of alignment. | Check alignment of VOR reference channel and course indication circuits (para 107 through 110). |
| 7 | Vertical pointer on the course indicator does not indicate correctly during localizer operation. | Localizer channel and/or course indication circuits out of alignment. | Check alignment of localizer channel and course indication circuits (para 108 through 111). |

## 71. Signal Substitution

The charts in *a* through *c* below will aid in localizing troubles to a stage of the converter. Adjust the test set generator (TM 11-518) and set its controls as specified for each test (*a* through *c* below).

*a. Localizer Channel Chart.* Set the test set generator controls as follows: MC to position A (110.9 mc), FUNCTION switch to AMP LOC (pointer centered) position, and ATTENUATOR to 3 microvolts. Tune the vhf navigation control unit to 110.9 mc. Connect the frequency meter between the points indicated and chassis ground and check for the signal frequency specified.

| Connection | Signal frequency (cps) | Possible trouble |
|---|---|---|
| V206 pin 2 (control grid, A section) | 90 and 150 | Defective relay K201 (fig. 35), capacitor C236, resistors R254 (fig. 36) or R255. |
| V206 pin 1 (plate, A section) | 90 and 150 | Defective tube V206 (fig. 37) or resistor R256 (fig. 36). |
| V206 pin 7 (control grid, B section) | 90 and 150 | Defective potentiometer R257 (fig. 36), resistor R258 or R259, or capacitor C237. |
| V206 pin 6 (plate of B section) | 90 and 150 | Defective tube V206 (fig. 37) or resistor R260 (fig. 36). |
| Between terminals 1 and 2 of filter Z202 | 90 | Defective filter Z202 (fig. 36). |
| Between terminals 1 and 2 of filter Z203 | 150 | Defective filter Z203 (fig. 36). |
| Between terminals 4 and 5 of connector J205 | dc | If 90 and 150 cps are measured, crystal diode CR209 (fig. 35) and/or CR210 is defective. If no dc is measured, crystal diode CR211, resistor R269 (fig. 34), or relay K202 (fig. 35) is defective. |

*b. VOR Reference Channel Chart.* Set the test set generator controls as follows: MC to position B (114.9 mc), OMNI TRACK to 0°, FUNCTION to OMNI, and ATTENUATOR to 3 microvolts. Tune the vhf navigation control unit to 114.9 mc. Connect the frequency meter to the points indicated and check for the signal frequency specified.

| Connection | Signal frequency (cps) | Possible trouble |
|---|---|---|
| V201 pin 3 (control grid, A section) | 30 and 9,960 | Defective relay K201 (fig. 35), capacitor C201, or relay K202. |
| V201 pin 4 (plate, A section) | 30 and 9,960 | Defective tube V201 (fig. 37) or resistor R202 (fig. 35). |

| Connection | Signal frequency (cps) | Possible trouble |
| --- | --- | --- |
| V203 pin 7 (control grid, A section) | 30 and 9,960 | Defective crystal diode CR201 (fig. 35) or CR202; resistor R204 (fig. 36), R207, or R208; or capacitor C202 or C203. |
| V203 pin 6 (plate, A section) | 30 and 9,960 | Defective tube V203 (fig. 37) or resistor R209 (fig. 36). |
| V203 pin 3 (control grid, B section) | 30 | Defective discriminator network Z201 (fig. 34); crystal diode CR203 (fig. 35) or CR204; resistor R211 (fig. 36), R212, R213 or R214; or capacitor C204, C205, C206, or C240. |
| V203 pin 4 (plate, B section) | 30 | Defective tube V203 (fig. 37) or resistor R215 (fig. 36). |
| V204 pin 7 (control grid, A section) | 30 | Defective resistor R216 (fig. 36), R217, R218 (fig. 35), or R219, or capacitor C208 (fig. 36). |
| V204 pin 8 (cathode, A section) | 30 | Defective tube V204 (fig. 37), resistor R220 (fig. 35), or capacitor C209A or C209B. |
| V205 pin 2 (control grid, A section) | 30 | Defective capacitor C210 (fig. 35) or C211; resistor R221, R222, R223, R224, or R225. |
| V205 pin 1 (plate, A section) | 30 | Defective tube V205 (fig. 37), resistor R226, or R227 (fig. 36). |
| V204 pin 3 (control grid, B section) | 30 | Defective resistor R228 (fig. 34), R229, R230, R231, or R232 (fig. 35); or capacitor C12, (fig. 34), C213, C214, C215, C216, or C217. |
| V204 pin 4 (plate, B section) | 30 | Defective tube V204 (fig. 40); resistor R233 (fig. 35), or R234 (fig. 35); or capacitor C218 (fig. 34), C219A, or C220 (fig. 35). |
| Between terminals 3 and 5 of T201 | 30 | Defective transformer T201 (fig. 34). |

*c. VOR Variable Channel Chart.* Set the test set generator controls as specified in *b* above. Connect the frequency meter to the points indicated and check for the presence of 30 cps.

| Connected | Possible trouble |
| --- | --- |
| V205 pin 7 (control grid, B section) | Defective resistor R241 (fig. 35), R242, R243, or R244; or capacitor C221, C222, C223, C224, or C225. |
| V205 pin 6 (plate, B section) | Defective tube V205 (fig. 37) or resistor R245 (fig. 35) or R246 (fig. 34). |
| V201 pin 7 (control grid, B section) | Defective resistor R247 (fig. 34), R248, R249, or R250 (fig. 35); or capacitor C226 (fig. 34), C227, C228, C229, C230, C231, or C232. |
| V201 pin 6 (plate, B section) | Defective tube V201 (fig. 37); resistor R251 (fig. 35) or R252; or capacitor C207B, C233, or C234 (fig. 34). |
| Between terminals 3 and 5 of T202 | Defective transformer T202 (fig. 34). |

## 72. Isolating Troubles Within Stages

When trouble has been localized to a stage, either through troubleshooting procedures or signal substitution, use the following techniques to isolate the defective part:

*a.* Test the tube involved in a tube tester or by substituting a similar type tube which is known to be operating normally.

*b.* Take voltage measurement at the tube sockets (fig. 37).

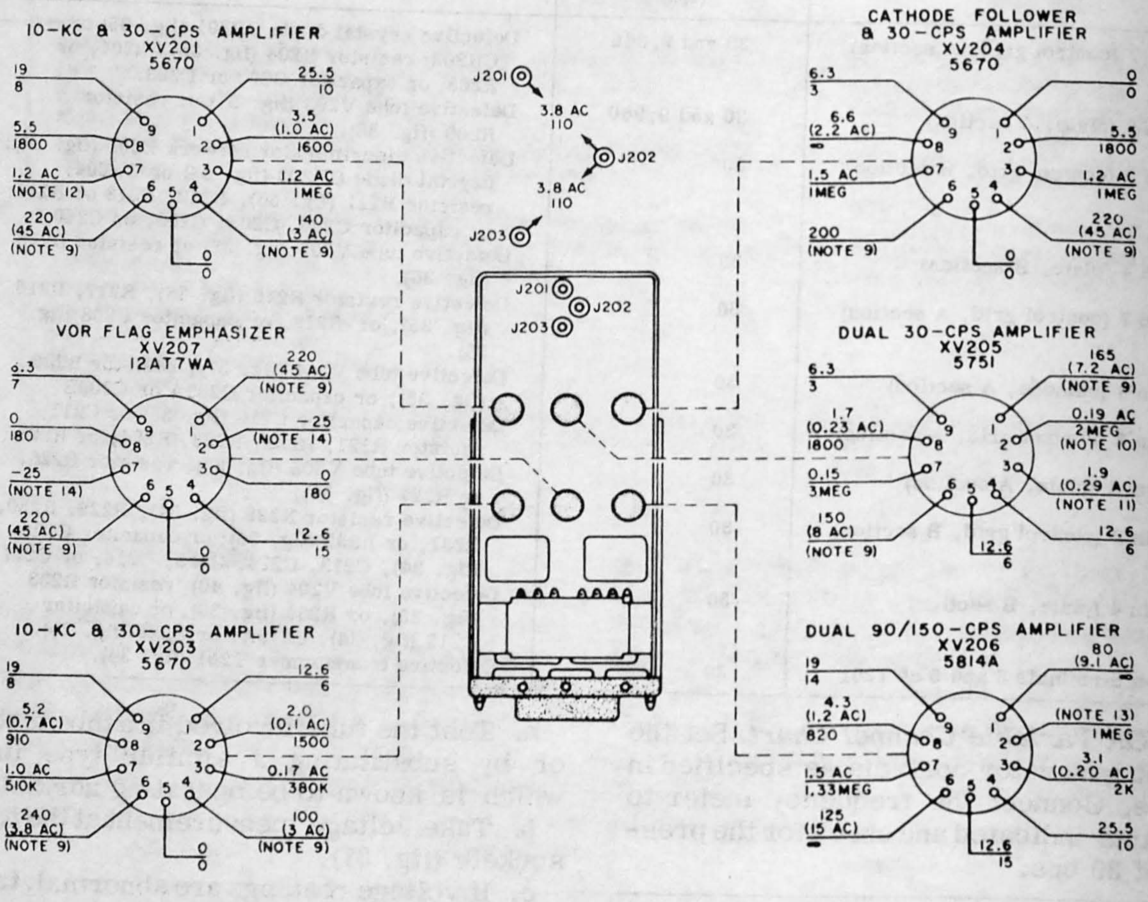
*c.* If voltage readings are abnormal, take resistance readings (fig. 37) to isolate open and short circuits. Refer also to the dc resistance of transformers and relay coils (para 71).

*d.* Use the wiring diagram (fig. 64) to circuit trace and isolate the faulty component.

## 73. Dc Resistance of Transformers and Relay Coils

The dc resistance of transformer windings and of relay coils in the converter are listed below:

| Transformer or coil | Terminals | Resistance (ohms) |
| --- | --- | --- |
| T201 | 1-2 | 2365 ±15% |
| | 3-4 | 125 ±15% |
| | 4-5 | 125 ±15% |
| T202 | 1-2 | 2365 ±15% |
| | 3-4 | 125 ±15% |
| | 4-5 | 125 ±15% |
| K201 | | 90 ±10% |
| K202 | | 90 ±10% |




**NOTES:**

1. VIEW IS OF BOTTOM OF CHASSIS.
2. UNLESS OTHERWISE INDICATED, VOLTAGES ARE DC, RESISTANCES ARE IN OHMS.
3. VOLTAGE READINGS ABOVE LINE, RESISTANCES BELOW LINE.
4. MEASUREMENTS ARE MADE WITH RESPECT TO GROUND, EXCEPT J201 AND J203, WHICH ARE MADE WITH RESPECT TO J202.
5. RESISTANCE MEASUREMENTS ARE MADE WITH CONVERTER DISCONNECTED FROM VHF NAVIGATION SET.
6. VOLTAGE MEASUREMENTS ARE MADE WITH CONVERTER CONNECTED IN VHF NAVIGATION SET.
7. DC VOLTAGE MEASUREMENTS ARE MADE WITH 20,000 OHMS-PER-VOLT VOLTMETER. WITH LV+ SET AT NOMINAL SUPPLY OF 28 VOLTS.
8. DC VOLTAGE MEASUREMENTS ARE MADE WITH MULTIMETER ME-26/U AND WITH TEST SIGNAL LEVELS OF 1.8 VOLTS ±0.1 VOLT AT 30 CPS AND 1.8 VOLTS ±0.2 VOLT AT 9960 CPS.
9. NO SIGNIFICANT MEASUREMENT DUE TO CAPACITOR CHARGING.
10. DEPENDS ON VALUE OF R222 AND SETTING OF R225.
11. DEPENDS ON SETTING OF R226.
12. DEPENDS ON SETTING OF R250.
13. NO SIGNIFICANT MEASUREMENT, 1.8 AC ON INPUT SIDE OF C236 WITH RELAY K201 ACTUATED.
14. RESISTANCE DEPENDS ON METER CONNECTIONS; SHOULD BE 1MEG OR 320K OHMS.

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*Figure 37. Converter, voltage and resistance diagram.*

## Section V. TROUBLESHOOTING VHF NAVIGATION CONTROL UNIT

### 74. Checking Low-Voltage Line for Shorts

a. *When to Check.* When any of the following conditions apply, use the multimeter to check for short circuits and clear the troubles before applying power to the vhf navigation set.

(1) When the vhf navigation control unit is being serviced apart from the other units of the vhf navigation set and the nature of the abnormal symptoms is not known.

(2) When power supply troubles repeat after service of the power supply, vhf navigation receiver, and converter.

(3) When the test power source draws excessive current during operational tests (para 59*b*) and power supply, vhf navigation receiver and converter are not short-circuited.

(4) When the vhf navigation control unit is being returned to operation after servicing.

b. *Conditions for Test.* To prepare for the short-circuit tests, disconnect the vhf navigation control unit from the rack (TM 11-5826-215-12).

c. *Measurements.* Make resistance measurements from pins A and F of connector J2 to pin D (fig. 38). These measurements should both indicate infinity. If not, switch S3 (fig. 38) or the associated wiring in the VOL-OFF switch and control is shorted to ground. Repair or replace the switch, as required, before applying power to the set.

### 75. Test Setup

Troubleshooting tests for the vhf navigation control unit consist of continuity

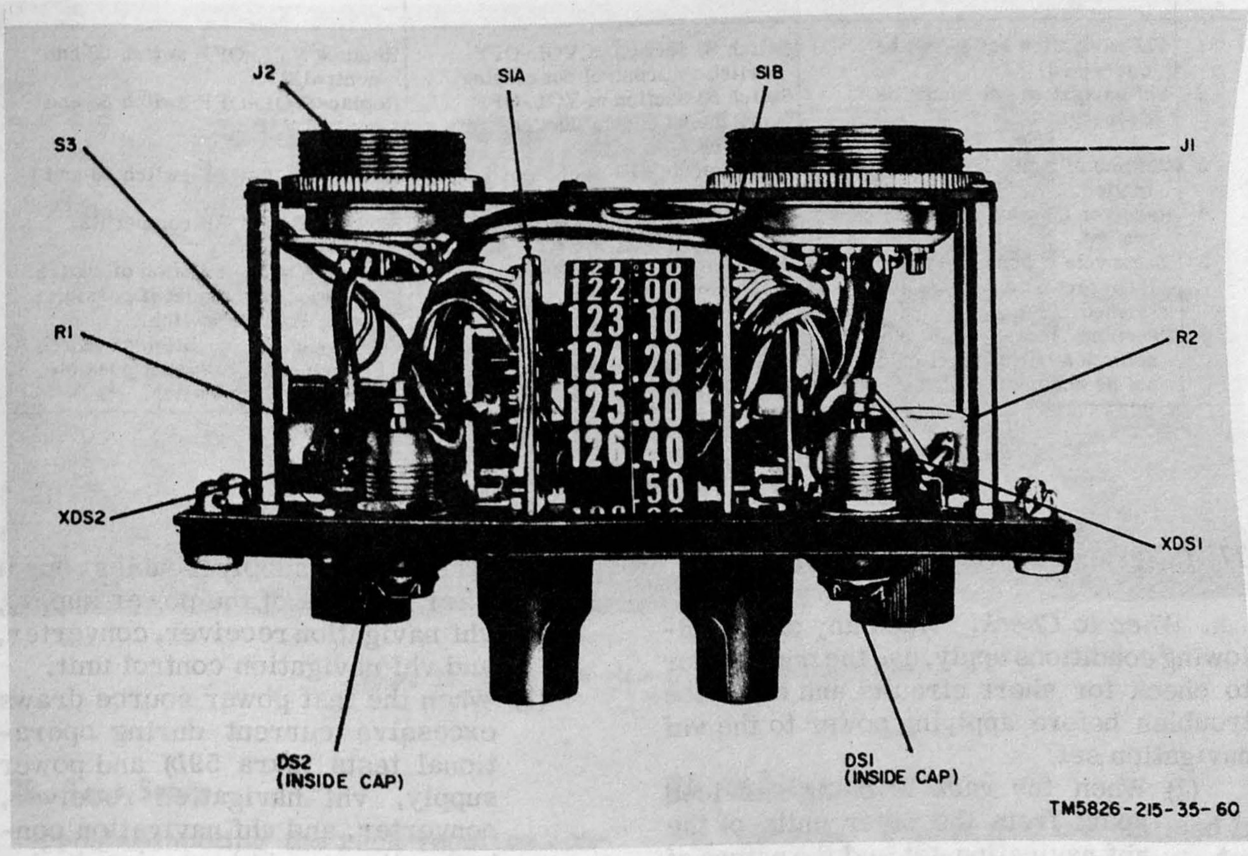



*Figure 38. Vhf navigation control unit, top interior view.*

tests. These tests require use of the ohmmeter scale of the multimeter.

## 76. Isolating Troubles

*a. General.* Procedures are outlined in the troubleshooting chart (*d* below) for isolating troubles to the parts of the vhf navigation control unit. Depending on the nature of the operational symptoms, one or more of the isolating procedures will be necessary. When use of the troubleshooting chart results in isolation of trouble to a particular part, use standard removal procedures.

*b. Use of Troubleshooting Chart.* The troubleshooting chart is designed to supplement the equipment performance checks (TM 11-5826-215-12), the operational tests (para 59), and the interunit troubleshooting chart (para 60). If no operational symptoms are known, proceed with the operational test until the trouble symptom is located. If reference to the interunit troubleshooting chart indicates that the trouble symptom is caused by a malfunction of the vhf navigation control unit, look for the symptom in the troubleshooting chart.

*Caution:* **If operational symptoms are not known, or they indicate the possibility of a short circuit within the vhf navigation control unit, make the short-circuit check described in paragraph 74 before applying power to the vhf navigation set.**

*c. Conditions for Tests.* Disconnect the vhf navigation control unit from all power before performing the tests in *d* below.

*d. Troubleshooting Chart.* For location of the component parts, refer to figure 38.

*Note:* Perform the operations in the operational test before using this chart, unless trouble has already been isolated.

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| 1 | Vhf navigation set cannot be energized. | Switch S3 section of VOL-OFF switch and control not closing. | Replace VOL-OFF switch S3 and control R1. |
| 2 | Vhf navigation set cannot be deenergized. | Switch S3 section of VOL-OFF switch and control has contacts shorted. | Replace VOL-OFF switch S3 and control R1. |
| 3 | Volume of audio cannot be controlled. | Potentiometer R1 section of VOL-OFF switch and control defective. | Replace VOL-OFF switch S3 and control R1. |
| 4 | Receiver quieting cannot be controlled. | SQUELCH control R2 defective. | Replace SQUELCH control R2. |
| 5 | Megacycle channel selection is incorrect or cannot be accomplished. | Defective megacycle channel selector switch S1A. | Visually check condition of switch S1A wipers. Adjust if possible; if not, replace switch. |
| 6 | Fractional megacycle channel selection is incorrect or cannot be accomplished. | Defective fractional megacycle channel selector switch S1B. | Visually check condition of switch S1B wipers. Adjust if possible; if not, replace switch. |

# Section VI. TROUBLESHOOTING RACK

## 77. Checking Low-Voltage Line for Shorts

*a. When to Check.* When any of the following conditions apply, use the multimeter to check for short circuits and clear the troubles before applying power to the vhf navigation set.

(1) When the rack is being serviced apart from the other units of the vhf navigation set and the nature of the abnormal symptom is not known.

(2) When power supply troubles repeat after service of the power supply, vhf navigation receiver, converter, and vhf navigation control unit.

(3) When the test power source draws excessive current during operational tests (para 59*b*) and power supply, vhf navigation receiver, converter, and vhf navigation control unit are not short-circuited.

(4) When the rack is being returned to operation after servicing.

*b. Conditions for Test.* To prepare for the short-circuit tests, disconnect all equipment from the rack, and disconnect the cable at connector J305 (fig. 39).

*c. Measurements.* Make the resistance measurements indicated in the following chart with the multimeter (ohms scale). If abnormal results are obtained, make the additional isolating checks outlined. When the faulty part is found, repair the trouble before applying power to the set.

| Point of measurement | Normal indication | Isolating procedure |
|---|---|---|
| From terminal A to terminal B of connector J305. | Infinity | If resistance is zero, check for short-circuited wiring between terminal A of connector J305 (fig. 39) and relay K301 and between terminal A of connector J304 and relay K301. |
| From terminal 6 to terminal 1 of connector J301. | Infinity | If resistance is zero, check for short-circuited wiring between terminal 6 of connector J301 and relay K301 and between terminal 1 of connector J302 and relay K301. |
| From terminal F to terminal D of connector J304. | 300 ohms | If resistance is zero, check for shorted relay K301 coil or for short-circuited wiring between terminal F of connector J304 and the relay coil. |

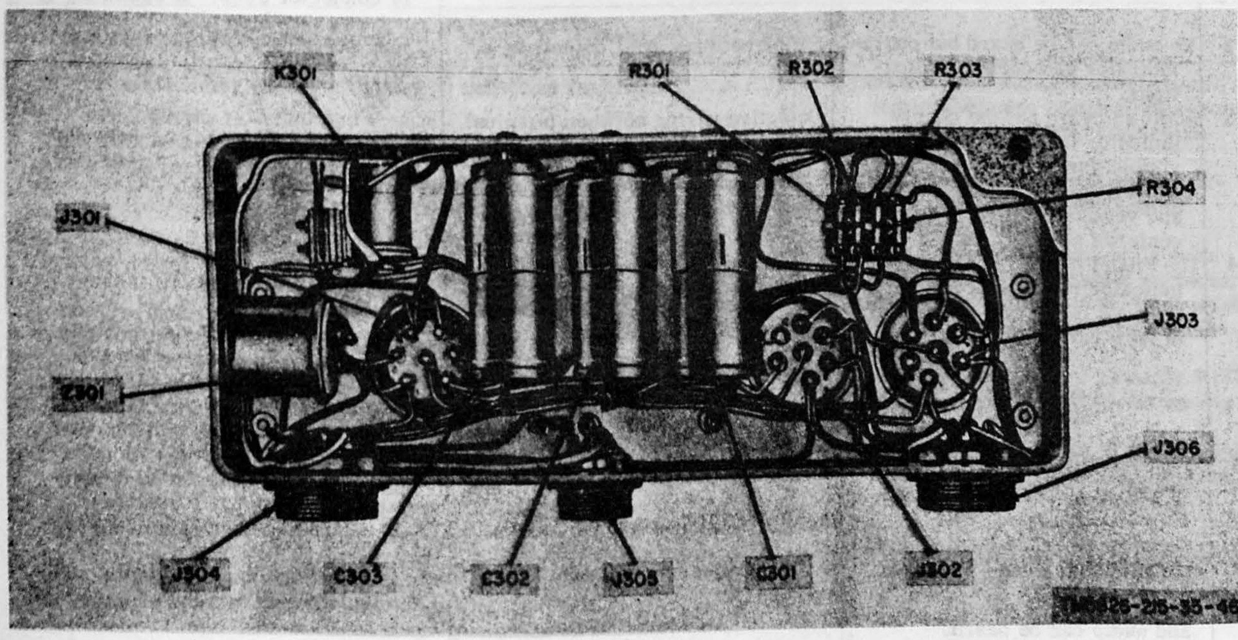



*Figure 39. Back rear view of interconnecting box.*

## 78. Test Setup

Troubleshooting the rack requires connection of a 28-volt source such as the test power supply between terminal F (+) and terminal D (-) of connector J304 (fig. 39).

## 79. Isolating Troubles

*a. General.* Procedures are outlined in the troubleshooting chart (*d* below) for isolating troubles to the parts of the rack. Depending on the nature of the operational symptoms, one or more of the isolating procedures will be necessary. When use of the troubleshooting chart results in isolation of trouble to a particular part, use the standard removal procedures described in paragraph 84.

*b. Use of Troubleshooting Chart.* The troubleshooting chart is designed to supplement the equipment performance checks (TM 11-5826-215-12), the operational tests (para 59), and the interunit troubleshooting chart (para 60). If no operational symptoms are known, proceed with the operational test until the trouble symptom is located. If reference to the interunit troubleshooting chart indicates that the trouble symptom is caused by a malfunction of the rack, look for the symptom in the troubleshooting chart. Refer to figure 39 for location of component parts.

*Caution:* **If operational symptoms are not known, or they indicate the possibility of a short circuit within the rack, make the short-circuit check described in paragraph 77 before applying power to the vhf navigation set.**

*c. Conditions for Tests.* To perform the troubleshooting tests, disconnect the vhf navigation receiver and converter from the rack and disconnect the rack from the vhf navigation control unit.

*d. Troubleshooting Chart.*

*Note:* Perform the operations in the operational test before using this chart, unless trouble has already been isolated.

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| 1 | No audio is heard and no course indicator displays are observed. | Defective relay K301 ............ | Apply 28 volts between terminal F of connector J304 and chassis ground and check continuity from terminal A of connector J305 and terminal 1 of connector J302. If continuity is not measured, replace relay K301. |
| 2 | No audio can be heard but course indicator has correct indications. | Filter network Z301 defective. | Check continuity of filter network Z301. |
| 3 | Audio is heard but the course indicator OFF vertical flag is visible during VOR operation, TO-FROM meter is at neutral, and vertical pointer remains centered at all times. | Defective wiring between terminal 5 of connector J301 and terminal 2 of connector J302. | Check continuity of wiring between terminal 5 of connector J301 and terminal 2 of connector J302. |
| 4 | TO-FROM meter of the course indicator remains at neutral, although OFF vertical flag is in view during VOR operation. | Capacitor C303 shorted, or wiring associated with TO-FROM meter connections defective. | Check capacitor C303 for shorted condition.<br>Check continuity of wiring between terminal 3 of connector J303 and terminal F of connector J306.<br>Check continuity of wiring between terminal 1 of connector J303 and terminal E of connector J306. |
| 5 | Vertical pointer on the course indicator produces incorrect deflection. | Capacitor C301 shorted .........<br>Resistor R301 or R302 defective. | Check capacitor C301 for shorted condition.<br>Check resistance of resistors R201 and R302. |
| 6 | Vertical pointer does not deflect, but TO-FROM meter and OFF vertical flag operate properly and audio can be heard. | Vertical pointer circuit shorted to ground. | Check continuity to ground from terminal 6 and 7 of connector J303. |
| 7 | OFF vertical flag is visible at all times although vertical pointer deflects and TO-FROM meter indicates TO and FROM during VOR operation. | Capacitor C302 shorted .........<br>Resistor R303 or R304 defective. | Check capacitor C302 for shorted condition.<br>Check resistance of resistors R303 and R304. |

## Section VII. TROUBLESHOOTING COURSE INDICATOR

### 80. Test Setup

Troubleshooting tests of the course indicator consist of continuity checks and resistance measurements. These tests require use of the ohmmeter scale of the multimeter.

### 81. Isolating Troubles

*a. General.* Procedures are outlined in the troubleshooting chart (*d* below) for isolating troubles to the parts of the course indicator. Depending on the nature of the operational symptoms, one or more of the isolating procedures will be necessary. When use of the troubleshooting chart results in isolation of trouble to a particular part (fig. 40), use standard removal techniques as outlined in paragraph 83 to replace the part.

*b. Use of Troubleshooting Chart.* The troubleshooting chart supplements the equipment performance checks (TM 11-5826-215-12), the operational tests (para 59), and the interunit troubleshooting chart (para 60). If no operational symptoms are known, proceed with the operational test until the trouble symptom is located. If reference to the interunit troubleshooting chart indicates that the trouble symptom is caused by a malfunction of the course indicator, look for the symptom in the troubleshooting chart.

*c. Conditions for Tests.* Disconnect the course indicator from the rack (TM 11-5826-215-12) to perform the troubleshooting tests.

*d. Troubleshooting Chart.*

*Note:* Perform the operations in the operational test before using this chart unless the trouble has already been isolated.

| Item | Indication | Probable trouble | Procedure |
|---|---|---|---|
| 1 | Vertical pointer does not deflect correctly. | Defective resolver | Check dc resistance measurements of stator and rotor windings of resolver (para 82). Repair or replace as required. |
| | | Defective mechanical connection between course selector knob and resolver. | Check tightness of mechanical couplings. Tighten or replace as required. Examine gears for broken or worn teeth. Repair or replace as required |
| | | Defective vertical pointer meter. | Measure resistance of vertical pointer meter winding (para 82). Replace meter if defective. |
| | | Defective resistor R1601 | Measure resistance of resistor R1601 (fig. 40). Replace if resistance is incorrect. |
| 2 | Vertical pointer does not deflect, but TO-FROM meter and OFF vertical flag operate properly and audio can be heard. | Defective vertical pointer meter. | Measure resistance of vertical pointer meter winding (para 82). Replace meter, if defective. |
| 3 | TO-FROM meter does not deflect during VOR operation, but audio can be heard, vertical pointer deflects and OFF vertical flag is out of sight. | Defective TO-FROM meter | Measure resistance of TO-FROM meter winding (para 82). Replace meter if defective. |
| 4 | OFF vertical flag is visible at all times, even though TO-FROM meter and vertical pointer deflect, and signal strength is known to be reliable. | Defective OFF vertical flag meter. | Measure resistance of OFF vertical flag meter (para 82). Replace meter if defective. |

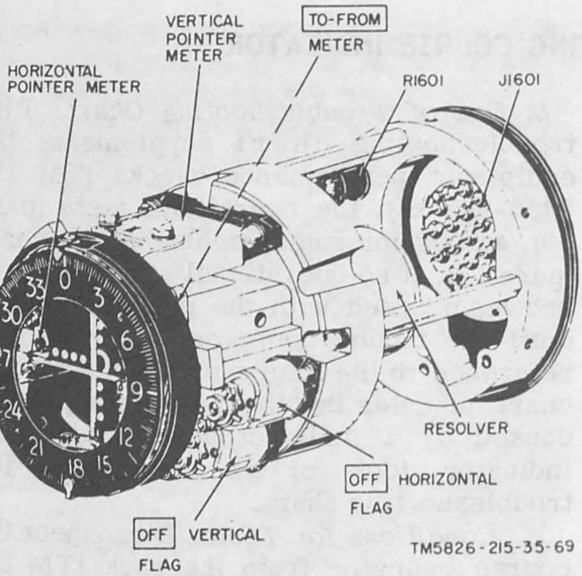



*Figure 40. Course indicator, case removed.*

## 82. Dc Resistance of Meter and Resolver Windings

The dc resistances of meter and resolver windings in the course indicator (fig. 40) are listed below:

| Winding | J1601 terminals | Resistance (ohms) |
|---|---|---|
| Vertical pointer | A-B | 1,000 ±3% |
| Horizontal pointer | C-D | 1,000 ±3% |
| OFF vertical flag | E-F | 1,000 ±3% |
| OFF horizontal flag | G-H | 1,000 ±3% |
| TO-FROM meter | I-J | 335 ±5% |
| Resolver: | | |
| Stator 1 | K-L | 1,040 ±8% |
| Stator 2 | K-N | 1,040 ±8% |
| Rotor 1 | O-P | 2,900 ±10% |

# CHAPTER 3
# REPAIR AND ALIGNMENT

## Section I. REPAIRS

### 83. General Parts Replacement Techniques

The following precautions and instructions apply specifically to the removal of parts from the vhf navigation receiver.

*Caution:* **Never use a soldering iron exceeding 25 watts to remove a component from a printed circuit board, a Zener diode, or a semiconductor crystal diode.**

*a. Vhf Navigation Receiver Printed Circuit Board Part Replacement.*

(1) Remove the large printed circuit board (fig. 25) from the vhf navigation receiver by removing the holding screws from the printed circuit mounting bracket.

(2) Make the parts on the small printed circuit board accessible by removing the two screws at each end of the capacitor mounting bracket, unsoldering the ground wire from A2C8, and pushing the mounting bracket up. Make parts on the large board accessible by separating the if./af assembly from the rf/if. assembly (para 86).

(3) Cut the leads of the defective part as close to the board as possible.

(4) Touch the soldering iron to the component part mounting hole until the solder in the mounting hole is melted and remove the old leads.

*Caution:* **Do not allow the soldering iron to make contact with any adjacent components and do not apply heat any longer than necessary.**

(5) Heat and remove any excess solder around the mounting holes.

(6) Shape the leads of the replacement part to fit the mounting holes; insert the leads in the mounting holes and crimp them to hold the part flat on the board.

(7) Apply a small amount of noncorrosive liquid soldering flux to the mounting holes with a toothpick or similar device.

(8) Tin the tip of the soldering iron.

(9) Bend the leads, on the opposite side of the printer circuit board, flat on the maximum conducting surface and apply the tip of the soldering iron long enough for solder to flow onto mounting holes.

*b. Vhf Navigation Receiver Zener Diodes Replacement.* Separate the if./af assembly from the rf/if. assembly (para 86) before replacing Zener diodes A2CR4 (fig. 24) and A2CR6. To replace diode A2CR4, perform procedures given in (1), (2), and (3) below. To replace diode A2CR6, perform procedures given in (4) through (7) below.

(1) Unsolder the bus wire from the positive terminal of the diode.

(2) Remove the two screws that hold the heat-sink block and remove the diode by unscrewing it from the block.

(3) When installing the new diode, screw it firmly into the heat-sink block, place the block in position, tighten the two screws, and resolder the bus wire to the positive terminal of the diode.

(4) Unsolder the two violet wires from the positive terminal of A2CR6.

(5) Hold the hexagonal shoulder of the diode body with pliers to prevent it from turning and remove the nut, washers, and diode.

(6) When installing the new diode, place the large solder lug under the diode, replace the flat washer and lockwasher on the stud, and tighten the nut; hold the hexagonal shoulder of the diode body to prevent turning.

(7) Resolder the two violet wires.

*c. Megacycle and Fractional Megacycle Crystal Replacement.*

(1) Separate the tuner assembly from the rf/if. assembly (para 87).
(2) Remove the crystal holding spring (3, fig. 45) from the appropriate crystal drum assembly by removing the four screws (4) that secure the plate to the drum (32).
(3) Use tweezers or small, long-nosed pliers and remove the desired crystal (5 or 6).
(4) Check the replacement crystal for correct frequency and straight pins.
(5) Install the replacement crystal.
(6) Place the crystal holding spring (3) in position over the crystals.
(7) Check each crystal for correct position under its segment of the plate.
(8) Secure the crystal holding spring with the four screws (4).

*d. Semiconductor Crystal Diode Replacement.* The vhf navigation receiver and converter contain semiconductor crystal diodes A2CR2 through A2CR6 (fig. 41), A3CR1, A3CR2 (fig. 31), and CR201 through CR212 (B, fig. 42). Whenever a diode is replaced, it must be correctly positioned. When soldering, hold the lead with pliers between the semiconductor body and the soldering point to form a heat sink and prevent excessive heat from damaging the diode. Do not remove the pliers until the heat from the solder joint has been dissipated.

### 84. Tube Replacement Techniques

When operational tests or troubleshooting procedures indicate that tubes in the vhf navigation receiver or in the converter are the possible cause of trouble, use the applicable procedure below to check the tubes.

*a. Tube Replacement.*

*Caution:* **Replacement of tubes A1V1 (fig. 41), A1V2, A1V6, or A2V4 ((1) below) may require realignment of the vhf navigation receiver (para 99 and 101). Never use a soldering iron exceeding 25 watts when soldering tube leads in the vhf navigation receiver.**

(1) *Vhf navigation receiver.* The tubes in the vhf receiver (fig. 41) are subminiature type and are accessible after removing the dust cover and side and bottom plates. The tubes have flexible leads soldered directly to terminal points. When replacing a tube, the location of the new tube leads should be as nearly like the original installation as possible. The spacing between tube leads should be kept to a minimum of one-sixteenth inch. Do not precut the tube leads before installation. Use a minimum amount of solder.

*Caution:* **Do not rock or rotate tubes ((2) below) when removing them from their socket; pull the tubes straight out with a tube puller to prevent bending of the tube pins.**

(2) *Converter.* The converter contains six 9-pin miniature tubes that are accessible after the top cover of the converter is removed (fig. 42).

*b. Tube Testing.* Remove and test one tube at a time. Discard a tube only if its defect is obvious or if the tube tester shows it to be defective. Do not discard a tube that tests at or near its minimum test limit on the tube tester. Put back the original tube in the same socket from which it was taken, or insert a new one, if required, before testing the next tube.

*c. Tube Substitution.* When troubleshooting the converter, it may be desired to isolate troubles by substituting tubes. Replace a suspected tube with a new tube. If the equipment remains inoperative, remove the new tube and put back the original tube. Repeat this procedure with each suspected tube until the defective tube is located. When troubleshooting the vhf navigation receiver, it is preferable to use the tube testing technique described in *b* above, since it eliminates the need to cut the leads in the replacement subminiature tube. All tubes used in the vhf navigation set are preferred-type tubes. Do not replace them with nonpreferred types.

### 85. Reforming Rack Capacitors C301, C302, and C303

Whenever the rack is repaired or, in any case, every 2 years, capacitors C301 (fig.

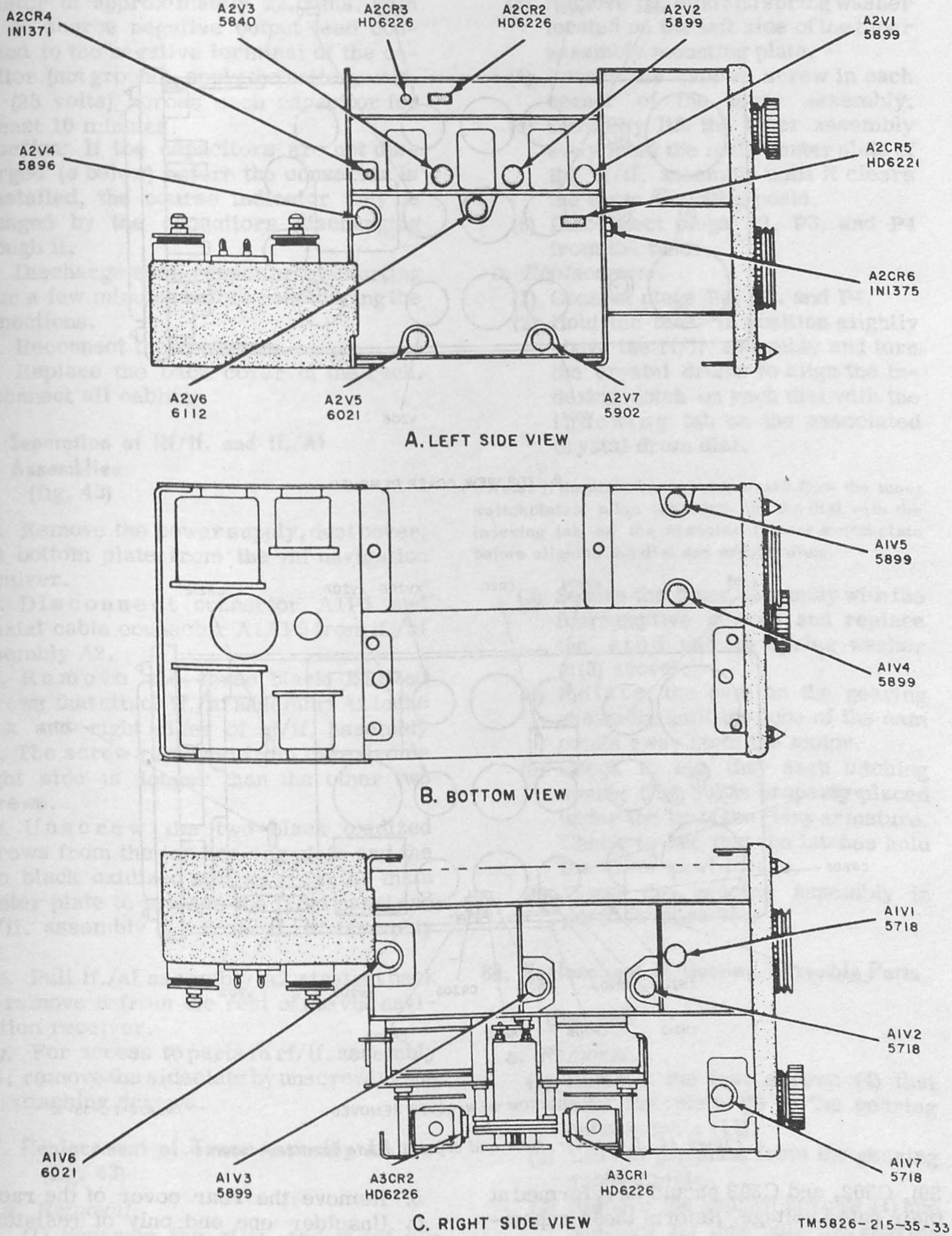
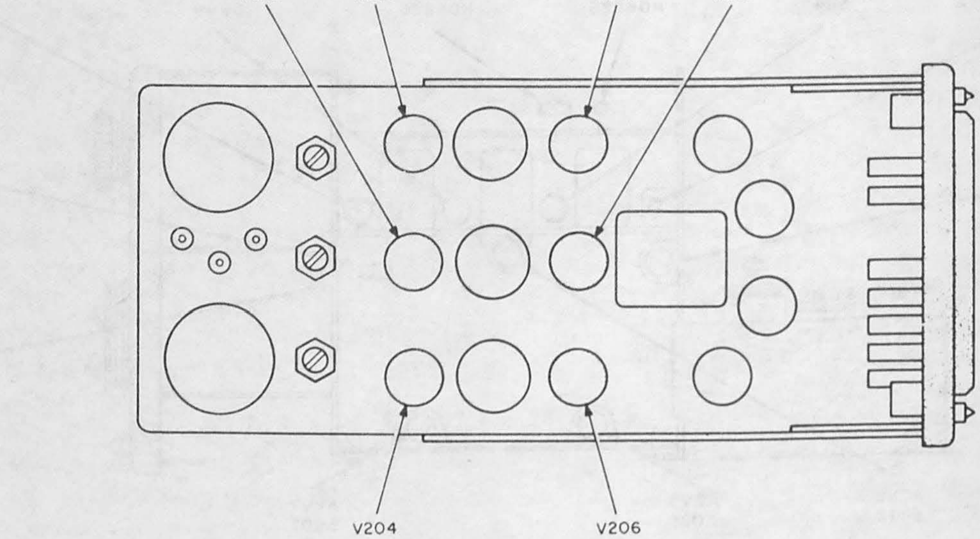
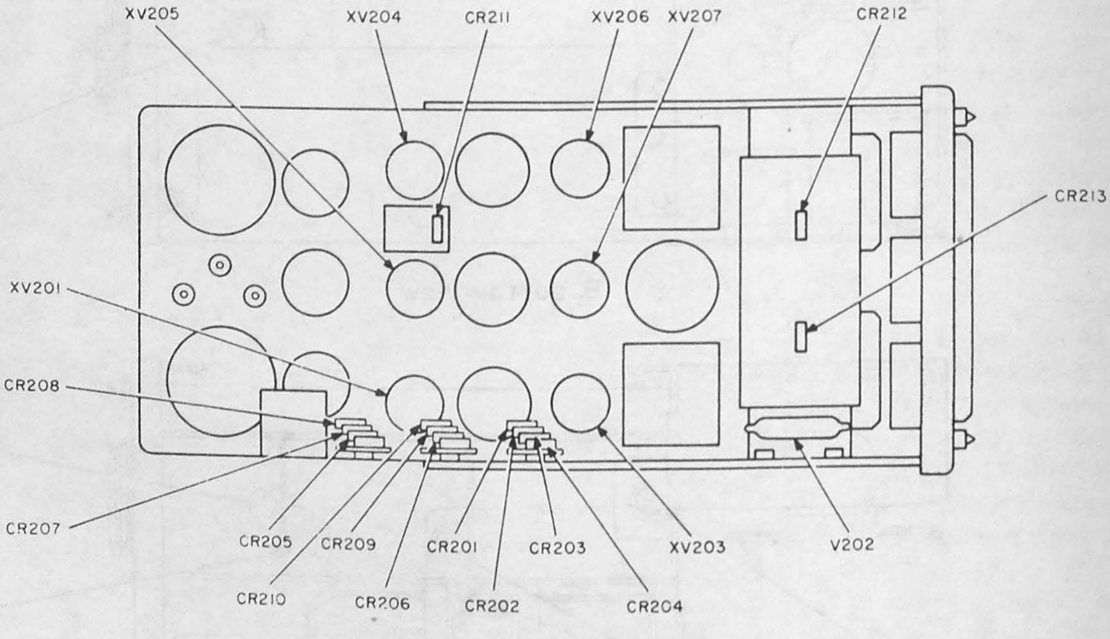



*Figure 41. Vhf navigation receiver, tube and crystal diode location diagram.*




A. TOP VIEW, COVER REMOVED




B. BOTTOM VIEW, COVER REMOVED

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*Figure 42. Converter, tube and crystal diode location diagram.*

39), C302, and C303 should be reformed at their rated voltage. Reform these capacitors as follows:

*a.* Disconnect all interconnecting cables. Remove the vhf navigation receiver and converter from the rack.

*b.* Remove the rear cover of the rack.

*c.* Unsolder one end only of resistors R301, R302, R303, and R304.

*d.* Connect a dc source with the rated voltage ±10 percent of the capacitor working voltage through a current limiting resistor of approximately 22 ohms. With the dc source negative output lead connected to the negative terminal of the capacitor (not ground), apply the battery voltage (28 volts) across each capacitor for at least 10 minutes.

*Caution:* **If the capacitors are not discharged (e below) before the converter is reinstalled, the course indicator may be damaged by the capacitors discharging through it.**

*e.* Discharge each capacitor by shorting it for a few minutes before resoldering the connections.

*f.* Reconnect the resistors.

*g.* Replace the back cover of the rack. Reconnect all cabling.

## 86. Separation of Rf/If. and If./Af Assemblies

(fig. 43)

*a.* Remove the power supply, dust cover, and bottom plate from the vhf navigation receiver.

*b.* Disconnect connector A1P1 and coaxial cable connector A1AP5 from if./af assembly A2.

*c.* Remove the three black oxidized screws that attach if./af assembly A2 to the back and right sides of rf/if. assembly A1. The screw removed from the extreme right side is longer than the other two screws.

*d.* Unscrew the two black oxidized screws from the top bearing plate and the two black oxidized screws from the main center plate to release the front panel and rf/if. assembly A1 from if./af assembly A2.

*e.* Pull if./af assembly A2 straight back to remove it from the rest of the vhf navigation receiver.

*f.* For access to parts in rf/if. assembly A1, remove the sideplate by unscrewing the 11 attaching screws.

## 87. Replacement of Tuner Assembly A3

(fig. 43)

*a. Removal.*

(1) Separate the rf/if. and if./af assemblies (para 86).

(2) Remove the gearing assembly (para 88).

(3) Remove the stud and spring washer located on the left side of the tuner assembly mounting plate.

(4) Loosen the captive screw in each corner of the tuner assembly.

(5) Carefully lift the tuner assembly away from the main center plate of the rf/if. assembly until it clears the three mounting posts.

(6) Disconnect plugs P2, P3, and P4 from the tuner.

*b. Replacement.*

(1) Connect plugs P2, P3, and P4.

(2) Hold the tuner in position slightly above the rf/if. assembly and turn the crystal drums to align the indexing notch on each dial with the indexing tab on the associated crystal drum dial.

*Note:* If the dials become separated from the tuner switchplates, align the notch on the dial with the indexing tab on the associated tuner switchplate before aligning the dial and crystal drum.

(3) Secure the tuner assembly with the four captive screws and replace the stud and its spring washer (*a*(3) above).

(4) Rotate the cam on the gearing assembly until the lobe of the cam points away from the motor.

(5) Check to see that each latching spring (fig. 50) is properly placed under the lip of the relay armature. Check to see that the latches hold the drive-pawl levers.

(6) Place the gearing assembly in position (para 88).

## 88. Replacement of Gearing Assembly Parts

(fig. 44)

*a. Removal.*

(1) Remove the four screws (4) that hold the plate (5) to the gearing subassembly (11).

(2) Lift off the plate from the gearing subassembly.

(3) Remove the captive screws (1) and washers (2) that hold the gearing assembly to the tuner assembly and the washers (7) through which motor A3B1 plug (6) passes.

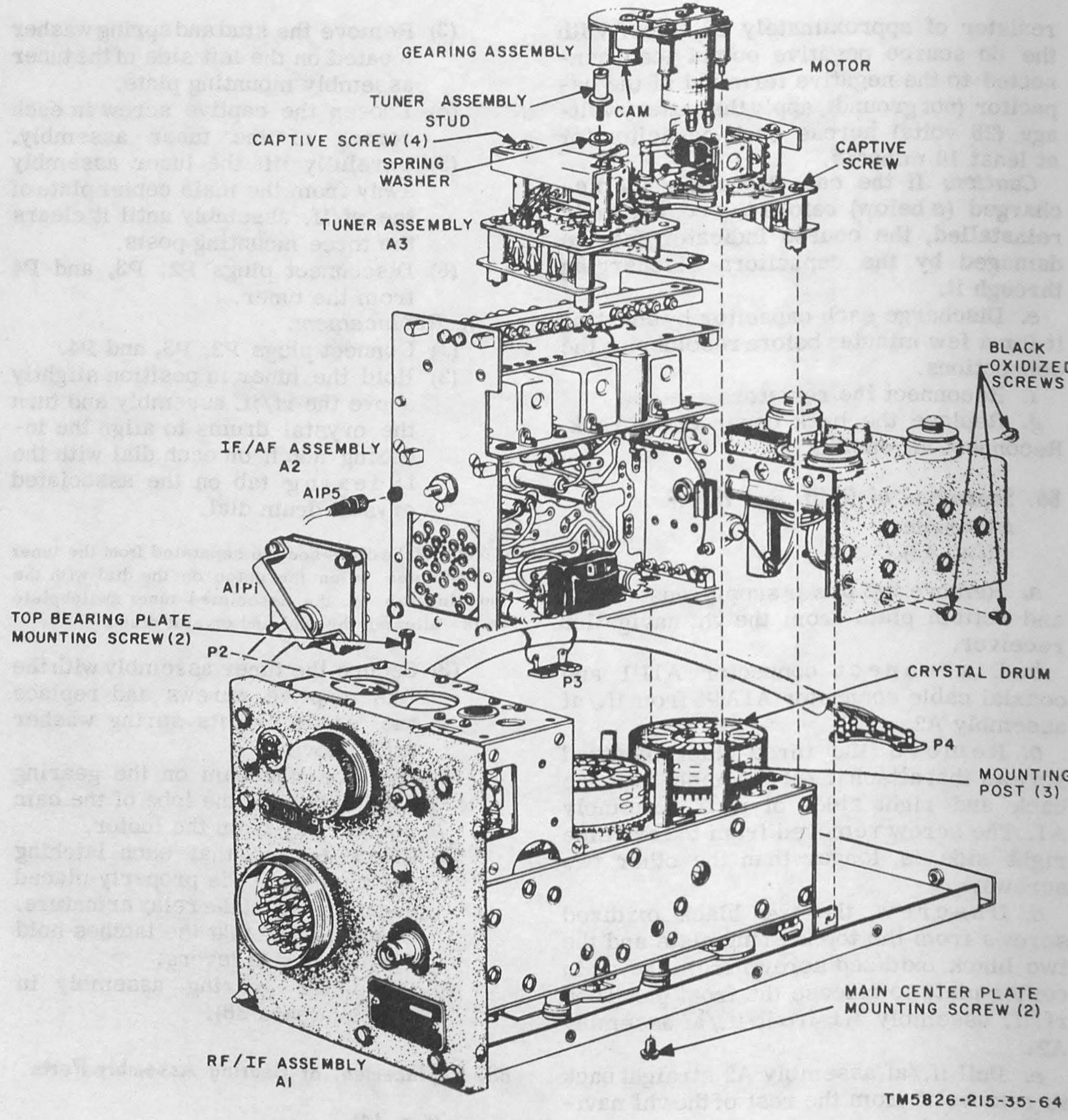



*Figure 43. Separation of vhf navigation receiver subassemblies.*

(4) Remove the screw that holds the support spring (10) to the gearing subassembly (11) and lower the support spring and motor A3B1 (8) from the gearing subassembly.

(5) Remove the plugs (6) from motor A3B1.

*b. Replacement.*

(1) Insert the plugs (6) in motor A3B1 through the washers (7).

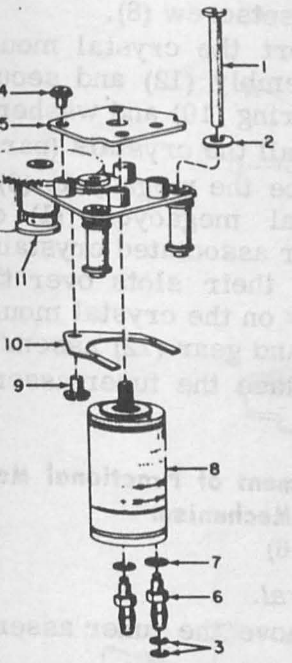
(2) Place the support spring (10) over motor A3B1; secure the support spring and motor to the gearing subassembly with the screw (9).

(3) Slip the washers (3) over the plugs (6) in motor A3B1 (8) and connect to the mating jack on the tuner assembly.

(4) Secure the gearing assembly to the

tuner assembly; use the captive screws (1) and washers (2).

(5) Lower the plate over the gearing subassembly and secure it with the four screws (4).




1 Captive screw
2 Washer
3 Washer
4 Screw
5 Plate
6 Plug
7 Washer
8 Motor A3B1
9 Screw
10 Support spring
11 Gearing subassembly

*Figure 44. Disassembly of gearing assembly.*

## 89. Replacement of Crystal Drums and Tuning Mechanism Parts

(fig. 45)

a. *Removal.*

(1) Remove the tuner assembly from the main center plate of the rf/if. assembly (para 87a).

(2) Slide the fractional megacycle (1) and megacycle (2) dials off the crystal drum assemblies.

(3) Remove the crystal holding springs (3), screws (4), and megacycle (6) and fractional megacycle (5) crystals (para 83c).

(4) Remove the setscrews (8) from the crystal mounting plate assembly (7) and the crystal mounting gear assembly (12).

(5) Remove the rings (10) from the crystal mounting plate assembly (7) and the crystal mounting gear assembly (12). Let the ring and washer (11) on the crystal mounting plate assembly (7) slide down the shaft assembly (29).

(6) Remove the washer (11) on the crystal mounting plate assembly (7).

(7) Lift off the crystal mounting plate assembly (7), crystal mounting gear assembly (12), ring (10), and bearing (9) from the crystal mount plate subassembly (7).

(8) Slide the bottom plate forward against the tension of the springs at the bottom of the lower rf frame assembly (30) and drop the cam assembly (27), ring (10), washer (11), and shaft assembly (29) out the bottom.

(9) Remove the setscrew (28) in the cam assembly and separate the cam assembly, ring, and washer from the shaft assembly.

(10) Use long-nosed pliers or tweezer and lift the two springs (21 and 22) attached to the terminals (18) screwed to the bottom plate (20) away from the terminals.

(11) Remove the setscrews (28) in the four bearings (9) attached to the bottom of the lower rf frame assembly (30).

(12) Remove the bearings with their associated washers and the bottom plate, which is supported by the bearings.

(13) Remove the screws (19) that hold the terminals (18) to the bottom plate (20).

(14) Remove the setscrews (26) that hold each of the three blocks (25) to their associated tuning capacitor posts.

(15) Remove the blocks (25) and attached parts.

(16) Remove the springs (22) and connecting terminals (23) from the arm assemblies (24).

(17) Disconnect the arm assemblies (24) from the blocks (25).

*b. Replacement.*

(1) Insert the arm assemblies (24) in the blocks (25).

(2) Slide the blocks (25) over the tuning capacitor posts and secure them with the setscrews (26).

(3) Interconnect the two forward block and arm assemblies (24) with two terminals (23) and a spring (22).

(4) Secure the terminals (18) to the bottom plate (20) with the screws (19).

(5) Install three of the four bearings (9) to the lower rf frame assembly (30) and secure with the setscrews (28).

(6) Fit the bottom plate (20) into the groove in the three bearings (9).

(7) Slip the fourth bearing groove over the bottom plate (20) and secure the bearing and bottom plate by tightening the setscrew (28) in the bearing.

(8) Connect one spring (22) to a flat terminal (23) and install the spring-terminal combination by slipping the free end of the terminal over the post on the rear arm assembly (24) and the free end of the spring over the bottom plate terminal (18) post.

(9) Install the fourth spring between the post on the bottom of the lower rf frame assembly (30) and the free terminal post on the bottom plate.

(10) Slip the cam assembly (27) over the shaft assembly (29) and secure with the setscrew (28).

(11) Insert the shaft assembly through the appropriate hole in the bottom of the lower rf frame assembly (30).

(12) Slip the ring (10) and washer (11) over the shaft assembly (29) in that order, then insert the top end of the shaft assembly through the hole in the top of the lower rf frame assembly.

(13) Lower the bearing (9) over the top of the shaft assembly and secure it with the ring (10).

(14) Lower the crystal mounting plate assembly (7) over the bearing and shaft assembly and secure with the setscrew (8).

(15) Insert the crystal mounting gear assembly (12) and secure it with the ring (10) and washer (11).

(16) Install the crystals (para 83*o*).

(17) Place the megacycle (2) and fractional megacycle (1) dials over their associated crystals and position their slots over the locking pins on the crystal mounting plate (7) and gear (12) assemblies.

(18) Replace the tuner assembly (para 87).

## 90. Replacement of Fractional Megacycle Tuning Mechanism

(fig. 46)

*a. Removal.*

(1) Remove the tuner assembly (para 87).

(2) Remove the screws (1) that hold the glass capacitors (2) to the plate (6) and push the capacitors aside gently.

(3) Loosen the ring (4) from the top bearing (3) and lift the bearing out of the plate.

(4) Remove the plate by removing the attaching screws.

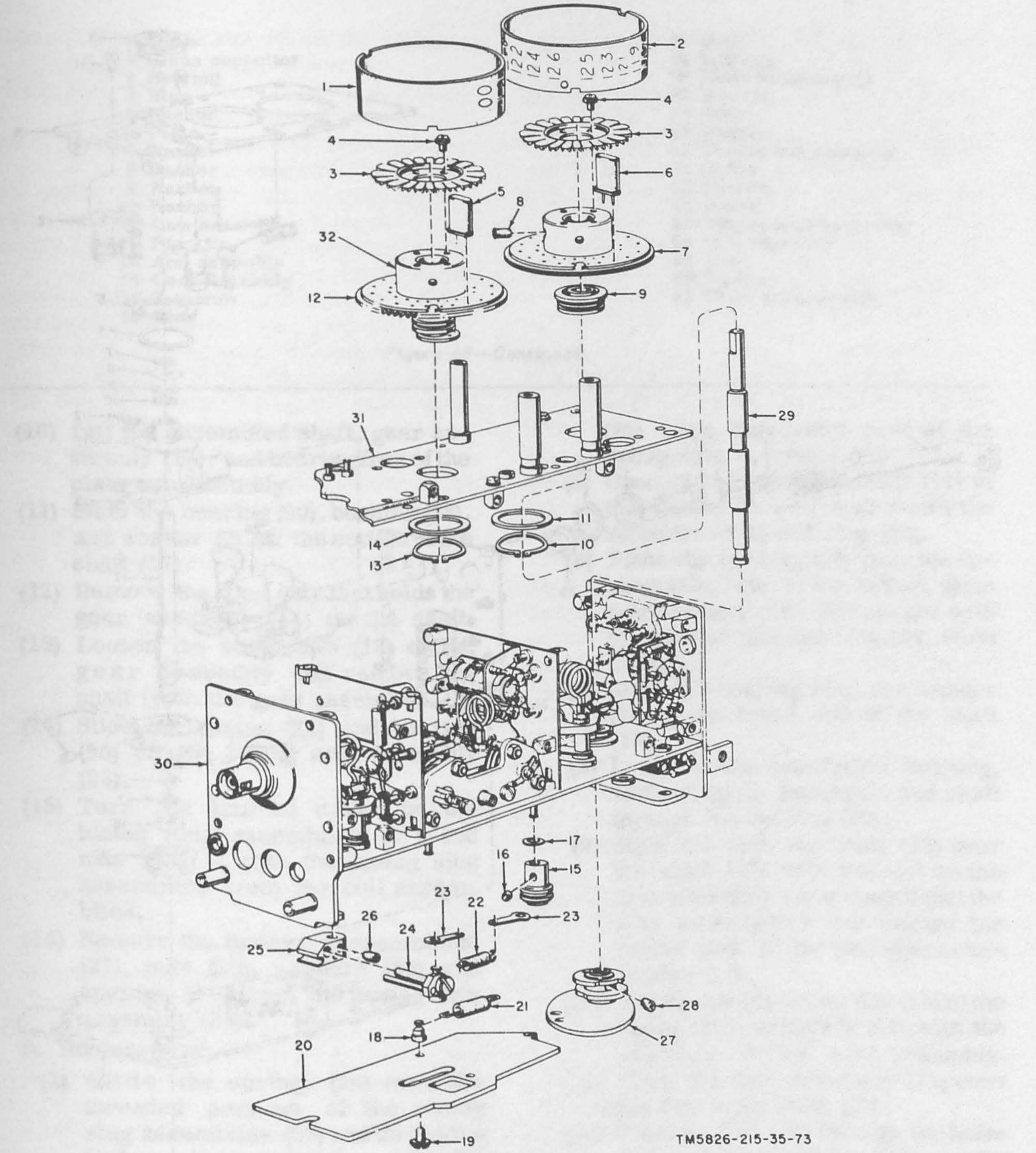
(5) Push out the pin (12) in the cam assembly (11) and lift the cam assembly, four washers (7, 8, 9, and 10), ring (4), and washer (5) off the shaft (17).

(6) Loosen the setscrew that holds the arm assembly (13) to the tuning arm assembly (23).

(7) Slide the arm assembly away from the tuning arm assembly.

(8) Slip the arm assembly off the shaft (17).

(9) Remove the ring (16) and washer (7) that holds the bearing (20) at the bottom of the plate subassembly (19).




1 Fractional megacycle dial
2 Megacycle dial
3 Crystal holding spring
4 Screw
5 Fractional megacycle crystal
6 Megacycle crystal
7 Crystal mounting plate assembly
8 Setscrew
9 Bearing
10 Ring
11 Washer
12 Crystal mounting gear assembly
13 Ring
14 Washer
15 Bearing
16 Setscrew
17 Washer
18 Terminal
19 Screw
20 Bottom plate
21 Spring
22 Spring
23 Terminal
24 Arm assembly
25 Block
26 Setscrew
27 Cam assembly
28 Setscrew
29 Shaft assembly
30 Lower rf frame assembly
31 Plate subassembly
32 Drum

*Figure 45. Disassembly of crystal drums and megacycle tuning mechanism.*

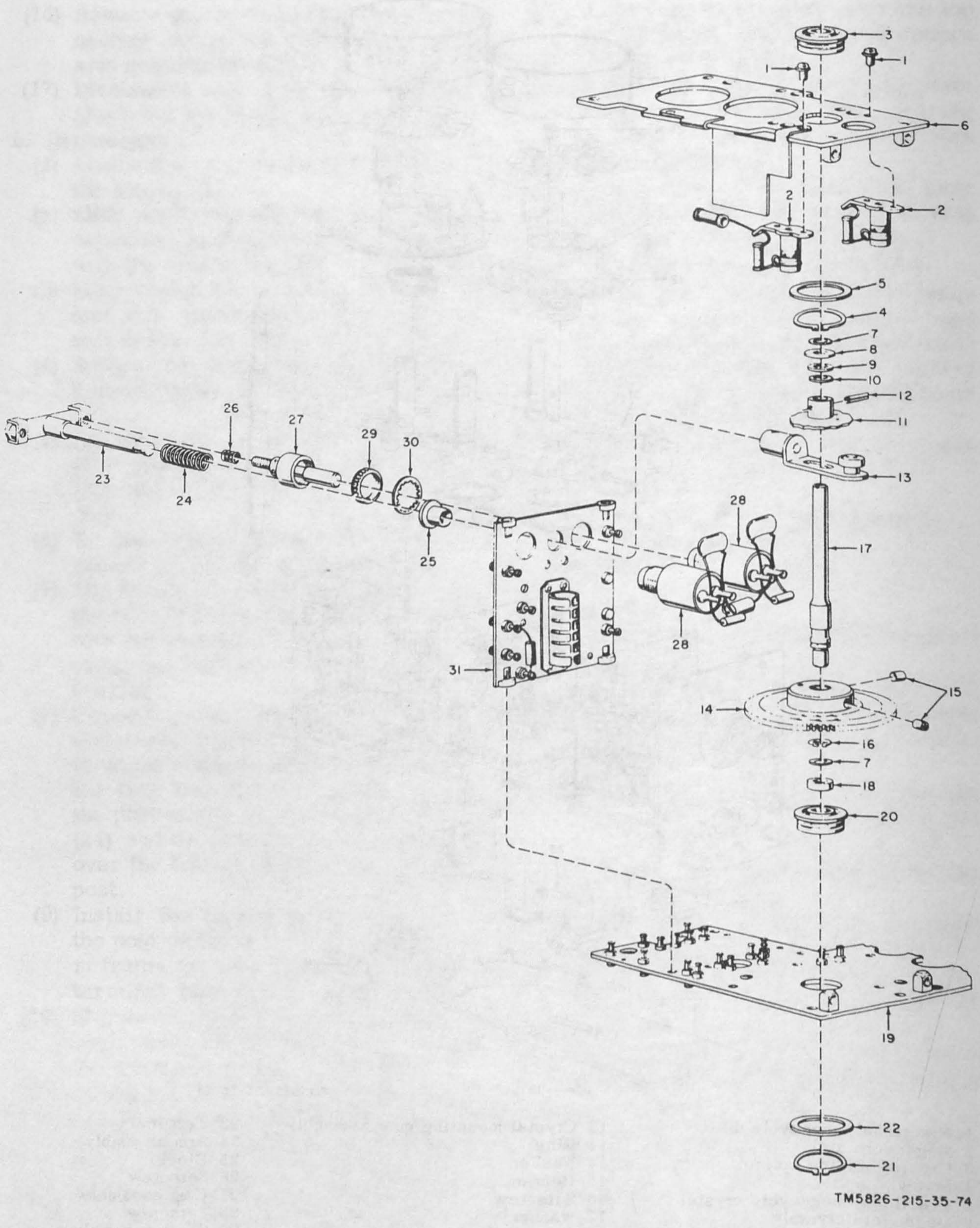



*Figure 46. Disassembly of fractional megacycle tuning mechanism.*

| | |
|---|---|
| 1 Screw | 17 Shaft |
| 2 Glass capacitor | 18 Bushing |
| 3 Bearing | 19 Plate subassembly |
| 4 Ring | 20 Bearing |
| 5 Washer | 21 Ring |
| 6 Plate | 22 Washer |
| 7 Washer | 23 Tuning arm assembly |
| 8 Washer | 24 Spring |
| 9 Washer | 25 Bearing |
| 10 Washer | 26 Spring |
| 11 Cam assembly | 27 Tuning slug assembly |
| 12 Pin | 28 Coil assembly |
| 13 Arm assembly | 29 Nut |
| 14 Gear assembly | 30 Washer |
| 15 Setscrew | 31 Plate subassembly |
| 16 Ring | |

*Figure 46—Continued.*

(10) Lift the assembled shaft, gear assembly (14), and bearing free of the plate subassembly.

(11) Slide the bearing (20), bushing (18), and washer (7) off the bottom of the shaft (17).

(12) Remove the ring (16) that holds the gear assembly (14) on the shaft.

(13) Loosen the setscrews (15) on the gear assembly and remove the shaft from the gear assembly.

(14) Slide the spring (24) and bearing (25) off the tuning arm assembly (23).

(15) Turn the knurled collar on the tuning slug assemblies (27) and nuts (29) to free the tuning slug assemblies from the coil assemblies.

(16) Remove the tuning slug assemblies (27), nuts (29), washers (30), and springs (26) from the tuning arm assembly (23).

*b. Replacement.*

(1) Slide the springs (24) over the threaded portions of the tuning slug assemblies (27) and thread the tuning slug assemblies into the tuning arm assembly (23).

(2) Slide the nuts (29) and washers (30) over the smooth end of the tuning slug assemblies (27).

(3) Push the coil assemblies (28) through the holes in the plate subassembly (19) and secure them to the tuning slug assemblies (27).

(4) Slide the spring (24) and bearing (25) over the center post of the tuning arm assembly (23).

(5) Connect the gear assembly (14) to the shaft (17) and secure with the setscrews (15) and ring (16).

(6) Place the bearing (20) over the appropriate hole in the bottom plate subassembly (19), and secure with the washer (22) and ring (21) from below.

(7) Slide the bushing (18), and washer (7) on the lower end of the shaft (17).

(8) Insert the assembled bushing, washer, gear assembly, and shaft through the bearing (20).

(9) Slide the arm assembly (13) over the shaft (17) with the slot on the arm assembly so arranged that the arm assembly can engage the center post of the tuning arm assembly (23).

(10) Secure the arm assembly (13) to the tuning arm assembly (23) with the setscrew in the arm assembly.

(11) Slide the cam assembly (11) over the top of the shaft (17).

(12) Push the pin (12) through the holes in the cam assembly (11) and the shaft (17).

(13) Slide the four washers (7, 8, 9, and 10) onto the shaft (17) over the cam assembly (11).

(14) Mount the plate (6) over the shaft (17) and secure it with the attaching screws.

(15) Slip the washer (5) over the bearing (3) and lower the bearing through

the hole in the plate (16) onto the shaft (17).

(16) Insert the ring (4) into the bearing (3).

(17) Mount the glass capacitors (2) and secure with the attaching screws.

(18) Replace the tuner assembly (para 87).

## 91. Replacement of Tuner Parts
(fig. 47)

*a. Removal.*

(1) Remove the screws (2) that hold the contact shield (1); then lift off the contact shield.

(2) Remove the mounting screws (5) and setscrews (6) for the relay (4) and crystal diode (3) assemblies and remove the relay and the crystal diode assemblies.

(3) Remove the retaining rings (9) for the left-hand pawl assembly (7) and right-hand pawl assembly (8).

(4) Slide off the washers (10), left-hand and the right-hand pawl assemblies, and springs (11).

(5) Disconnect the spring (12) that interconnects the left-hand (33) and right-hand (23) lever assemblies.

(6) Remove the retaining ring (14) and washer (15) from the post of each lever assembly.

(7) Remove the retaining ring (17) that secures the pawl assemblies (16) on the two lever assemblies (23 and 33).

(8) Unhook the attaching springs (12) and lower the pawl assemblies from the lever assemblies.

(9) Remove the screws (19) from the posts in the two lever assemblies.

(10) Remove the posts (18), flat washers (20), shouldered washers (21), and springs (13) from each lever assembly.

(11) Remove the pawl assemblies (7 and 8).

(12) Remove the springs (34) from the left-hand (38) and right-hand (39) ratchet assemblies.

(13) Remove the nut (36) and washer (37) from each ratchet assembly.

(14) Lift off the index plate (35) on each ratchet assembly.

(15) Remove the left-hand and right-hand ratchet assembly.

(16) Remove the bushings (40) from the panel subassembly (53).

(17) Loosen the studs (41) below the panel subassembly, and remove the washers (42) and plate assemblies (43).

(18) Remove the posts (45) that hold the contact plate assembly (44) and remove the contact plate assembly.

(19) Remove the screws (46) that hold the plate subassembly (49) that contains the capacitor (47) and choke (48) and remove the plate subassembly.

(20) Remove the retaining rings (51), washers (52), and bearings (50) from the panel subassembly (53).

*b. Replacement.*

*Note:* Refer to figures 31 and 50 for positioning the parts being replaced.

(1) Secure the bearings (50, fig. 47) and washers (52) on the panel subassembly (53) with the retaining rings (51).

(2) Connect the plate subassembly (49) (containing the capacitor (47), choke (48), and contact plate assembly (44)) to the panel subassembly (53) and secure with the screws (46) and posts (45), respectively.

(3) Connect the washers and plate assemblies to the bearings (50) in the panel subassembly (53) and secure with the studs.

(4) Slip the bushing (40) over the top of the bearings.

(5) Place the left-hand (38) and right-hand (39) ratchet assemblies over their respective bushings (40).

(6) Lower the index plates (35) over the studs (41) on the ratchet assemblies.

(7) Place the washers (37) over each index plate center hole and secure the assembly with the nuts (36).

(8) Place the spring (34) on each assembly between the flange on the

index plate (35) and the stud (41) on the ratchet assembly.

(9) Place the lever assemblies over their respective panel subassembly posts (18) and slip the springs (22) over the lever assembly collar on the panel subassembly post (18).

(10) Slip the washers (20 and 21) over the posts and secure the collared ends of the lever assemblies with the retaining rings (17).

(11) Connect one end of the springs (22) that were connected as instructed in (9) above around the panel subassembly posts (54) and the other ends around the posts that project downward from the lever assemblies.

(12) Raise the collar on the posts (18) through the slots in the lever assemblies.

(13) Slip the springs (13) and washers (21 and 20) over the post (18) collars and secure with the screws (19).

(14) Bend the springs (13) that were connected as instructed in (13) above so that the ends fit around the semicircular post on the lever assembly and around the terminal post on the pawl assembly (16).

(15) Raise the pawl assembly associated with each lever assembly onto the posts that were connected as instructed in (12) above, fit the slotted end into the ratchet assembly groove, and secure with the retaining rings (51).

(16) Interconnect the two lever assemblies with the coil spring (12).

(17) Lower the springs (11), washers (10), right-hand (8) and left-hand (7) pawl assemblies and washers over the large corner posts on the panel subassembly (53).

(18) Secure the right- and left-hand pawl assemblies with the retaining rings (9).

(19) Fit one end of the springs that were connected as instructed in (17) above around the lever assembly studs (41) that project up through the holes in the right- and left-hand pawl assemblies.

(20) Fit the other end of the springs that were connected as instructed in (17) above around the grooved post on the pawl assemblies.

(21) Secure the relay (4) and crystal diode (3) assemblies in place with the screws (5) and setscrews (6).

(22) Mount the contact shields (1) in place with the screws (2).

## 92. Lubrication

*Caution:* **Be sure that no oil or grease touches the spring contacts or printed circuit contact plates on switches S1A and S1B of the vhf navigation control unit. Lubricants on these parts will cause intermittent contact.**

*a.* Refer to figures 48 and 49 for lubrication instructions on the vhf navigation receiver and control unit. The symbol 500 on each of these illustrations stands for a period of 500 hours. This time period refers to 500 hours of operating time, not elapsed time.

*b.* To lubricate the vhf navigation receiver, remove the dust cover and separate the if./af assembly from the rf/if. assembly (para 86). Clean the points to be lubricated (fig. 48) with a long brush dipped in Cleaning Compound (Federal stock No. 7930-395-9542). Remove excess cleaner from the brush to prevent the cleaning compound from dripping into the unit.

*Warning:* **Cleaning compound is flammable and its fumes are toxic. Do not use near a flame; provide adequate ventilation.**

*c.* Use a sharp-pointed tool to apply a small amount of grease to several of the indexing plate notches and ratchet teeth, and to the lever arm post bearings. Use a brush to apply a small amount of silicone fluid to several points on the switchplate contact surface and to several crystal pins in each crystal drum.

*d.* To lubricate the vhf navigation control unit, remove the dust cover from the unit. Clean the points to be lubricated (fig. 49) with a long brush dipped in cleaning compound. Remove excess cleaner from the

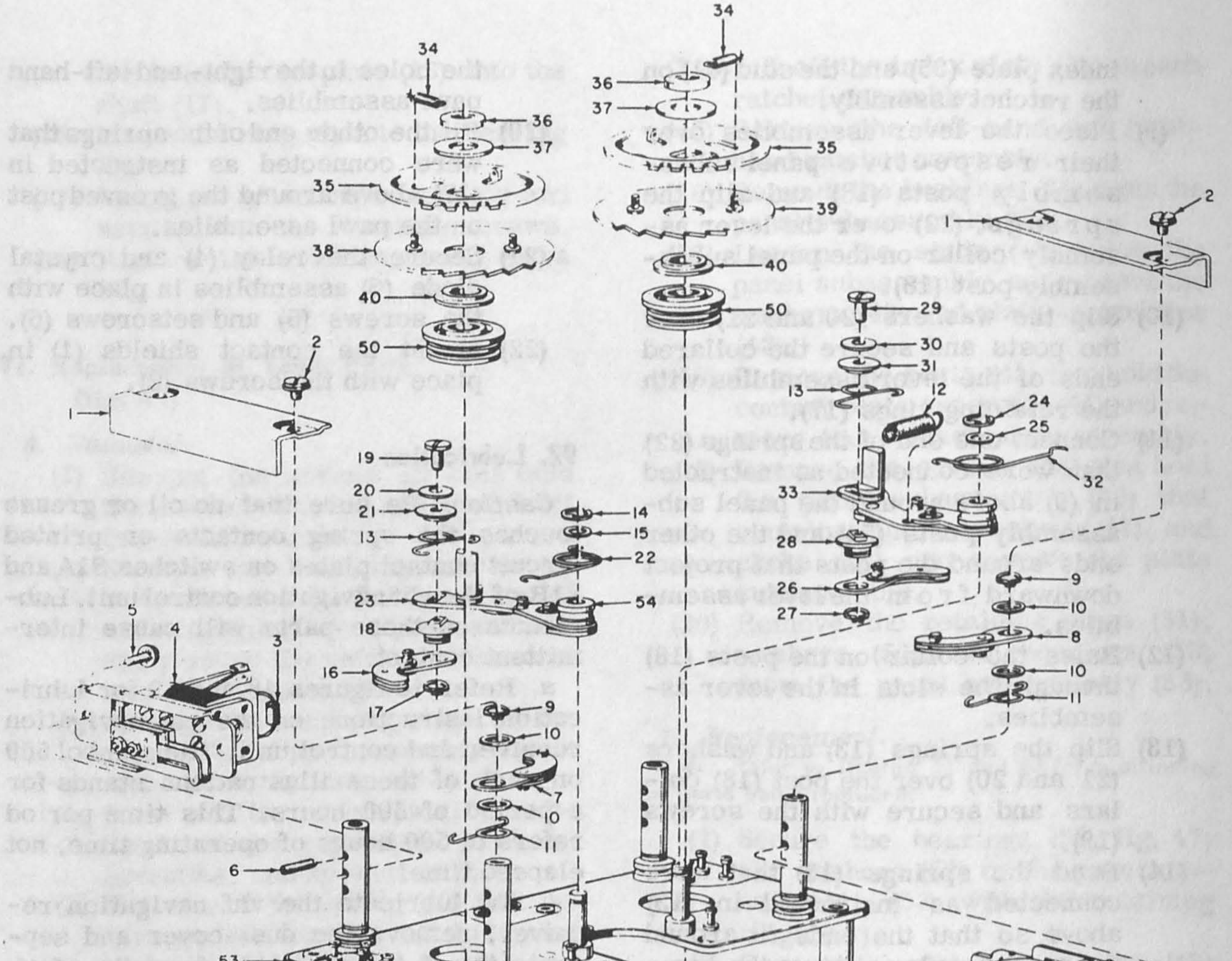



*Figure 47. Disassembly of tuner assembly.*

1 Contact shield
2 Screw
3 Crystal diode
4 Relay
5 Screw
6 Setscrew
7 Left-hand pawl assembly
8 Right-hand pawl assembly
9 Ring
10 Washer
11 Spring
12 Spring
13 Spring
14 Ring
15 Washer
16 Pawl assembly
17 Ring
18 Post
19 Screw
20 Washer
21 Washer
22 Spring
23 Right-hand lever assembly
24 Ring
25 Washer
26 Pawl assembly
27 Ring
28 Post
29 Screw
30 Washer
31 Washer
32 Spring
33 Left-hand lever assembly
34 Spring
35 Index plate
36 Nut
37 Washer
38 Left-hand ratchet assembly
39 Right-hand ratchet assembly
40 Bushing
41 Stud
42 Washer
43 Plate assembly
44 Contact plate assembly
45 Post
46 Screw
47 Capacitor
48 Choke
49 Plate subassembly
50 Bearing
51 Ring
52 Washer
53 Panel subassembly
54 Panel assembly post

*Figure 47—Continued.*

brush to prevent the cleaning compound from dripping into the unit. Use a brush to apply a thin coat of grease to the detent gear teeth and bevel gear teeth. Use a sharp-pointed tool, and with the vhf navigation control unit upside down, apply 1 drop of oil to each control shaft bearing. With the unit right side up, apply 1 drop of oil to each drum shaft bearing.

e. The following parts have been lubricated by the manufacturer:

*(1) Vhf navigation receiver.*

| Part | Military lubricant | Commercial lubricant | Lubrication period (hr) |
|---|---|---|---|
| Indexing plate notches and ratchet teeth | Grease, Aircraft and Instrument (GL) | | 500 |
| Lever arm post bearing | Grease, Aircraft and Instrument (GL) | | 500 |
| Switchplate contact surface | | Silicone fluid Dow-Corning 510 (500 centistrokes viscosity), Dow Chemical Co., Midland, Mich; or equivalent. | 500 |
| Crystal pins | | Silicone fluid Dow-Corning 510 (500 centistrokes viscosity), Dow Chemical Co., Midland, Mich; or equivalent. | 500 |

*(2) Vhf navigation control unit.*

| Part | Military lubricant | Lubrication period (hr) |
|---|---|---|
| Detent gear | Grease, Aircraft and Instrument (GL) | 500 |
| Bevel gear | Grease, Aircraft and Instrument (GL) | 500 |
| Control shaft bearing | Lubricating Oil, General Purpose, Preservative, (PL-Medium) | 500 |
| Drum shaft bearing | Lubricating Oil, General Purpose, Preservative, (PL-Medium) | 500 |

## 93. Vhf Navigation Receiver Tuner Assembly Adjustments

Normally, adjustment of tuner assembly A3 is not necessary; however, if readjustment is required, proceed as follows:

*a.* Adjust the latching relay position as follows:

(1) Turn the equipment off.

(2) Remove the receiver top cover by removing the 4 screws on the top cover, the screws on the bottom plate, and the 11 screws on the sideplate.

(3) Rotate the gearing assembly drive cam to its maximum-throw position (fig. 50).

(4) Remove the two screws that hold each guard in place.

(5) Adjust the relay mounting screws and relay locking setscrews so that the latch overlaps the latching pin by at least 0.020 inch and clears the pin by at least 0.015 inch when the relay is unenergized. When the relay is energized, the latch must disengage the latching pin with at least 0.015-inch clearance on the back stroke.

*b.* Adjust the driving stroke as follows:

(1) Loosen the drive-pawl pivot screw.

(2) Use the slotted end of the drive-pawl lever and adjust the pawl position so that with the relay energized and the drive cam near maximum throw, the indexing pin drops into the slot in the index plate at each drum position. When the drive cam is in the minimum-throw position, the drive pawl must retract enough to engage the following ratchet tooth of the drive ratchet plate at each drum position.

## 94. Vhf Navigation Receiver Tracking Adjustments

Normally, adjustment of the rf and if. tracking circuits is not necessary; however, if mechanical parts in the tuning linkage were changed, their alignment should be checked before proceeding with electrical tests. Due to the pawl action, the crystal drums turn in one direction only. The megacycle crystal drum and associated cams start at 108 mc, ascend in even-megacycle steps to 126 mc, pass through the blank position to 125 mc, then descend in odd-megacycle steps to 109 mc, to complete the cycle. Adjust the tracking circuit as follows:

*a.* Turn the equipment off.

*b.* Remove the vhf navigation receiver top cover, bottom plate and sideplate.

*c.* Set the vhf navigation receiver megacycle crystal drum to the blank space between 126 and 125 mc. The hole on the maximum radius of the heart-shaped cam should be directly over the shaft of A1C28 (B, fig. 51). If the hole is not properly aligned, loosen the No. 4 splined-drive setscrew that attaches the crystal drum to the cam driving shaft, and rotate the cam into proper alignment. The setscrew is accessible through a hole in the crystal drum at the blank space. Tighten the setscrew.

*d.* Check the operation of audio level switch A1S2 (B, fig. 51). As the megacycle crystal drum is rotated, the associated lever should close switch A1S2 halfway between 119 and 117 on the crystal drum, and open the switch halfway between 116 and 118. If the switch does not operate properly, proceed as follows:

(1) Set the megacycle drum to 119.

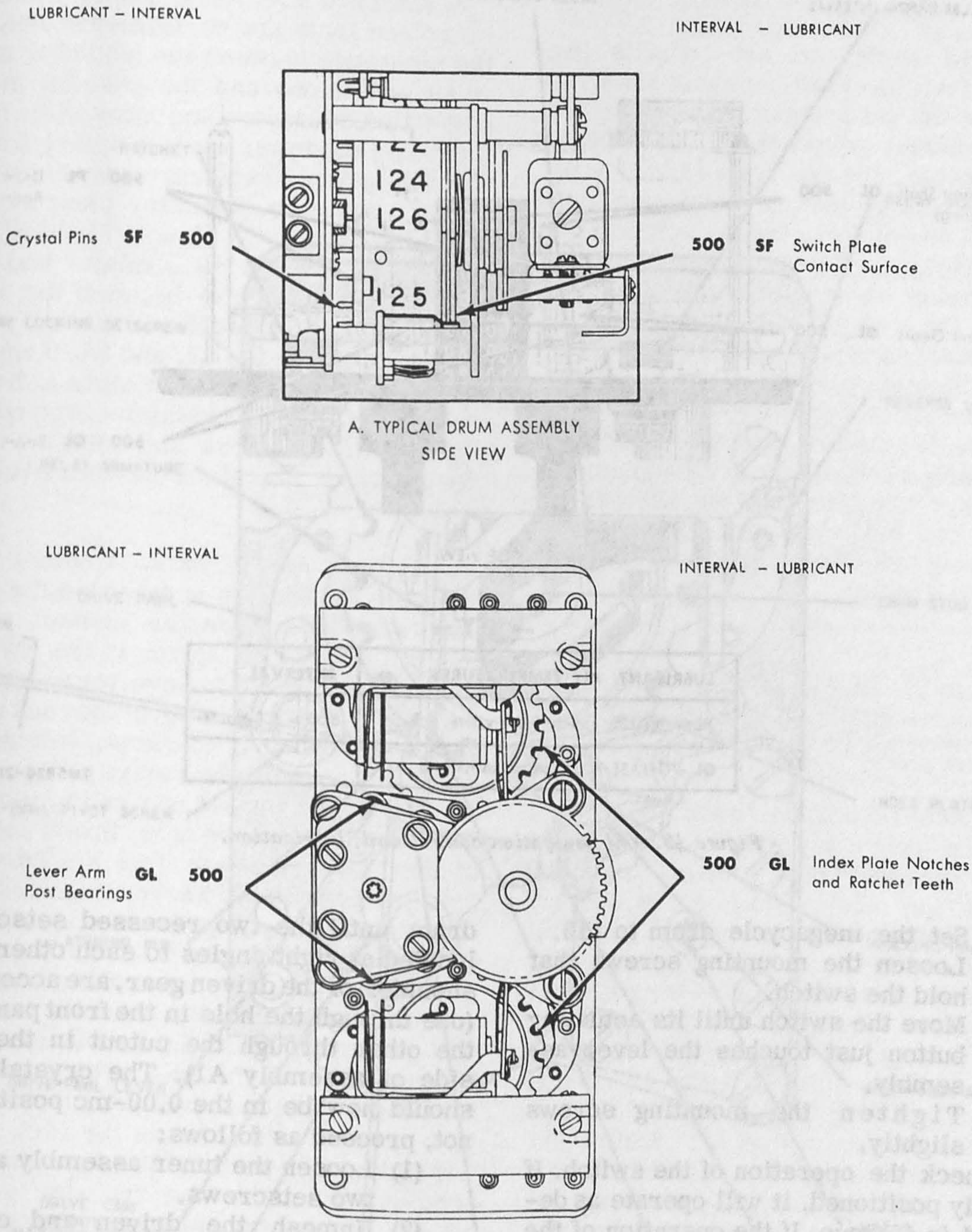
(2) Loosen the mounting screws that hold the switch.

(3) Move the switch until its actuating button just touches the lever assembly.

(4) Tighten the mounting screws slightly.

*e.* Check the operation of the switch. If properly positioned, it will operate as described in *d* above. If the switch operation is normal, tighten the mounting screws. If the switch does not actuate properly, repeat the instructions in *d*(1) through (4) above.

*f.* Check the operation of localizer switch A1S1 (B, fig. 51). As the megacycle crystal drum is rotated, the associated lever should close switch A1S1 halfway between 113 and 111 on the crystal drum, and open the switch halfway between 110 and 112. If the switch does not operate properly, proceed as follows:




**— KEY —**

| LUBRICANT, ALL TEMPERATURES | INTERVAL |
|---|---|
| **GL** – GREASE, Aircraft and Instruments | **500** – 500 Hours |
| **SF** – SILICONE FLUID, Dow Corning 510 | |

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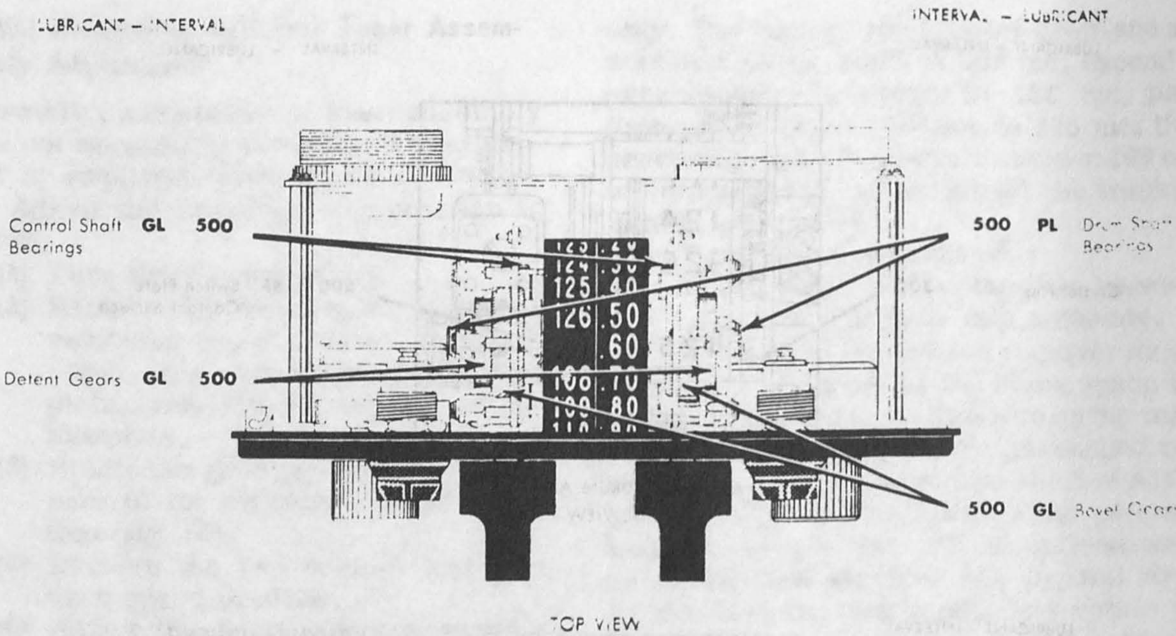
*Figure 48. Vhf navigation receiver, lubrication.*




**— KEY —**

| LUBRICANT, ALL TEMPERATURES | INTERVAL |
|---|---|
| PL – OIL, Lubricating, Preservative, Special | 500 – [illegible] Hours |
| GL – GREASE Aircraft and Instruments | |

TM5826-215-35-45

*Figure 49. Vhf navigation control unit, lubrication.*

(1) Set the megacycle drum to 113.
(2) Loosen the mounting screws that hold the switch.
(3) Move the switch until its actuating button just touches the lever assembly.
(4) Tighten the mounting screws slightly.

*g.* Check the operation of the switch. If properly positioned, it will operate as described in *f* above. If the operation of the switch is normal, tighten the mounting screws. If the switch does not actuate properly, repeat the instructions in *f* (1) through (4) above.

*h.* Check the alignment of the fractional megacycle crystal drum gear and its associated driven gear.

*i.* Remove the button plug, located below the SQUELCH control on the vhf navigation receiver front panel.

*j.* Turn the fractional megacycle crystal drum until the two recessed setscrews, located at right angles to each other in the shoulder of the driven gear, are accessible (one through the hole in the front panel and the other through the cutout in the right side of assembly A1). The crystal drum should now be in the 0.00-mc position. If not, proceed as follows:

(1) Loosen the tuner assembly and the two setscrews.
(2) Unmesh the driven and crystal drum gears.
(3) Turn the crystal drum to 0.00 mc, and remesh the gears.
(4) Tighten the tuner assembly, but do not tighten the setscrews.

*k.* Turn the slotted driven-gear shaft until maximum coil-slug penetration is reached.

*l.* Tighten the two setscrews.

*m.* Check the gain of the 1.7-mc if. amplifiers (para 65*c*).

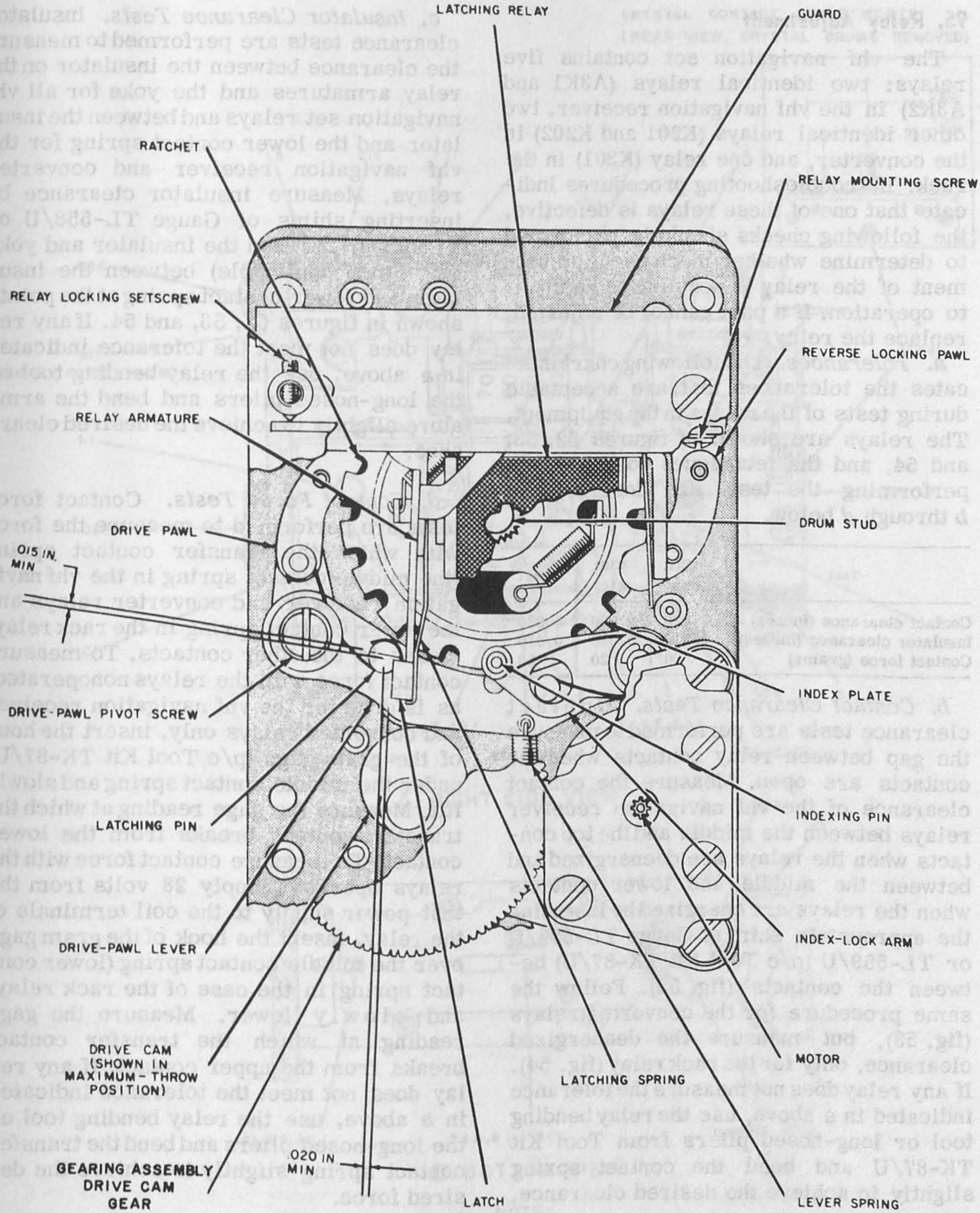



*Figure 50. Tuner assembly A3, adjustment points.*

## 95. Relay Adjustment

The vhf navigation set contains five relays: two identical relays (A3K1 and A3K2) in the vhf navigation receiver, two other identical relays (K201 and K202) in the converter, and one relay (K301) in the rack. If troubleshooting procedures indicate that one of these relays is defective, the following checks should be performed to determine whether mechanical adjustment of the relay is possible to return it to operation. If a part cannot be adjusted, replace the relay.

a. *Tolerances.* The following chart indicates the tolerances that are acceptable during tests of the relays in the equipment. The relays are shown in figures 52, 53, and 54, and the techniques to be used in performing the tests are described in *b* through *d* below.

| Test | A3K1, A3K2 | K191, K102 | K301 |
|---|---|---|---|
| Contact clearance (inches) | 0.020 | 0.020 | 0.030 |
| Insulator clearance (inches) | 0.010 | 0.010 | 0.010 |
| Contact force (grams) | 20 | 20 | 50 |

b. *Contact Clearance Tests.* Contact clearance tests are performed to measure the gap between relay contacts when the contacts are open. Measure the contact clearance of the vhf navigation receiver relays between the middle and the top contacts when the relays are deenergized and between the middle and lower contacts when the relays are energized by inserting the appropriate shim of Gauge TL-558/U or TL-559/U (p/o Tool Kit TK-87/U) between the contacts (fig. 52). Follow the same procedure for the converter relays (fig. 53), but measure the deenergized clearance, only for the rack relay (fig. 54). If any relay does not measure the tolerance indicated in *a* above, use the relay bending tool or long-nosed pliers from Tool Kit TK-87/U and bend the contact spring slightly to achieve the desired clearance.

c. *Insulator Clearance Tests.* Insulator clearance tests are performed to measure the clearance between the insulator on the relay armatures and the yoke for all vhf navigation set relays and between the insulator and the lower contact spring for the vhf navigation receiver and converter relays. Measure insulator clearance by inserting shims of Gauge TL-558/U or TL-559/U between the insulator and yoke and (when applicable) between the insulator and lower contact spring at the points shown in figures 52, 53, and 54. If any relay does not meet the tolerance indicated in *a* above, use the relay bending tool or the long-nosed pliers and bend the armature slightly to achieve the desired clearance.

d. *Contact Force Tests.* Contact force tests are performed to measure the force with which the transfer contact spring (the middle contact spring in the vhf navigation receiver and converter relays and the lower contact spring in the rack relay) makes to the other contacts. To measure contact force with the relays nonoperated, as is done for the vhf navigation receiver and converter relays only, insert the hook of the gram gage (p/o Tool Kit TK-87/U) under the middle contact spring and slowly lift. Measure the gage reading at which the transfer contact breaks from the lower contact. To measure contact force with the relays operated, apply 28 volts from the test power supply to the coil terminals of the relay. Insert the hook of the gram gage over the middle contact spring (lower contact spring in the case of the rack relay) and slowly lower. Measure the gage reading at which the transfer contact breaks from the upper contact. If any relay does not meet the tolerance indicated in *a* above, use the relay bending tool or the long-nosed pliers and bend the transfer contact spring slightly to achieve the desired force.

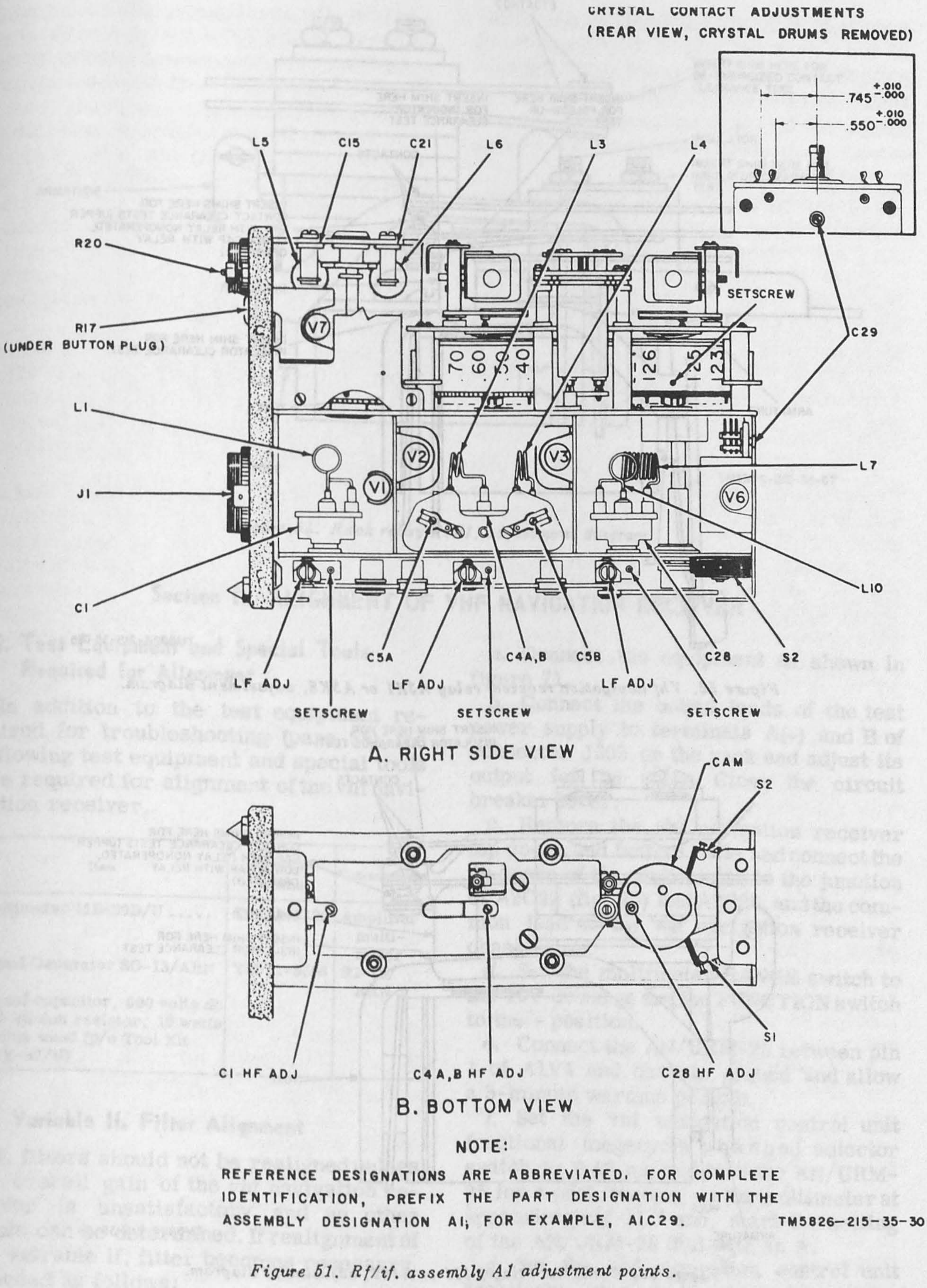



*Figure 51. Rf/if. assembly A1 adjustment points.*

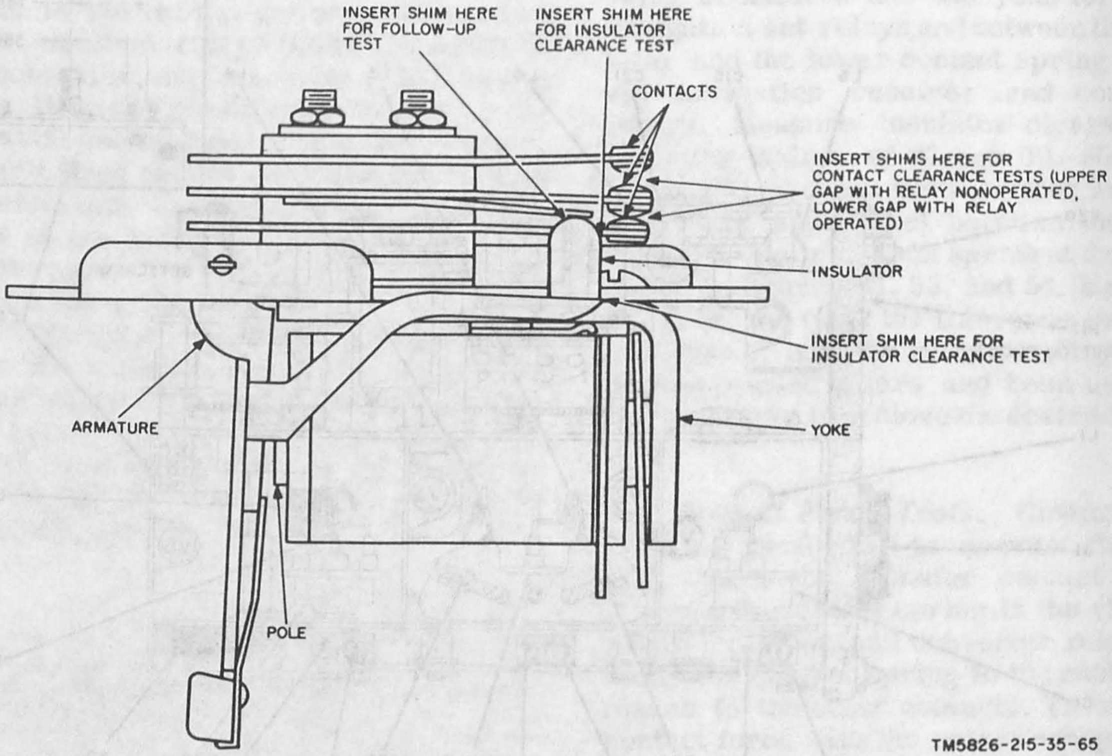



*Figure 52. Vhf navigation receiver relay A3K1 or A3K2, adjustment diagram.*

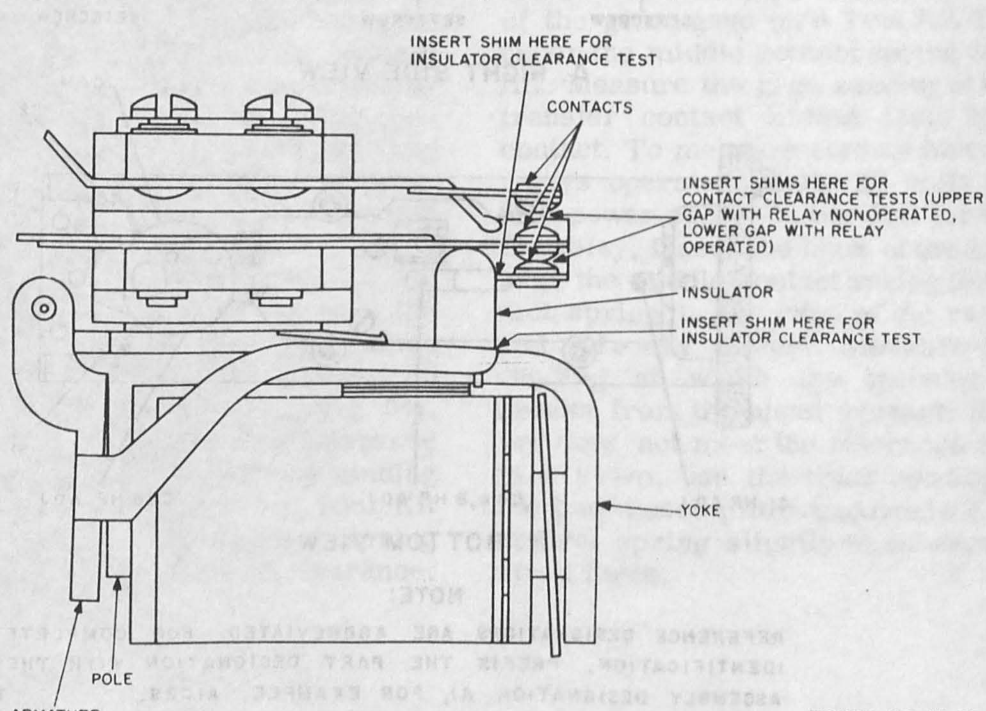



*Figure 53. Converter relay K101 or K102, adjustment diagram.*

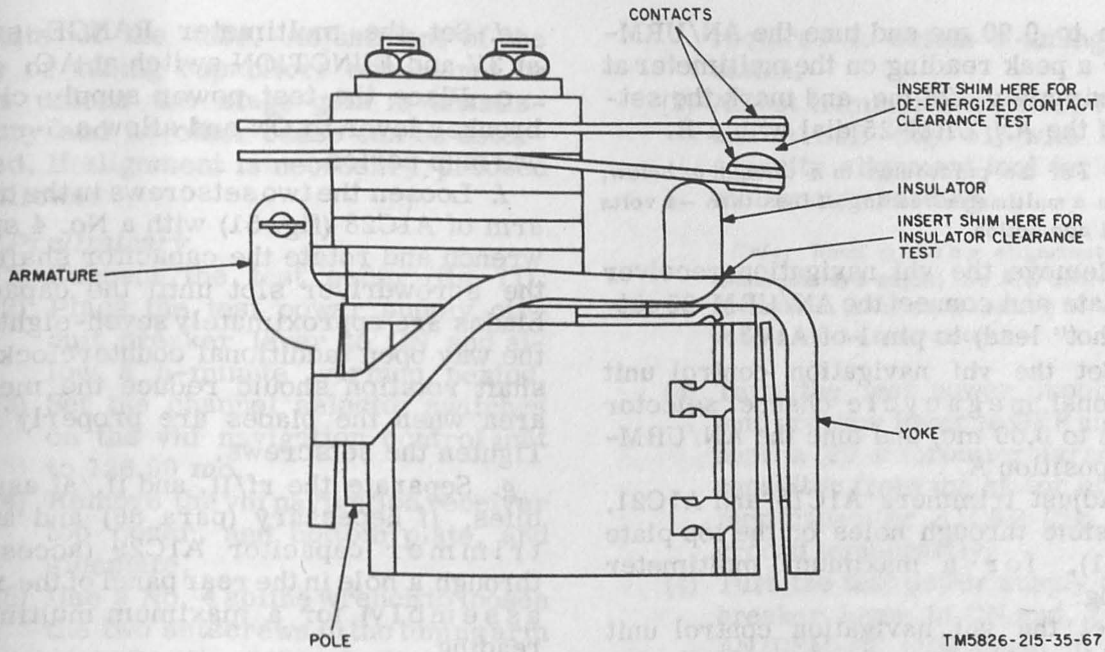



*Figure 54. Rack relay K301, adjustment diagram.*

## Section II. ALIGNMENT OF VHF NAVIGATION RECEIVER

### 96. Test Equipment and Special Tools Required for Alignment

In addition to the test equipment required for troubleshooting (para 58), the following test equipment and special tools are required for alignment of the vhf navigation receiver.

| Item | Technical manual | Common name |
|---|---|---|
| Multimeter ME-30B/U ..... | TM 11-5132 | Amplifier multimeter |
| Signal Generator SG-13/ARN | TM 11-5556 | SG-13/ ARN |
| 20-uuf capacitor, 600 volts dc | | |
| 200-kilohm resistor, 10 watts | | |
| Tuning wand (p/o Tool Kit TK-87/U) | | |

### 97. Variable If. Filter Alignment

If. filters should not be realigned unless the overall gain of the vhf navigation receiver is unsatisfactory and no other cause can be determined. If realignment of the vairable if. filter becomes necessary, proceed as follows:

*a.* Connect the equipment as shown in figure 71.

*b.* Connect the output leads of the test power supply to terminals A(+) and B of connector J305 on the rack and adjust its output for 28 volts. Close the circuit breaker lever.

*c.* Remove the vhf navigation receiver top cover and bottom plate and connect the dc probe of the multimeter to the junction of A2C22 (fig. 25) and A2R26, and the common lead to the vhf navigation receiver chassis.

*d.* Set the multimeter RANGE switch to the 10V dc range and the FUNCTION switch to the - position.

*e.* Connect the AN/URM-25 between pin 1 of A1V4 and chassis ground and allow a 5-minute warmup period.

*f.* Set the vhf navigation control unit fractional megacycle channel selector switch to 0.00 mc and tune the AN/URM-25 for a peak reading on the multimeter at approximately 11.7 mc; mark the setting of the AN/URM-25 dial with an A.

*g.* Set the vhf navigation control unit fractional megacycle channel selector switch to 0.90 mc and tune the AN/URM-25 for a peak reading on the multimeter at approximately 126 mc, and mark the setting of the AN/URM-25 dial with a B.

*Note.* For the procedures in *h* through *o* below, maintain a multimeter reading of less than −4 volts to avoid agc action.

*h.* Remove the vhf navigation receiver sideplate and connect the AN/URM-25 output ("hot" lead) to pin 1 of A1V3.

*i.* Set the vhf navigation control unit fractional megacycle channel selector switch to 0.00 mc, and tune the AN/URM-25 to position A.

*j.* Adjust trimmers A1C15 and A1C21, accessible through holes on the top plate (fig. 51), for a maximum multimeter reading.

*k.* Set the vhf navigation control unit fractional megacycle channel selector switch to 0.90 mc, and tune the AN/URM-25 to position B.

*l.* Adjust slug-tuned inductors A1L5 (fig. 51) and A1L6 for a maximum multimeter indication by rotating each inductor slug clockwise or counterclockwise; use a small capstan wrench (p/o Tool Kit TK-87/U) or lever.

*m.* Repeat the procedures in *i* through *l* above until further adjustment of indicator slugs produces negligible increase in output, as indicated on the multimeter. The inductance adjustment should always be the final adjustment.

*n.* Make if. stage gain measurements (para 65*c*).

*o.* Deenergize the equipment.

## 98. Megacycle Oscillator-Doubler Alignment

Align the megacycle oscillator-doubler stage as follows:

*a.* Connect the test setup (fig. 71).

*b.* Remove the vhf navigation receiver top cover and bottom plate and set the vhf navigation control unit megacycle channel selector switch to 126 mc.

*c.* Connect the COMMON clip of the multimeter to chassis ground and the ac probe to the junction of pins 2 and 8 of A1V3. (Tube A1V3 is accessible through a large hole provided in the left sideplate (fig. 26).

*d.* Set the multimeter RANGE switch at 3V and FUNCTION switch at AC.

*e.* Place the test power supply circuit breaker lever to ON and allow a 5-minute warmup period.

*f.* Loosen the two setscrews in the tuning arm of A1C28 (fig. 51) with a No. 4 spline wrench and rotate the capacitor shaft; use the screwdriver slot until the capacitor blades are approximately seven-eighths of the way open (additional counterclockwise shaft rotation should reduce the meshed area when the blades are properly set). Tighten the setscrews.

*g.* Separate the rf/if. and if./af assemblies, if necessary (para 86) and adjust trimmer capacitor A1C29 (accessible through a hole in the rear panel of the rf/if. assembly) for a maximum multimeter reading.

*h.* Use the tuning wand to check doubler coil A1L10 (fig. 51) for a peak multimeter reading. Place the iron tip near the coil; if the reading increases, move the turns of A1L10 closer together. Place the brass tip near the coil; if the reading increases, spread the turns of A1L10. A maximum multimeter reading should be obtained when the wand is held away from the coil.

*i.* Set the vhf navigation control unit megacycle channel selector switch to 108 mc.

*j.* Recheck A1L10 with the tuning wand. If necessary, turn the A1C28 tuning arm adjustment screw to obtain a peak multimeter reading when the wand is removed.

*k.* Check A1L7 with the tuning wand. If necessary, adjust the coil turn spacing as described for A1L10 in *j* above.

*l.* Repeat *g* through *j* above until no further improvement in output occurs.

*m.* Check the rf output for every megacycle channel. The multimeter should read 0.7 volt (minimum) for each channel.

*n.* Deenergize the equipment.

## 99. Rf Alignment

Complete rf alignment is necessary if major parts, such as tuning capacitors and tuning arms, are replaced. Generally, only replacement of a tube requires the adjustment of the tuned input and output circuits of the tube. Adjustment of the coils or tuning capacitors should not be made unless the stage gain is unsatisfactory and no other cause can be determined. If alignment is necessary, proceed as follows:

a. *Preliminary.*

(1) Connect the test setup (fig. 71).

(2) Place the test power supply circuit breaker lever to ON and allow a 5-minute warmup period.

(3) Set the channel selector switches on the vhf navigation control unit to 126.50 mc.

(4) Remove the vhf navigation receiver top cover, and bottom plate, and sideplate.

(5) Use a No. 4 spline wrench to loosen the two setscrews in the tuning arm of A1C4 (fig. 51) and adjust the capacitor rotor; use the screwdriver slot in the end of the capacitor shaft, so that the capacitor blades are approximately seven-eighths of the way open. (Additional counterclockwise shaft rotation should reduce the meshed area when the blades are properly set.) Tighten the setscrews.

(6) Loosen the two setscrews in the tuning arm of cascode grid tuning-capacitor A1C1 and rotate the shaft until the capacitor is at its approximate minimum-capacity position. Tighten the setscrews.

(7) Connect the dc probe of the multimeter to the junction of A2C22 and A2R26 (fig. 25), and the COMMON clip to the vhf navigation receiver chassis.

(8) Set the multimeter RANGE switch to the 10V position and the FUNCTION switch to the - position.

(9) Connect the output of the AN/USM-44 to ANT jack J1 on the vhf navigation receiver front panel.

b. *Procedure.*

(1) Tune the AN/USM-44 through 126.50 mc, as indicated by a maximum reading on the multimeter. At first, a relatively large signal generator output voltage may be required to obtain a tuning indication.

(2) Adjust trimmer capacitors A1C5A and A1C5B (fig. 51) with a low-capacity alignment tool for a peak multimeter reading.

*Note.* When making alignment adjustments, always adjust the AN/USM-44 output level to maintain a reading of -4 volts or less on the multimeter.

(3) Turn the test power supply circuit breaker lever to OFF and connect a 20-micromicrofarad (uuf) capacitor from the stator of trimmer capacitor A1C5B (fig. 51) to ground temporarily.

(4) Turn the test power supply circuit breaker lever to ON and, with the AN/USM-44 still tuned to 126.50 mc, readjust trimmer capacitor A1C5A for a peak reading on the multimeter.

(5) Check antenna coil A1L1 with the tuning wand for optimum peaking. If adjustment is required, loosen the two setscrews in the tuning arm of A1C1, adjust the capacitor rotor as required to obtain a maximum reading, and tighten the setscrews.

(6) Set the vhf navigation control unit channel selector switches to 108.50 mc and tune the AN/USM-44 for a maximum multimeter reading at 108.50 mc.

(7) Use the tuning wand to check plate coil A1L3 for optimum tuning. If adjustment is required, carefully tune A1C4 or A1L3 to obtain maximum output.

(8) Check A1L1 with the tuning wand for optimum peaking. If adjustment is required, tune A1C1 by means of its tuning arm adjustment screw.

(9) Set the vhf navigation control unit channel selector switches to 126.50 mc.

(10) Turn the power off ((3) above) and disconnect the 20-uuf capacitor ((3) above), and connect it from the stator of A1C5A to ground.

(11) Turn the power on ((4) above) and tune the AN/USM-44 for 126.50 mc.

(12) Adjust A1C5B for a peak multimeter reading.
(13) Set the vhf navigation control unit channel selector switches to 108.50 mc and tune the AN/USM-44 for 108.50 mc.
(14) Check A1L4 with the tuning wand. If adjustment is required, tune A1L4 to obtain maximum output. Repeat (9) through (12) above.
(15) Remove power ((3) above) and disconnect the 20-uuf capacitor in ((10) above).
(16) Replace the vhf navigation receiver sideplate and set the vhf navigation control unit channel selector switches to 126.50 mc.
(17) Tune the AN/USM-44 for 126.50 mc and adjust A1C5B through the access hole in the sideplate, for peak output.
(18) Adjust if. sensitivity control A1R17 to approximately 80 percent of full clockwise travel.
(19) Adjust the AN/USM-44 for a 4-microvolt, 108.50-mc, rf output modulated 30 percent by a 1,000-cps audio signal and set the vhf navigation control unit to 108.50 mc. Connect the amplifier multimeter between A2J4 and ground.
(20) Adjust the VOL-OFF knob on the vhf navigation control unit for a 14-db indication on the voltmeter.
(21) Record the amplifier multimeter reading obtained when the AN/USM-44 and the vhf navigation control unit are set to the following frequencies: 108.00, 108.90, 113.00, 113.50, 113.90, 117.00, 117.50, and 117.90 mc. The reading at each frequency should be 14 ±6 db.
(22) Set the AN/USM-44 and the vhf navigation control unit to 118.00 mc. The multimeter reading should drop approximately 9 db from the level recorded ((21) above).
(23) Adjust the VOL-OFF knob on the vhf navigation control unit for a 14-db indication on the amplifier multimeter. Record the amplifier multimeter reading obtained when the AN/USM-44 and the vhf navigation control unit are set to the following frequencies: 118.00, 118.90, 122.00, 122.50, 122.90, 126.00, 126.50, and 126.90 mc. The reading at each frequency should be 14 ±6 db.
(24) Deenergize the equipment.

## 100. Vhf Navigation Receiver Output Level Adjustment

*a. Preliminary.*

(1) Connect the test setup (fig. 71).
(2) Place the test power supply circuit breaker lever to ON and allow a 5-minute warmup period.
(3) Remove the vhf navigation receiver top cover and bottom plate.
(4) Connect the amplifier multimeter between pin 5 of A2J4 and the vhf navigation receiver chassis.
(5) Set the vhf navigation control unit channel selector switches and the test set generator to 114.90 mc.
(6) Set the test set generator FUNCTION switch at 30∿; adjust the 30∿ MOD switch for 30-percent modulation and the ATTENUATOR control to 50 microvolts.
(7) Connect the test set generator OUTPUT ATTEN jack to the ANT jack of the vhf navigation receiver. The amplifier multimeter should indicate between 1.8 and 2.1 volts. If necessary, change the value of A2R45 (fig. 25) to obtain the correct voltage. The resistor should be between 50K and 470K ohms.

*b. Procedure.*

(1) Check the amplifier multimeter reading at 30-percent modulation of 9,960-cps modulation signals. The reading should not vary more than ±1.5 db from the 30-cps value obtained (*a*(7) above).
(2) Set the vhf navigation control unit and the test set generator to 110.90 mc.
(3) Adjust the test set generator 30∿ MOD control for 20-percent modulation and set the FUNCTION switch to the AMP LOC (pointer centered) position.

(4) Set the test set generator ATTENUATOR control to 50 microvolts. The amplifier multimeter should read 1.8 ±0.2 volts and the course indicator vertical pointer should center.

(5) Set the test set generator FUNCTION switch to AMP LOC (pointer left) position. The amplifier multimeter should read 1.8 ±0.2 volts and the course indicator vertical pointer should swing left.

(6) Set the test set generator FUNCTION switch to AMP LOC (pointer right) position. The amplifier multimeter should read 1.8 ±0.2 volts and the course indicator vertical pointer should swing right.

(7) Deenergize the equipment.

### 101. Receiver Phase Shift Check

The 30-cps phase shift of the vhf navigation receiver must be 192° overall. Replacement of capacitor C16, C17, C18, or C19; resistor R13, R14, or R44; transformer T3; or tube V4 in the if./af assembly may change the phase shift. As a result, an overall check of the vhf navigation receiver course accuracy should be performed as follows:

*a.* Connect the test setup (fig. 71).

*Note:* Be sure that the converter is operating properly when performing the following steps:

*b.* Remove the vhf navigation receiver top cover.

*c.* Connect the test set generator to vhf navigation receiver ANT jack J1.

*d.* Adjust the test set generator for a 114.9-mc, 0° angle to omni modulation signal and set the test set generator ATTENUATOR control to 50 microvolts.

*e.* Set the course indicator course selector knob to position the course pointer to exactly 0°. If the vertical pointer is deflected completely out of the 3/16-inch diameter black circle, adjust the value of resistor A2R44 (fig. 25) to bring the pointer to an on-course indication. The resistor used should be between 47K and 470K ohms. If the pointer is off course but still inside the black circle, converter control R225 (fig. 34) may be adjusted for an on-course indication.

*f.* Slowly increase the test set generator ATTENUATOR setting to 5,000 microvolts, and then decrease it to 5 microvolts. The pointer should not leave the black circle. Any erratic reading may be A2C29, A2C15, or A2C34, which should be replaced with capacitors that have a minimum of the rated capacitance value. Erratic reading may also result if diode A2CR1 or A2CR2 is defective.

## Section III. ALIGNMENT OF CONVERTER

### 102. Test Equipment Required for Alignment

In addition to the equipment required for alignment of the vhf navigation receiver (para 96), Maintenance Kit, Electronic Equipment MK-252/ARN (TM 11-5826-210-12) is required for alignment of the converter.

### 103. Special Converter Alignment Considerations

*a.* The phase of the 30-cps navigation output of the vhf navigation receiver leads the phase of the input modulation envelope by 192° when the vhf navigation receiver navigation output line is open-circuited. This phase shift must be considered whenever the converter is tested or aligned as a separate unit.

*b.* When the converter is fed directly from the DEMOD output of the test set generator, such as during course accuracy checks, on-course indications should be obtained when the reading on the course indicator is 192° greater than the angle to setting of the test set generator OMNI TRACK switch; that is, for an omnitrack of 0°, an on-course indication should correspond to a course indicator reading of 192° TO; for a 300° track, an on-course indication should be obtained at 132° (492° -360°); and similarly for other courses.

*c.* The reason for this difference is that the open-circuit phase of the test set generator DEMOD output is 192° behind the corresponding vhf navigation receiver output phase; therefore, the course indicator course selector knob must be rotated to advance the phase by 192° in the converter. A properly operating converter should produce on-course indications on the vertical pointer of the course indicator whenever the TO reading of the TO-FROM meter is 192° greater than the setting of the test set generator OMNI TRACK switch, or when the FROM reading of the TO-FROM meter is 12° greater.

### 104. Preliminary Procedure

Make the following tests and adjustments before aligning the converter:

*a.* Connect the equipment as shown in figure 55.

*b.* Adjust the test power supply output for 28 volts and allow a 15-minute warmup period.

*c.* Connect the multimeter (1000V RANGE, DC FUNCTION) between Interconnecting Box J-677/ARN terminals HV+ and G.

*d.* Adjust the test power supply to obtain a multimeter reading of +240 volts.

*e.* Connect the multimeter (3V RANGE, AC FUNCTION) between Interconnecting Box J-676/ARN terminals NAV MOD V and G.

*f.* Set the NAV MOD SOURCE switch on the test set generator to EXTERNAL.

*g.* Adjust the test set generator for *level set* indications of the rf level for both individual 30-cps and 9,960-cps modulations (TM 11-518).

*h.* Set the test set generator FUNCTION switch to 30∿, the DEMOD output to obtain a NAV MOD V reading of 1.8 volts, and the FUNCTION switch to OMNI.

*i.* Turn converter control R226 (fig. 34) to its extreme counterclockwise position and set R225 and R239 (fig. 36) approximately at midposition.

### 105. VOR Variable Channel Alignment

*a.* Perform the preliminary procedure (para 104).

*b.* Connect the multimeter (10V RANGE, AC FUNCTION) between converter test jacks J202 and J203.

*c.* Set the test set generator FUNCTION switch to OMNI.

*d.* Vary converter control R250 (fig. 34) to adjust the variable channel output voltage to approximately 4 volts.

### 106. VOR Reference Channel and Phase Comparison Circuits Alignment

*a.* Perform the preliminary procedure (para 104).

*b.* Set the test set generator FUNCTION switch to OMNI.

*c.* Make a preliminary adjustment of converter BAL potentiometer R239 (fig. 36) to obtain an on-course indication on the course indicator.

*d.* Set the test set generator OMNI TRACK switch to 0°, and the course indicator course selector knob to position the course pointer to 191.5°.

*e.* Connect the multimeter between test jacks J201 (fig. 34) and J202 on the converter.

*f.* Adjust converter REF LEVEL potentiometer R266 to obtain a reading of approximately 4 volts on the multimeter.

*g.* Adjust converter PHASE potentiometer R225 for an on-course indication on the course indicator.

*h.* Set the test set generator OMNI TRACK switch to 180°. The course indicator vertical pointer should remain centered (on course); if not, readjust BAL potentiometer R239 (fig. 36) to reduce the off-center error by one half.

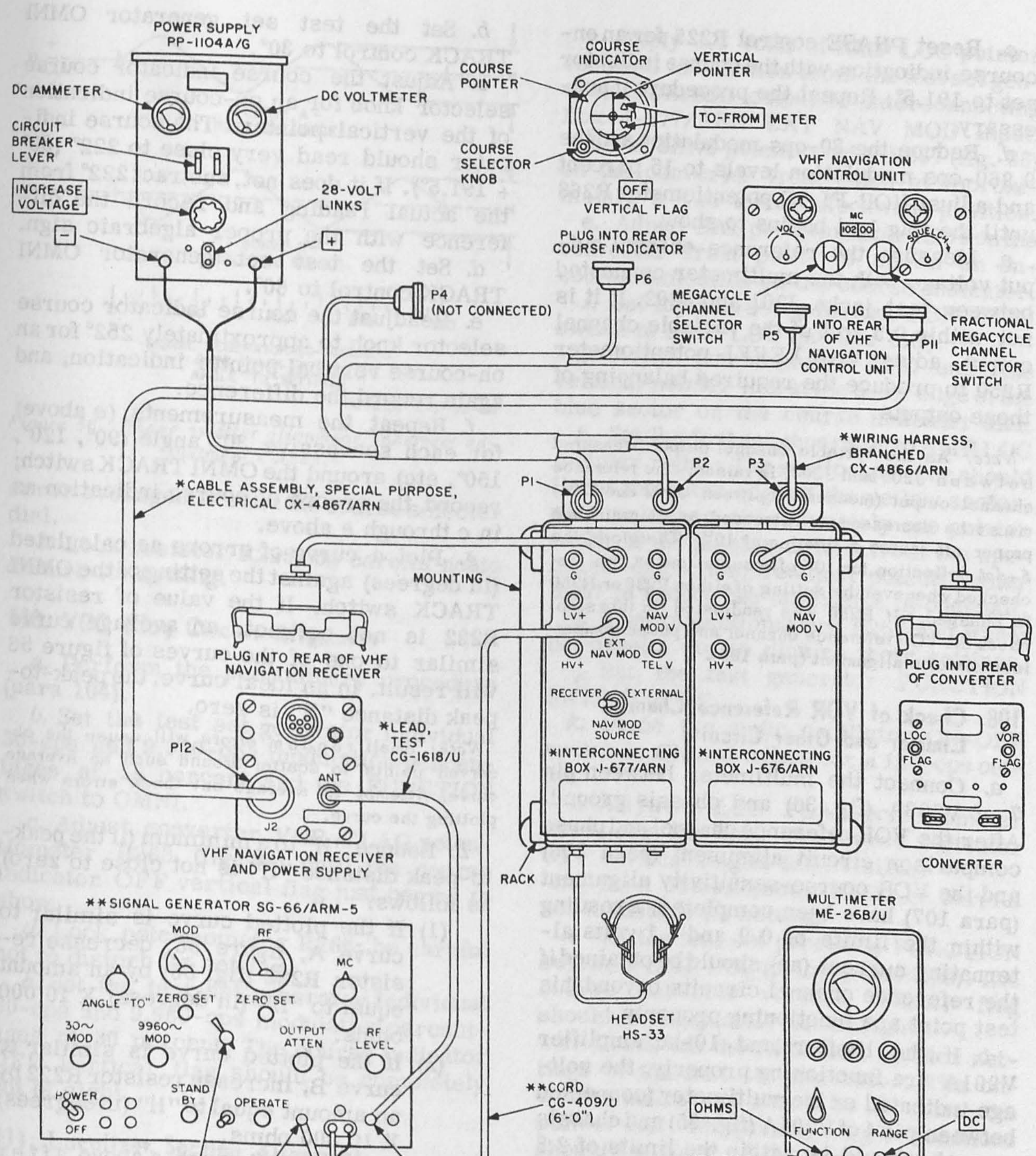
*i.* Repeat the adjustments of R225 (fig. 34) at a 0° OMNI TRACK setting and of R239 (fig. 36) at a 180° OMNI TRACK setting (*e* through *h* above) until an on-course indication is obtained for both tracks.

*j.* Lock R239; be careful not to disturb its setting.

### 107. VOR Course Sensitivity Alignment

*a.* Perform the preliminary procedure (para 104).

*b.* Set the test set generator OMNI TRACK switch at 0° and the course indicator to 181.5°. The course indicator vertical pointer should indicate a *5-dot* deflection to the right (yellow) side. If necessary, adjust REF LEVEL control R226 (fig. 34) to obtain this deflection.




TM5826-215-35-61

*Figure 55. Converter, alignment test setup.*

*c.* Reset PHASE control R225 for an on-course indication with the course indicator set to 191.5°. Repeat the procedure if necessary.

*d.* Reduce the 30-cps modulation and the 9,960-cps modulation levels to 15 percent and adjust VOR FLAG potentiometer R268 until the flag just begins to show.

*e.* Measure the reference channel output voltage with the multimeter connected between test jacks J201 and J202. If it is not within 0.5 volt of the variable channel output, adjust VAR LEVEL potentiometer R250 to produce the required balancing of these outputs.

*Note.* As the variable channel output (measured between J202 and J203) is raised, the reference channel output (measured between J202 and J201) must be decreased or increased to maintain the proper off-course deflection of 10°. Therefore, the *5-dot* deflection for 10° off-course must be rechecked whenever the setting of either R226 or R250 is changed. If R250 was readjusted in this step, check the VOR reference channel and phase comparison circuits alignment (para 106).

## 108. Check of VOR Reference Channel Limiter and Other Circuits

*a.* Connect the multimeter between pin 7 of V203A (fig. 36) and chassis ground. After the VOR reference channel and phase comparison circuit alignment (para 106) and the VOR course-sensitivity alignment (para 107) have been completed, a reading within the limits of 0.9 and 1.1 volts alternating current (ac) should be obtained if the reference channel circuits beyond this test point are functioning properly.

*b.* If the limiter and 10-kc amplifier V201A are functioning properly, the voltage indicated on the multimeter (connected between pin 4 of V201A (fig. 35) and chassis ground) should be within the limits of 2.8 and 3.4 volts ac.

## 109. Phase Splitter Network Alignment to Minimize Quadrantal Errors

*Caution:* **Do not attempt this critical adjustment unless resistors R221 or R222, or capacitor C210 has been replaced.**

*a.* Perform the preliminary procedure (para 104).

*b.* Set the test set generator OMNI TRACK control to 30°.

*c.* Adjust the course indicator course selector knob for an on-course indication of the vertical pointer. The course indicator should read very close to 222° (30° + 191.5°). If it does not, subtract 222° from the actual reading and record the difference with the proper algebraic sign.

*d.* Set the test set generator OMNI TRACK control to 60°.

*e.* Readjust the course indicator course selector knob to approximately 252° for an on-course vertical pointer indication, and again record the difference.

*f.* Repeat the measurements (*e* above) for each successive 30° angle (90°, 120°, 150°, etc) around the OMNI TRACK switch; record the errors of course indication as in *c* through *e* above.

*g.* Plot a curve of errors as calculated (in degrees) against the setting of the OMNI TRACK switch. If the value of resistor R222 is not correct, an average curve similar to one of the curves of figure 56 will result. In an ideal curve, the peak-to-peak distance "H" is zero.

*Note:* Small random errors will cause the observed points to scatter around such an average curve. Attempt to average out these errors when plotting the curve.

*h.* Reduce "H" to a minimum (if the peak-to-peak distance "H" is not close to zero) as follows:

(1) If the plotted curve is similar to curve A, figure 56, decrease resistor R222 (fig. 56) by an amount equal to "H" (in degrees) X 10,000 ohms.

(2) If the plotted curve is similar to curve B, increase resistor R222 by an amount equal to "H" (in degrees) X 10,000 ohms.

*i.* Perform *b* through *g* above after changing resistor R222 by the amount calculated in *h* above to confirm the resultant value of resistor R222.

*j.* Set the test set generator OMNI TRACK switch to 90° and set the course indicator to 282°.

*k.* Unlock resistor R225 (fig. 34) and adjust it for an on-course vertical pointer indication, or as required to give minimum

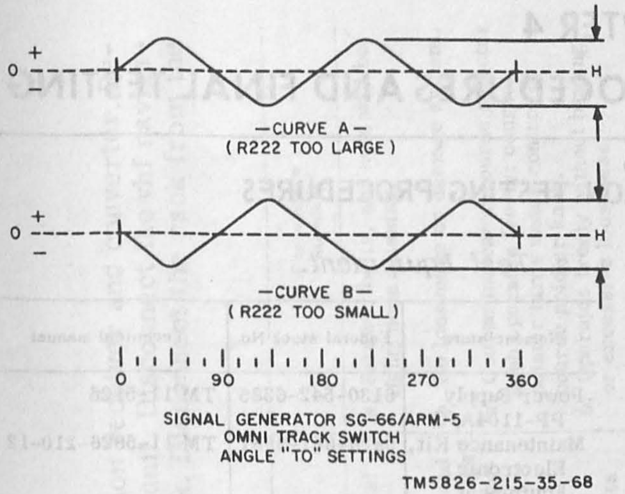



*Figure 56. Phase splitter alignment, incorrect adjustment curves.*

error averaged around the course selector dial.

*l.* Lock resistor R225; be careful not to disturb its setting.

## 110. VOR Flag Circuit Alignment

*a.* Perform the preliminary procedure (para 104).

*b.* Set the test set generator individual 30-cps and 9,960-cps modulation percentages at 15 percent and the FUNCTION switch to OMNI.

*c.* Adjust converter VOR FLAG potentiometer R268 (fig. 34) until the course indicator OFF vertical flag just begins to show.

*d.* Lock potentiometer R268; be careful not to disturb its setting.

*e.* Set the test set generator individual 30-cps and 9,960-cps modulation percentages at 30 percent. The course indicator OFF vertical flag should be completely out of sight.

## 111. Localizer Section Alignment

*a.* Perform the preliminary procedure (para 104).

*b.* Set the vhf navigation control unit channel selector switches to 110.90 mc.

*c.* Apply 1.8 volts of AMP LOC pointer centered modulation from the test set generator DEMOD output to Interconnecting Box J-677/ARN EXT NAV MOD input.

*d.* Set SENS potentiometer R257 (fig. 36) on the converter front panel at approximately a two-thirds clockwise position.

*e.* Adjust BAL potentiometer R264 on the converter front panel to obtain an on-course indication on the course indicator.

*f.* Set the test set generator FUNCTION switch to AMP LOC (pointer left).

*g.* Adjust potentiometer R257 until the vertical pointer lies at the outer edge of the blue sector on the course indicator dial.

*h.* Set the test set generator to AMP LOC (pointer right). The vertical pointer should lie at the outer edge of the yellow sector, plus or minus approximately one pointer width. If the pointer differs from the specified defelction, readjust potentiometer R257 to reduce the difference by one-half.

*i.* Lock potentiometers R257 and R264; be careful not to disturb their settings.

*j.* Set the test generator FUNCTION SWITCH to RF.

*k.* Place the audio oscillator ON-OFF switch to ON and adjust for a 150-cps output.

*l.* Adjust LOC FLAG potentiometer R269 (fig. 34) until the course indicator OFF vertical flag is fully visible.

*m.* Lock potentiometer R269; be careful not to disturb its setting.

*n.* Set the test set generator FUNCTION switch to AMP LOC (pointer centered). The course indicator vertical pointer flag should be completely out of sight.

*o.* Check all the AMP LOC pointer settings of the test set generator. The on-course indication, should be accurate; the *pointer left* and *pointer right* positions should be short of the ends of their respective colored sections by about two pointer widths. Residual errors should be approximately balanced on both sides. In all settings, the flag should be completely out of sight.

# CHAPTER 4
# FOURTH ECHELON TESTING PROCEDURES AND FINAL TESTING

## Section I. FOURTH ECHELON TESTING PROCEDURES

### 112. General

*a.* Testing procedures are prepared for use by Signal Field Maintenance Shops and Signal Service Organizations responsible for fourth echelon maintenance of signal equipment to determine the acceptability of repaired signal equipment. These procedures set forth specific requirements that repaired signal equipment *must* meet before it is returned to the using organization. The testing procedures may also be used as a guide for the testing of equipment that has been repaired at third echelon if the proper tools and test equipment are available. A summary of the performance standards is given in paragraph 119.

*b.* Comply with the instructions preceding each chart before proceeding to the chart. Perform each test in sequence. *Do not vary the sequence.* For each step, perform all the actions required in the *Test equipment control settings* and *Equipment under test control settings* columns; then perform each specific test procedure and verify it against its performance standard.

### 113. Test Equipment, Tools, and Materials

All test equipment, tools, materials, and other equipment required to perform the testing procedures given in this section are listed in the following charts and are authorized under TA 11-17 and TA 11-100 (11-17).

*a. Test Equipment.*

| Nomenclature | Federal stock No. | Technical manual |
|---|---|---|
| Power Supply PP-1104A/G | 6130-542-6385 | TM 11-5126 |
| Maintenance Kit, Electronic Equipment MK-252/ARN | 5826-681-9881 | TM 11-5826-210-12 |
| Multimeter ME-26B/U | 6625-542-6407 | TM 11-6625-200-12 |
| Radio Test Set AN/ARM-5 | 6625-669-0272 | TM 11-518 |
| Audio Oscillator TS-382/U | 6625-192-5094 | TM 11-2684A |
| Headset HS-33 | 5965-170-4814 | |

*b. Tools.* The tools required are contained in Tool Kits TK-87/U and TK-88/U.

### 114. Test Facilities

An ac power source of 115 volts, 60 cycles is required to power the test equipment. For some tests, a source of dc power capable of supplying 28 volts at 6 amperes is required to operate Receiving Set, Radio AN/ARN-30D. Power Supply PP-1104A/G (para 58) or any other available source of power that meets the above requirements may be used.

### 115. Modification Work Orders

No modification work orders pertinent to this equipment were in effect on the date of this publication. A listing of current modification work orders will be found in DA Pamphlet 310-4.

## 116. Physical Tests and Inspection

*a. Test Equipment and Materials.*
Tool Kits TK-87/U and TK-88/U.

*b. Test Connections and Conditions.* Remove the dust covers from the vhf navigation receiver and converter. Remove the backplate from the rack. Remove the cover from the vhf navigation control unit. Disconnect the vhf navigation control unit. Disconnect the vhf navigation receiver and converter from the rack. Disconnect the rack from the mounting.

*c. Procedure.*

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| 1 | N/A | Controls may be in any position. | *a.* Inspect all controls and mechanical assemblies for loose or missing screws, bolts, or nuts. | *a.* Screws, bolts, and nuts will be tight; none missing. |
| | | | *b.* Inspect all connectors, sockets, and receptacles for looseness and damage. | *b.* No looseness or damage evident. |
| 2 | N/A | Controls may be in any position. | *a.* Turn course indicator course selector knob. | *a.* Course indicator course selector knob operates freely; course pointer turns under control of course pointer knob. |
| | | | *b.* Rotate vhf navigation control unit SQUELCH control through its limits of travel. | *b.* Operates freely without binding or excessive looseness. |
| | | | *c.* Turn vhf navigation control unit megacycle and fractional megacycle channel selector switches through their limits of travel. | *c.* Operate freely without binding or excessive looseness. MC dial readings change with rotation of switches. |
| | | | *d.* Turn vhf navigation control unit VOL-OFF switch and control knob through its limits of travel. | *d.* Operates freely to on and then turns freely without binding or excessive looseness. |
| 3 | N/A | Controls may be in any position. | *a.* Inspect all cases and chassis for damage, missing parts, and condition of finish.<br>*Note:* Touchup painting is recommended in lieu of refinishing whenever practicable. | *a.* No damage or missing parts evident. External surfaces intended to be painted will not show bare metal. |
| | | | *b.* Inspect condition of panel lettering on vhf navigation control unit. | *b.* Panel lettering will be legible. |
| 4 | N/A | Controls may be in any position. | Inspect shock mounts on rack and rear of vhf navigation receiver. | No cracks, excessive dryness, or other form of deterioration evident. |
| 5 | N/A | N/A | Check the equipment for applicable modification work orders (para 115). | None. |

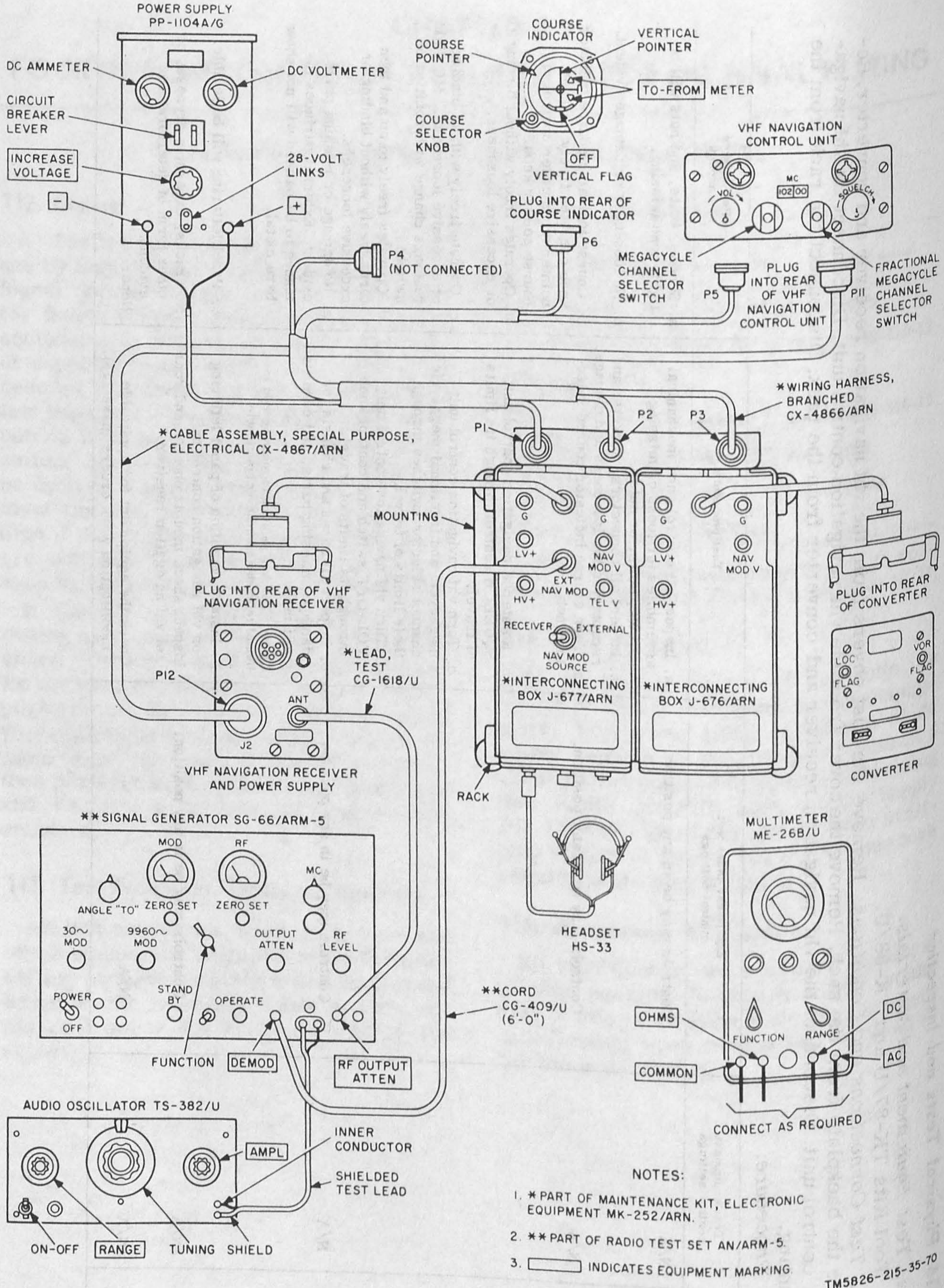



*Figure 57. Vhf navigation receiver and control unit tests.*

## 117. Vhf Navigation Receiver and Control Unit Tests

*a. Test Equipment and Materials.*

Power Supply PP-1104A/G
Maintenance Kit, Electronic Equipment MK-252/ARN
Radio Test Set AN/ARM-5 (with additional 108.00-mc and 126.9-mc crystals)
Audio Oscillator TS-382/U
Multimeter ME-26B/U
Headset HS-33

*b. Test Connections and Conditions.* Connect the equipment as shown in figure 57.

*c. Procedure.*

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| 1 | Circuit breaker lever: OFF<br>Links: Both connected vertically for 28-volt operation.<br>INCREASE VOLTAGE: 1<br>POWER-OFF: OFF<br>NAV MOD SOURCE: RECEIVER<br>FUNCTION: OFF<br>RANGE: 1000V<br>ON-OFF: OFF | VOL-OFF: OFF<br>SQUELCH: counterclockwise | *a.* Connect ME-26B/U DC probe to J-677/ARN LV+ terminal. Connect ME-26B/U COMMON clip to G terminal (insert paper clip in G terminal test jack and connect COMMON clip to paper clip, if necessary).<br>*b.* Place PP-1104A/G circuit breaker lever to ON. Place ME-26B/U FUNCTION switch to +. Allow 5-minute warmup before proceeding.<br>*c.* Turn vhf navigation control unit VOL-OFF knob to on (slightly clockwise). Place PP-1104A/G INCREASE VOLTAGE switch to 4.<br>*d.* Place ME-26B/U RANGE switch to 100V.<br>*e.* Place ME-26B/U RANGE switch to 1000V. Disconnect dc probe from J-677/ARN LV+ terminal and connect to HV+ terminal.<br>*f.* Adjust PP-1104A/G INCREASE VOLTAGE knob for 240 volts on ME-26B/U. | *a.* None.<br>*b.* None.<br>*c.* Vhf navigation receiver tube filaments light.<br>*d.* Meter reads 28 volts.<br>*e.* None.<br>*f.* None. |
| 2 | Leave controls in positions last indicated in step No. 1. | Leave controls in position last indicated in step No. 1. | *a.* Connect 50-ohm termination cap on SG-66/ARM-5 to RF OUTPUT 1 VOLT.<br>*b.* Place 108.00-mc crystal in SG-66/ARM-5 crystal socket A. Place 114.9-mc crystal in SG-66/ARM-5 crystal socket B.<br>*c.* Place SG-66/ARM-5 STAND-BY-OPERATE switch to STAND-BY and POWER-OFF to POWER. Allow 5-minute warmup before proceeding.<br>*d.* Place SG-66/ARM-5 STAND-BY-OPERATE switch to OPERATE.<br>*e.* Press SG-66/ARM-5 MOD ZERO SET knob and rotate knob to zero MOD meter. Press SG-66/ARM-5 RF ZERO SET knob and rotate knob to zero RF meter.<br>*f.* Set SG-66/ARM-5 FUNCTION switch to RF and MC switch to A. Set RF LEVEL to center-range.<br>*g.* Insert insulated screwdriver in SG-66/ARM-5 A hole and adjust for maximum on RF meter.<br>*h.* Set SG-66/ARM-5 MC switch to B and with insulated screwdriver in B hole, adjust for maximum on RF meter.<br>*i.* Adjust SG-66/ARM-5 RF LEVEL control to align RF meter needle with LEVEL SET line.<br>*j.* Set SG-66/ARM-5 FUNCTION switch to 9960 MOD. Adjust 9960∽ MOD control to align MOD meter needle with LEVEL SET line.<br>*k.* Set SG-66/ARM-5 FUNCTION switch to 30 MOD. Adjust 30∽ MOD control to align MOD meter needle with LEVEL SET line. | *a.* None.<br>*b.* None.<br>*c.* None.<br>*d.* None.<br>*e.* None.<br>*f.* None.<br>*g.* None.<br>*h.* None.<br>*i.* None.<br>*j.* None.<br>*k.* None. |
| 3 | Leave controls in positions last indicated in step 2. | Leave controls in positions last indicated in step 1. | *a.* Place TS-382/U ON-OFF switch to ON. Allow 15-minute warmup.<br>*b.* Tune vhf navigation control unit channel selector switches to 114.9 mc.<br>*c.* Place TS-382/U RANGE switch to X10 and tuning control to 100.<br>*d.* Place SG-66/ARM-5 FUNCTION switch to RF.<br>*e.* Adjust vhf navigation control unit VOL-OFF knob clockwise and counterclockwise.<br>*f.* Tune vhf navigation control unit channel selector switches to frequency other than 114.9 mc. Adjust vhf navigation control unit SQUELCH control clockwise.<br>*g.* Adjust vhf navigation control unit to desired level of quieting.<br>*h.* Tune vhf navigation control unit channel selector switches to 114.9 mc again. | *a.* None.<br>*b.* None.<br>*c.* None.<br>*d.* None.<br>*e.* 1,000-cps tone is heard on headset. Volume increases with clockwise rotation of VOL-OFF knob; decreases with counterclockwise rotation.<br>*f.* Noise on headset is quieted.<br>*g.* Noise level on headset is adjustable.<br>*h.* 1,000-cps tone is heard on headset again. |
| 4 | Leave controls in positions last indicated in step 3. | Leave controls in positions last indicated in step 3. | *a.* Turn vhf navigation control unit megacycle channel selector switch through all positions, one at a time.<br>*b.* Turn vhf navigation control unit fractional megacycle channel selector switch through all positions, one at a time.<br>*c.* Place PP-1104A/G INCREASE VOLTAGE knob to 1 and repeat *a* and *b* above.<br>*d.* Place PP-1104A/G INCREASE VOLTAGE knob to position established in step 1*f*. | *a.* Megacycle channel crystal drum dial, seen through frequency window on right side of vhf navigation receiver, has same reading as vhf navigation control unit left MC dial for each position.<br>*b.* Fractional megacycle crystal drum dial seen through frequency window on right side of vhf navigation receiver has same reading as vhf navigation control unit right MC dial.<br>*c.* Same as *a* and *b* above, but vhf navigation receiver crystal drums take longer to switch to new position tuned at vhf navigation control unit.<br>*d.* None. |
| 5 | Leave controls in positions last indicated in step 4. | Leave controls in positions last indicated in step 4. | *a.* Disconnect ME-26B/U DC probe from J-677/ARN HV+ terminal and connect to TEL V. terminal.<br>*b.* Tune vhf navigation control unit channel selector switches to produce reading of 108.00 mc. Turn vhf navigation control unit SQUELCH control completely counterclockwise.<br>*c.* Place SG-66/ARM-5 MC control to A mc and ATTENUATOR control to 1.5 microvolts (3 hard (no load condition) microvolts).<br>*d.* Adjust vhf navigation control unit VOL-OFF knob to produce 5-volt reading on ME-26B/U.<br>*e.* [illegible] and reduce setting of SG-66/ARM-5 ATTENUATOR control until ME-26B/U reading drops to 2 volts.<br>*f.* Adjust TS-382/U AMPL control to produce 30-percent modulation on SG-66/ARM-5 MOD meter.<br>*g.* Replace 114.9-mc crystal in SG-66/ARM-5 crystal socket B with 126.9-mc crystal. Set SG-66/ARM-5 MC switch to B and, with insulated screwdriver in B hole, adjust for maximum on RF meter.<br>*h.* Tune vhf navigation control unit channel selector switches to 126.9 mc and repeat *d* and *e* above. | *a.* None.<br>*b.* None.<br>*c.* None.<br>*d.* None.<br>*e.* [illegible] 6-db signal + noise to noise ratio) occurs at value below 1.5 microvolts (3 hard microvolts) on SG-66/ARM-66 ATTENUATOR dial.<br>*f.* None.<br>*g.* None.<br>*h.* Same as e above. |
| 6 | Leave controls in positions last indicated in step 5. | Leave controls in positions last indicated in step 5. | *a.* Set SG-66/ARM-5 ATTENUATOR control to 15 microvolts (3 hard microvolts).<br>*b.* Adjust vhf navigation control unit VOL-OFF control to produce 5-volt reading on ME-26B/U.<br>*c.* Set SG-66/ARM-5 ATTENUATOR control to 50,000 microvolts (100,000 hard microvolts).<br>*d.* Set SG-66/ARM-5 MICROVOLTS control to 100,000 microvolts (200,000 hard microvolts).<br>*e.* Place SG-66/ARM-5 MC control to A and vhf navigation control unit channel selector switches to 108.00 mc.<br>*f.* Set SG-66/ARM-5 ATTENUATOR control to 1.5 microvolts (3 hard microvolts).<br>*g.* Adjust vhf navigation control unit VOL-OFF control for 5-volt reading on ME-26B/U.<br>*a.* Repeat *c* and *d* above. | *a.* None.<br>*b.* None.<br>*c.* ME-26B/U reads between 7.8 and 10 volts for 4- to 6-db rise in agc operation.<br>*d.* ME-26B/U reads between 10 and 12.5 volts for 6- to 8-db rise in agc operation.<br>*e.* None.<br>*f.* None.<br>*g.* None.<br>*a.* Same as *c* and *d* above. |
| 7 | N/A | N/A | Deenergize and disconnect equipment. | None. |

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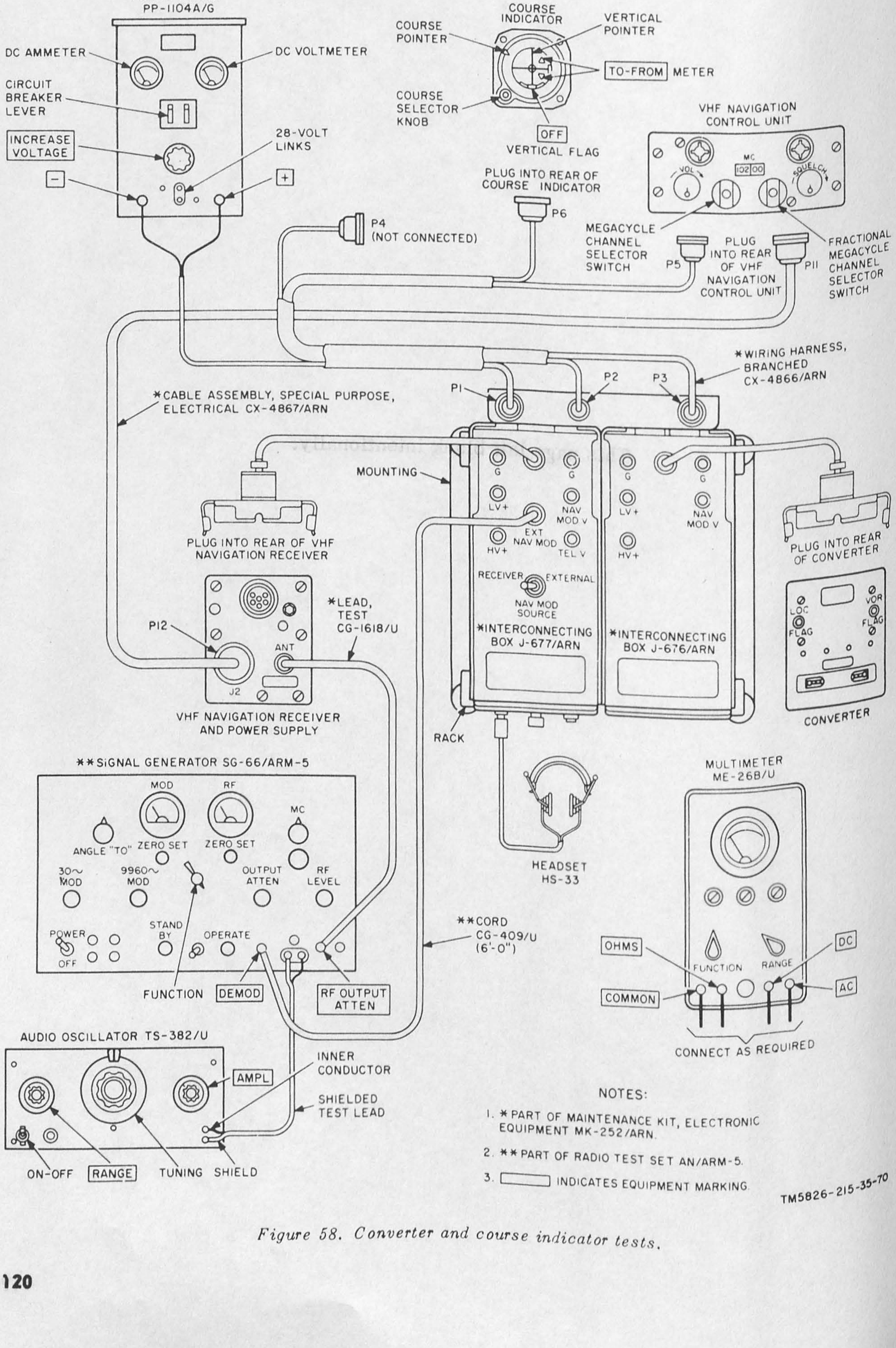



*Figure 58. Converter and course indicator tests.*

## 118. Converter and Coarse Indicator Tests

a. *Test Equipment and Materials.*

Audio Oscillator TS-382/U
Power Supply PP-1104A/G
Maintenance Kit, Electronic Equipment MK-252/ARN
Multimeter ME-26B/U
Radio Test Set AN/ARM-5
Tool Kits TK-87/U and TK-88/U

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 58.

c. *Procedure.*

| Step No. | Test equipment control settings | Equipment under test control settings | Test procedure | Performance standard |
|---|---|---|---|---|
| 1 | *PP-1104A/G:*<br>Circuit breaker lever: OFF<br>Links: Both connected vertically for 28-volt operation.<br>INCREASE VOLTAGE: 1<br>*SG-66/ARM-5:*<br>POWER-OFF: OFF<br>*J-677/ARN:*<br>NAV MOD SOURCE: RECEIVER<br>*ME-26B/U:*<br>FUNCTION: OFF<br>RANGE: 1000V<br>*TS-382/U:*<br>ON-OFF: OFF | *Vhf navigation control unit:*<br>VOL-OFF: OFF<br>SQUELCH: counterclockwise | *a.* Connect ME-26B/U dc probe to J-677/ARN LV+ terminal. Connect ME-26B/U COMMON clip to G terminal (insert paper clip in G terminal test jack and connect COMMON clip to paper clip, if necessary). | *a.* None. |
| | | | *b.* Place P-1104A/G circuit breaker lever to ON. Place ME-26B/U FUNCTION switch to +. Allow 5-minute warmup before proceeding. | *b.* None. |
| | | | *c.* Turn vhf navigaticn control unit VOL-OFF knob to on (slightly clockwise). Place PP-1104A/G INCREASE VOLTAGE switch to 4. | *c.* Vhf converter tube filaments light. |
| | | | *d.* Place ME-26B/U RANGE switch to 100V. Meter should read 28 volts. | *d.* None. |
| | | | *e.* Place ME-26B/U RANGE switch to 1000V. Disconnect dc probe from J-677/ARN LV+ terminal and connect to HV+ terminal. | *e.* None. |
| | | | *f.* Adjust PP-1104A/G INCREASE VOLTAGE knob for 240 volts on ME-26B/U. | *f.* None. |
| 2 | Leave controls in positions last indicated in step 1. | Leave controls in positions last indicated in step 1. | *a.* Connect 50-ohm termination cap on SG-66/ARM-5 to RF OUTPUT 1 VOLT. | *a.* None. |
| | | | *b.* Place 110.9-mc crystal in SG-66/ARM-5 crystal socket A. Place 114.9-mc crystal in crystal socket B. | *b.* None. |
| | | | *c.* Place SG-66/ARM-5 STAND-BY-OPERATE switch to STAND-BY and POWER-OFF to POWER. Allow 5-minute warmup before proceeding. | *c.* None. |
| | | | *d.* Place SG-66/ARM-5 STAND-BY-OPERATE switch to OPERATE. | *d.* None. |
| | | | *e.* Press in SG-66/ARM-5 MOD ZERO SET knob and rotate knob to zero MOD. Press in SG-66/ARM-5 RF ZERO SET knob and rotate knob to zero RF meter. | *e.* None. |
| | | | *f.* Set SG-66/ARM-5 FUNCTION switch to RF, and MC switch to A. Set RF LEVEL to center range. | *f.* None. |
| | | | *g.* Insert insulated screwdriver in SG-66/ARM-5 A hole and adjust for maximum on RF meter. | *g.* None. |
| | | | *h.* Set SG-66/ARM-5 MC switch to B and, with insulated screwdriver in B hole, adjust for maximum on RF meter. | *h.* None. |
| | | | *i.* Adjust SG-66/ARM-5 RF LEVEL control to align RF meter needle with LEVEL SET line. | *i.* None. |
| | | | *j.* Set SG-66/ARM-5 FUNCTION switch to 9960 ∿ MOD. Adjust 9960 MOD control to align MOD meter needle with LEVEL SET line. | *j.* None. |
| | | | *k.* Set SG-66/ARM-5 FUNCTION switch to 30 ∿ MOD. Adjust 30 MOD control to align MOD meter needle with LEVEL SET line. | *k.* None. |
| 3 | Leave controls in positions last indicated in step 2. | Leave controls in positions last indicated in step 1, except:<br>*Vhf navigation control unit:*<br>Channel selector switches to produce 114.90 reading on MC dials. | *a.* Disconnect ME-26B/U DC probe from J-677/ARN HV+ terminal and connect to NAV MOD V terminal. | *a.* None. |
| | | | *b.* Place J-677/ARN NAV MOD SOURCE switch to EXTERNAL. | *b.* None. |
| | | | *c.* Place ME-26B/U RANGE switch to 3V and adjust SG-66/ARM-5 MOD 30 ∿ control to produce 1.8-volt reading on ME-26B/U. | *c.* None. |
| | | | *d.* Place SG-66/ARM-5 FUNCTION switch to OMNI. | *d.* None. |
| | | | *e.* Rotate SG-66/ARM-5 OMNI TRACK "ANGLE TO" switch through each of its positions and rotate course indicator course selector knob to position course pointer to corresponding course dial reading. | *e.* On-course indicator: vertical pointer centers; OFF vertical flag is out of sight; TO-FROM meter reads TO; for each setting of OMNI TRACK "ANGLE TO" switch on SG-66/ARM-5. |
| | | | *f.* Place SG-66/ARM-5 FUNCTION switch to 30 ∿ MOD. | *f.* OFF vertical flag on-course indicator is in full view. |
| | | | *g.* Place SG-66/ARM-5 FUNCTION switch to 9960 ∿ MOD. | *g.* OFF vertical flag on-course indicator is in full view. |
| | | | *h.* Place SG-66/ARM-5 FUNCTION switch to OMNI. | *h.* Same as *e* above. |
| 4. | Leave controls in position last indicated in step 3, except:<br>*SG-66/ARM-5:*<br>MC: A<br>FUNCTION: 30 MOD | Leave controls in position last indicated in step 3, except:<br>*Vhf navigation control unit:*<br>Channel selector switches to produce 110.90 reading on MC dials. | *a.* Adjust SG-66/ARM-5 30 ∿ MOD control to produce 1.8-volt reading on ME-26B/U. | *a.* None. |
| | | | *b.* Set SG-66/ARM-5 FUNCTION switch to AMP LOC (pointer centered). | *b.* On-course indicator: vertical pointer centers; OFF vertical flag is out of sight. |
| | | | *c.* Set SG-66/ARM-5 FUNCTION switch to AMP LOC (pointer left). | *c.* On-course indicator: vertical pointer swings left to outer edge of blue sector; OFF vertical flag is out of sight. |
| | | | *d.* Set SG-66/ARM-5 FUNCTION switch to AMP LOC (pointer right). | *d.* On-course indicator: vertical pointer swings right to within about one pointer width of outer edge of yellow sector; OFF vertical flag is out of sight. |
| | | | *e.* Place TS-382/U ON-OFF switch to ON. Allow 15-minute warmup before proceeding. | *e.* None. |
| | | | *f.* Place TS-382/U RANGE switch to X1 and tuning control to 150. | *f.* None. |
| | | | *g.* Set SG-66/ARM-5 FUNCTION switch to RF. Adjust TS-382/U AMPL control to produce 30-percent modulation on SG-66/ARM-5 MOD meter. | *g.* OFF vertical flag on-course indicator is fully visible. |
| | | | *h.* Place TS-382/U tuning control to 90 and adjust AMPL control to produce 30-percent modulation on SG-66/ARM-5 MOD meter. | *h.* Same as *g* above. |

## 119. Summary of Test Data

Personnel may find it convenient to arrange the checklist in a manner similar to that shown below:

a. *Vhf Navigation Receiver and Control Unit.*

| Test data | Performance standard |
|---|---|
| 1. INPUT VOLTAGE | 28 v |
| 2. RECEIVER SENSITIVITY | |
| a. 108 mc | 3 hard microvolts max 6-db signal-plus-noise to signal ratio |
| b. 126.9 mc | 3 hard microvolts max 6-db signal-plus-noise to signal ratio |
| 3. AGC OPERATION | |
| a. 100,000 hard microvolts | Rise from +4 db to +6 db |
| b. 200,000 hard microvolts | Rise from +6 to +8 db |
| 4. VISUAL TESTS | |
| a. Vhf navigation receiver tube filaments light. | |
| b. Vhf navigation receiver megacycle crystal drum rotates with movement of vhf navigation control unit megacycle MC dial. | |
| c. Vhf navigation receiver fractional megacycle crystal drum follows vhf navigation control unit fractional megacycle MC dial. | |
| d. Vhf navigation receiver megacycle and fractional megacycle channel selector drums follow vhf navigation control unit MC dials with input voltage reduced. | |
| 5. LISTENING TESTS | |
| a. Audio can be heard. | |
| b. Audio volume controlled by setting of VOL-OFF control. | |
| c. Noise level quieted by SQUELCH control. | |

b. *Converter and Course Indicator.*

| Test data | Performance standard |
|---|---|
| 1. INPUT POWER Tube filaments light | |
| 2. VOR OPERATION | |
| a. OFF vertical flag out of sight with reliable VOR input. | |
| b. OFF vertical flag in full view with unreliable VOR input. | |
| c. Vertical pointer tracks phase difference between VOR inputs. | |
| d. TO-FROM meter deflects correctly. | |
| 3. LOCALIZER OPERATION | |
| a. OFF vertical flag out of sight with reliable localizer input. | |
| b. OFF vertical flag in full view with unreliable localizer input. | |
| c. OFF vertical flag in full view with 90-cps input only. | |
| d. OFF vertical flag in full view with 150-cps input only. | |
| e. Vertical pointer centers when input components have equal amplitude. | |
| f. Vertical pointer deflects left. | |
| g. Vertical pointer deflects right. | |

# Section II. FINAL TESTING

## 120. Purpose of Final Testing

The tests outlined in this section are designed to measure the performance capability of a repaired equipment. Equipment that meets the minimum standards stated in the tests will furnish satisfactory operation, equivalent to that of new equipment.

## 121. Test Equipment Required for Final Testing

The test equipment required for final testing is given for each individual test (para 59, 65, 117, and 118).

## 122. Test Setups

The tests will be performed under the

conditions listed and illustrated for each test (para 59, 65, 117, and 118).

### 123. Final Testing Procedures

Perform the following tests in the order given.

*a.* Operational test (para 59).

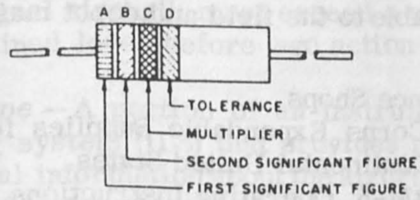
*b.* Stage gain measurements (para 65).

*c.* Vhf navigation receiver and control unit tests (para 117).

*d.* Converter and course indicator tests (para 118).

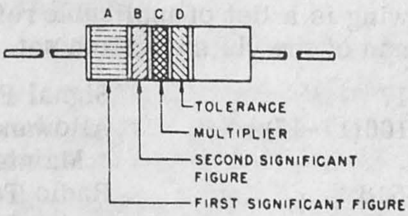
## COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

### COMPOSITION-TYPE RESISTORS




BAND A— Equal Width Band Signifies Composition-Type

### WIREWOUND-TYPE RESISTORS




BAND A— Double Width Signifies Wire-wound Resistor

### COLOR CODE TABLE

| BAND A | | BAND B | | BAND C | | BAND D* | |
|---|---|---|---|---|---|---|---|
| COLOR | FIRST SIGNIFICANT FIGURE | COLOR | SECOND SIGNIFICANT FIGURE | COLOR | MULTIPLIER | COLOR | RESISTANCE TOLERANCE (PERCENT) |
| BLACK | 0 | BLACK | 0 | BLACK | 1 | | |
| BROWN | 1 | BROWN | 1 | BROWN | 10 | | |
| RED | 2 | RED | 2 | RED | 100 | | |
| ORANGE | 3 | ORANGE | 3 | ORANGE | 1,000 | | |
| YELLOW | 4 | YELLOW | 4 | YELLOW | 10,000 | SILVER | ± 10 |
| GREEN | 5 | GREEN | 5 | GREEN | 100,000 | GOLD | ± 5 |
| BLUE | 6 | BLUE | 6 | BLUE | 1,000,000 | | |
| PURPLE (VIOLET) | 7 | PURPLE (VIOLET) | 7 | | | | |
| GRAY | 8 | GRAY | 8 | SILVER | 0.01 | | |
| WHITE | 9 | WHITE | 9 | GOLD | 0.1 | | |

### EXAMPLES OF COLOR CODING

| BAND | A | B | C | D* |
|---|---|---|---|---|
| | ORANGE | WHITE | RED | SILVER |
| | 3 | 9 | X100 | ± 10% |

| BAND | A | B | C | D* |
|---|---|---|---|---|
| | ORANGE | BLUE | GOLD | GOLD |
| | 3 | 6 | X0.1 | ± 5% |

| | | |
|---|---|---|
| NOMINAL RESISTANCE | 3,900 Ohms | 3.6 Ohms |
| RESISTANCE TOLERANCE | ± 10 percent | ± 5 percent |

STD-R2

*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

*Figure 59. Resistor color codes.*

# APPENDIX

## REFERENCES

Following is a list of applicable references available to the field and depot maintenance repairman of the vhf navigation set.

| | |
|---|---|
| TA 11-17 | Signal Field Maintenance Shops |
| TA 11-100(11-17) | Allowance of Signal Corps Expendable Supplies for Signal Maintenance Shop, Continental United States |
| TM 11-518 | Radio Test Set AN/ARM-5, Operating Instructions |
| TM 11-2684A | Audio Oscillators TS-382A/U, TS-382B/U, TS-382D/U, and TS-382E/U |
| TM 11-5120 | Frequency Meters AN/URM-32 and AN/URM-32A and Power Supply PP-1243/U |
| TM 11-5126 | Power Supplies PP-1104A/G and PP-1104B/G |
| TM 11-5132 | Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, and ME-30C/U |
| TM 11-5551 | Instruction Book for R-F Signal Generator Set AN/URM-25 |
| TM 11-5556 | Signal Generator SG-13/ARN |
| TM 11-5826-210-12 | Operator's and Organizational Maintenance Manual: Maintenance Kit, Electronic Equipment MK-252/ARN |
| TM 11-5826-215-12 | Operator's and Organizational Maintenance Manual: Receiving Set, Radio AN/ARN-30D |
| TM 11-5826-220-35 | Field and Depot Maintenance Manual: Power Supply PP-2792/ARN-30D |
| TM 11-6625-200-12 | Operation and Organizational Maintenance: Multimeter ME-26B/U |
| TM 11-6625-274-12 | Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U |

# GLOSSARY

*Agc Delay* — The condition in which an agc threshold is established in such a way that signal strength must exceed a predetermined level before agc action begins.

*Glide Slope* — A portion of an instrument landing system (ILS) that provides navigational information about the aircraft's angle of glidepath to the runway letdown point.

*Hard Microvolt* — A term used in this manual to indicate the voltage amplitude at the output of Signal Generator SG-66/ARM-5 under no load condition.

*Localizer* — A vhf radio system for guiding aircraft along an approach path to an airport runway.

*Omni* — A familiar term for VOR operation.

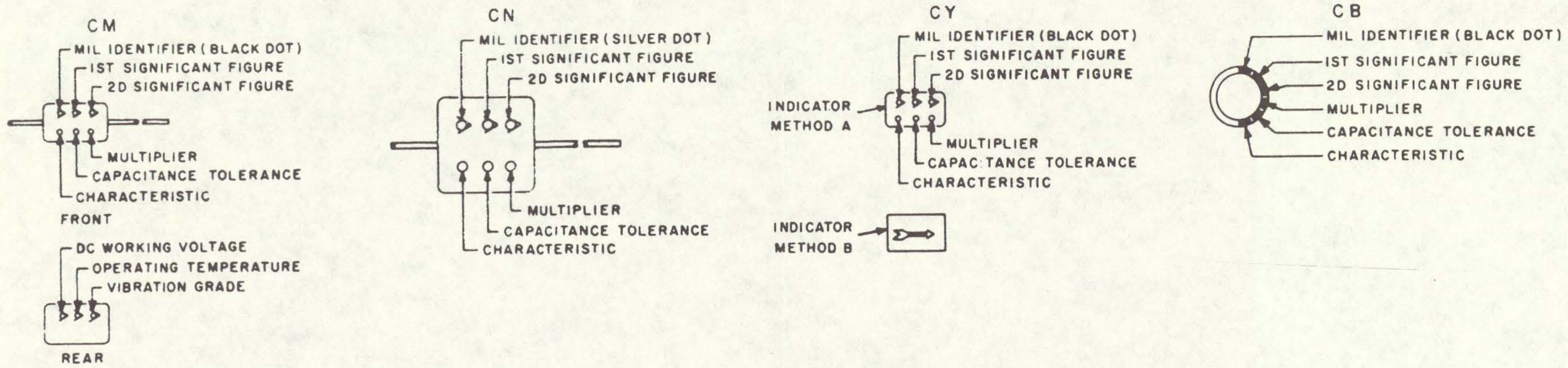
*Propeller Modulation* — Modulation imposed upon a radio carrier wave by the action of an aircraft's propellers.

*Zener Breakdown* — The condition which exists when the value of a voltage of opposite polarity applied across a semiconductor diode is great enough to cause the diode to stop acting as a high back resistance.

## INDEX

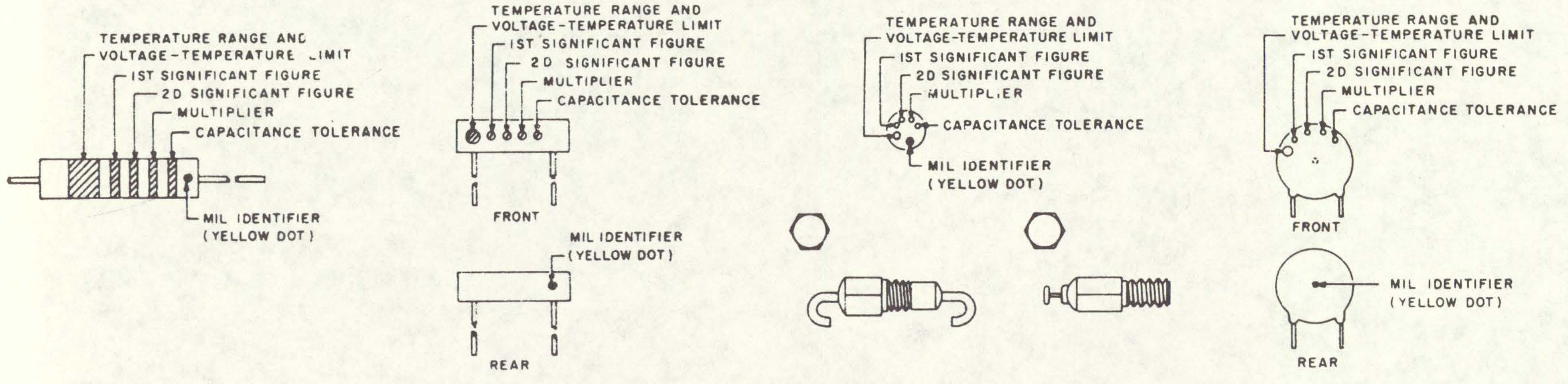
## COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



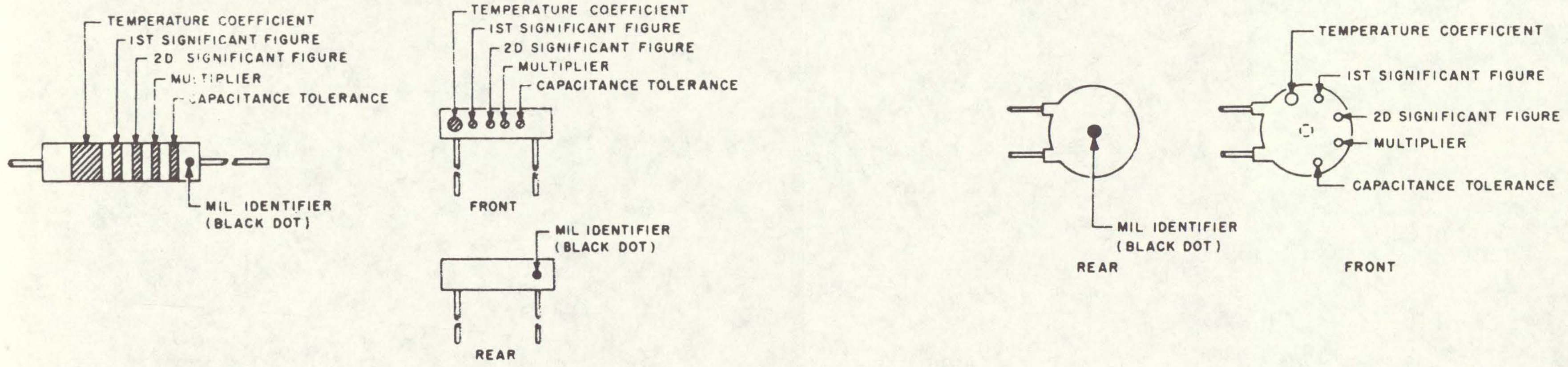

MICA-DIELECTRIC | PAPER-DIELECTRIC | GLASS-DIELECTRIC, GLASS CASE | MICA, BUTTON TYPE

GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK




AXIAL LEAD | RADIAL LEAD | FEED-THROUGH | STAND-OFF | DISK-TYPE

GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC




AXIAL LEAD | RADIAL LEAD | DISK-TYPE

## COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

| COLOR | MIL ID | 1st SIG FIG | 2nd SIG FIG | MULTIPLIER[1] | CAPACITANCE TOLERANCE | | | | CHARACTERISTIC[2] | | | | DC WORKING VOLTAGE | OPERATING TEMP. RANGE | VIBRATION GRADE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | CM | CN | CY | CB | CM | CN | CY | CB | CM | CM | CM |
| BLACK | CM, CY CB | 0 | 0 | 1 | | | ± 20% | ± 20% | | A | | | | −55° to +70°C | 10–55 cps |
| BROWN | | 1 | 1 | 10 | | | | | B | E | | B | | | |
| RED | | 2 | 2 | 100 | ± 2% | | ± 2% | ± 2% | C | | C | | | −55° to +85°C | |
| ORANGE | | 3 | 3 | 1,000 | | ± 30% | | | D | | | D | 300 | | |
| YELLOW | | 4 | 4 | 10,000 | | | | | E | | | | | −55° to +125°C | 10–2,000 cps |
| GREEN | | 5 | 5 | | ± 5% | | | | F | | | | 500 | | |
| BLUE | | 6 | 6 | | | | | | | | | | | −55° to +150°C | |
| PURPLE (VIOLET) | | 7 | 7 | | | | | | | | | | | | |
| GREY | | 8 | 8 | | | | | | | | | | | | |
| WHITE | | 9 | 9 | | | | | | | | | | | | |
| GOLD | | | | 0.1 | | | ± 5% | ± 5% | | | | | | | |
| SILVER | CN | | | | ± 10% | ± 10% | ± 10% | ± 10% | | | | | | | |

TABLE II – For use with Group II, General Purpose, Style CK

| COLOR | TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3] | 1st SIG FIG | 2nd SIG FIG | MULTIPLIER[1] | CAPACITANCE TOLERANCE | MIL ID |
|---|---|---|---|---|---|---|
| BLACK | | 0 | 0 | 1 | ± 20% | |
| BROWN | AW | 1 | 1 | 10 | ± 10% | |
| RED | AX | 2 | 2 | 100 | | |
| ORANGE | BX | 3 | 3 | 1,000 | | |
| YELLOW | AV | 4 | 4 | 10,000 | | CK |
| GREEN | CZ | 5 | 5 | | | |
| BLUE | BV | 6 | 6 | | | |
| PURPLE (VIOLET) | | 7 | 7 | | | |
| GREY | | 8 | 8 | | | |
| WHITE | | 9 | 9 | | | |
| GOLD | | | | | | |
| SILVER | | | | | | |

TABLE III – For use with Group III, Temperature Compensating, Style CC

| COLOR | TEMPERATURE COEFFICIENT[4] | 1st SIG FIG | 2nd SIG FIG | MULTIPLIER[1] | CAPACITANCE TOLERANCE | | MIL ID |
|---|---|---|---|---|---|---|---|
| | | | | | Capacitances over 10uuf | Capacitances 10uuf or less | |
| BLACK | 0 | 0 | 0 | 1 | | ± 2.0uuf | CC |
| BROWN | −30 | 1 | 1 | 10 | ± 1% | | |
| RED | −80 | 2 | 2 | 100 | ± 2% | ± 0.25uuf | |
| ORANGE | −150 | 3 | 3 | 1,000 | | | |
| YELLOW | −220 | 4 | 4 | | | | |
| GREEN | −330 | 5 | 5 | | ± 5% | ± 0.5uuf | |
| BLUE | −470 | 6 | 6 | | | | |
| PURPLE (VIOLET) | −750 | 7 | 7 | | | | |
| GREY | | 8 | 8 | 0.01 | | | |
| WHITE | | 9 | 9 | 0.1 | ± 10% | | |
| GOLD | +100 | | | | | ± 1.0uuf | |
| SILVER | | | | | | | |

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL-C–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

STD–C2

*Figure 60. MIL-STD capacitor color code markings.*

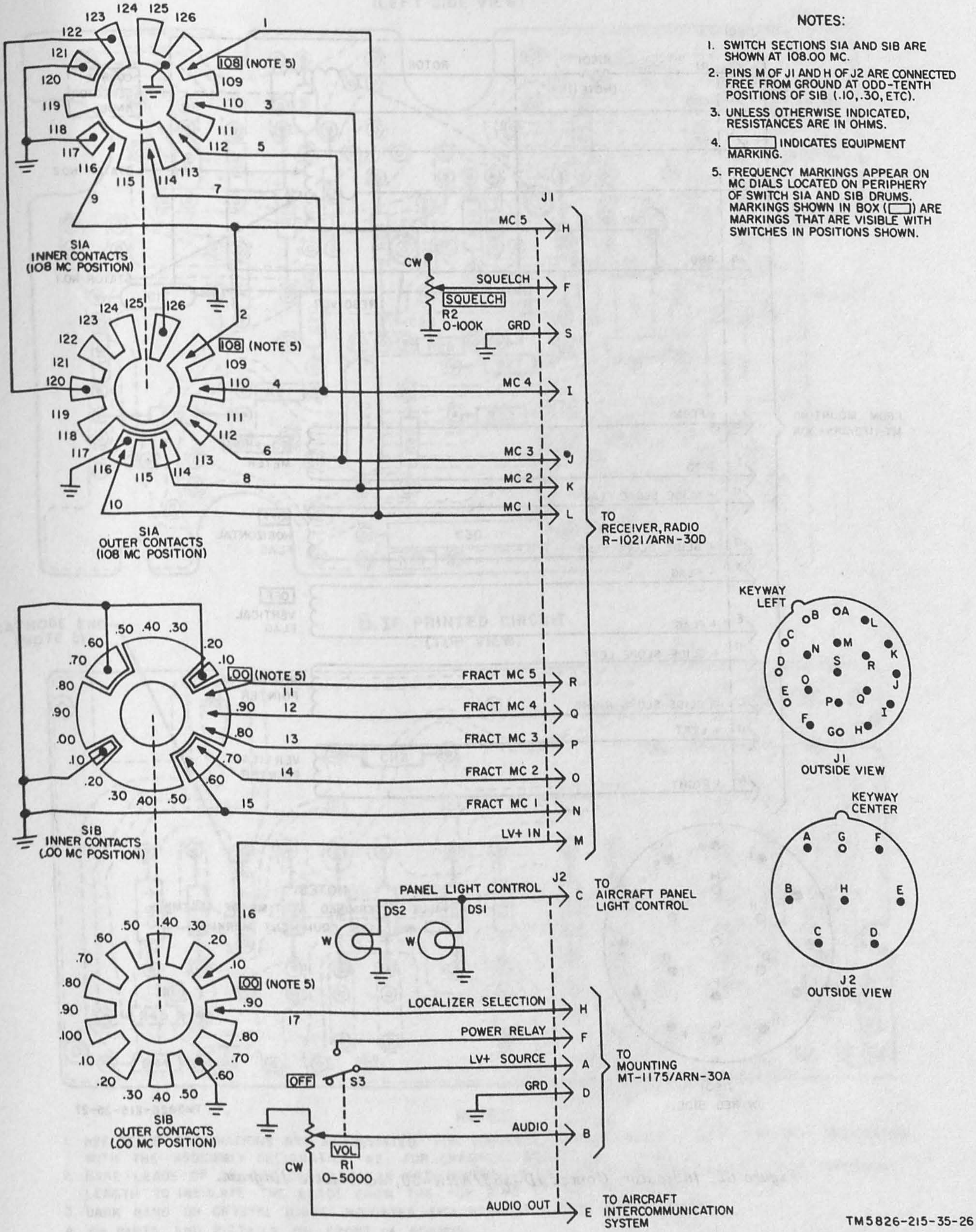



*Figure 61. Control, Radio Set C-3436/ARN-30D, schematic diagram.*

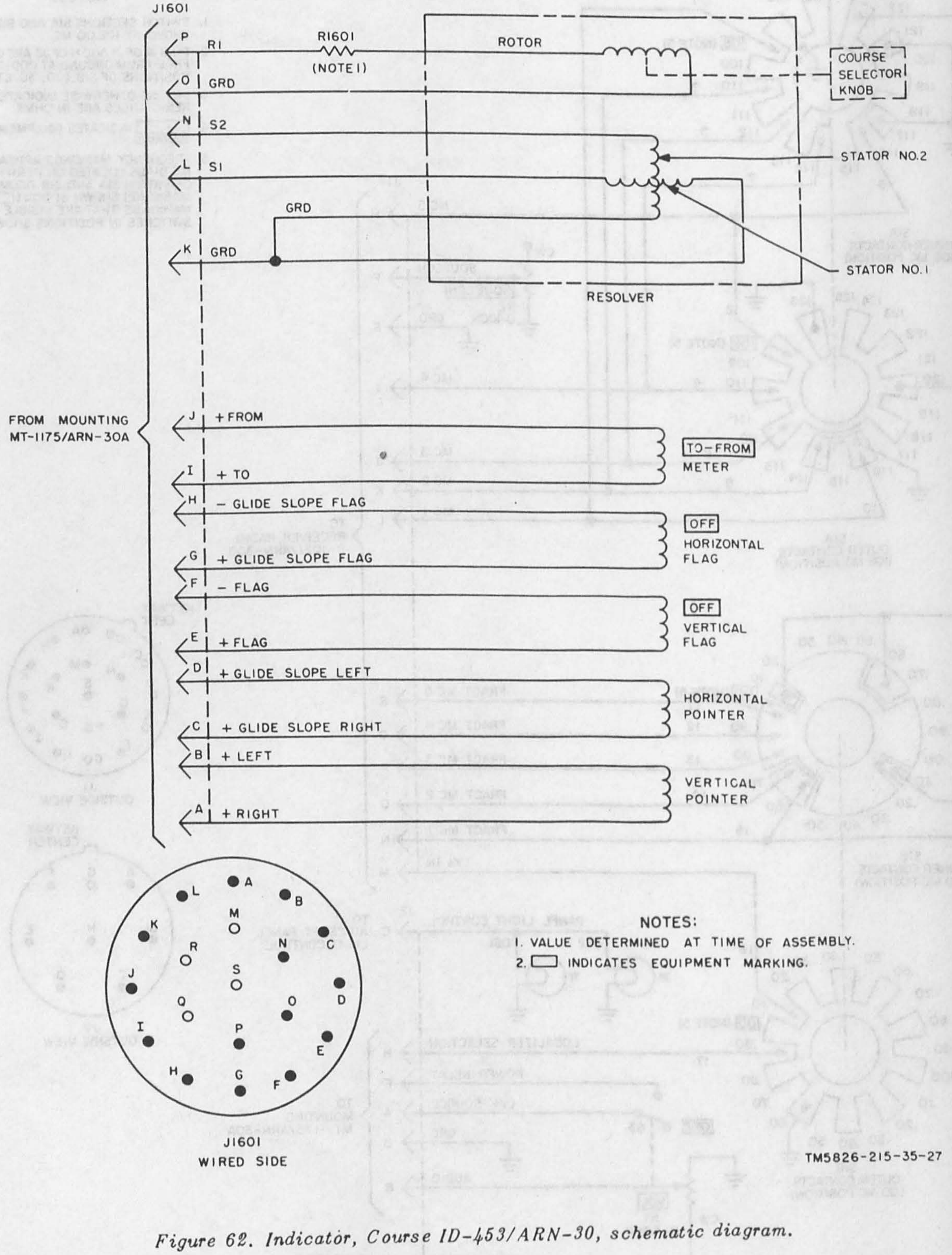
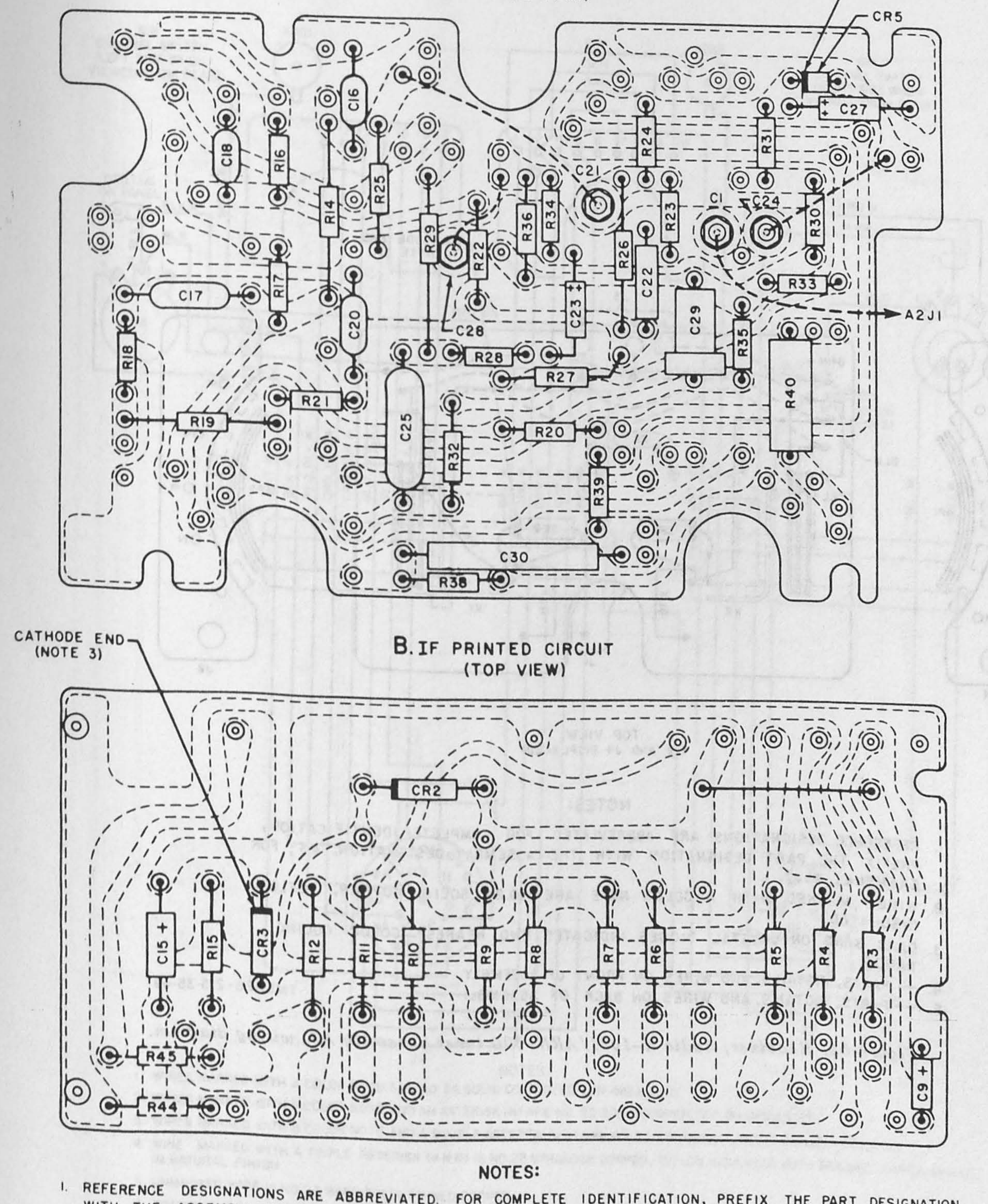



*Figure 62. Indicator, Course ID-453/ARN-30, schematic diagram.*

A. AF PRINTED CIRCUIT
(LEFT SIDE VIEW)

B. IF PRINTED CIRCUIT
(TOP VIEW)

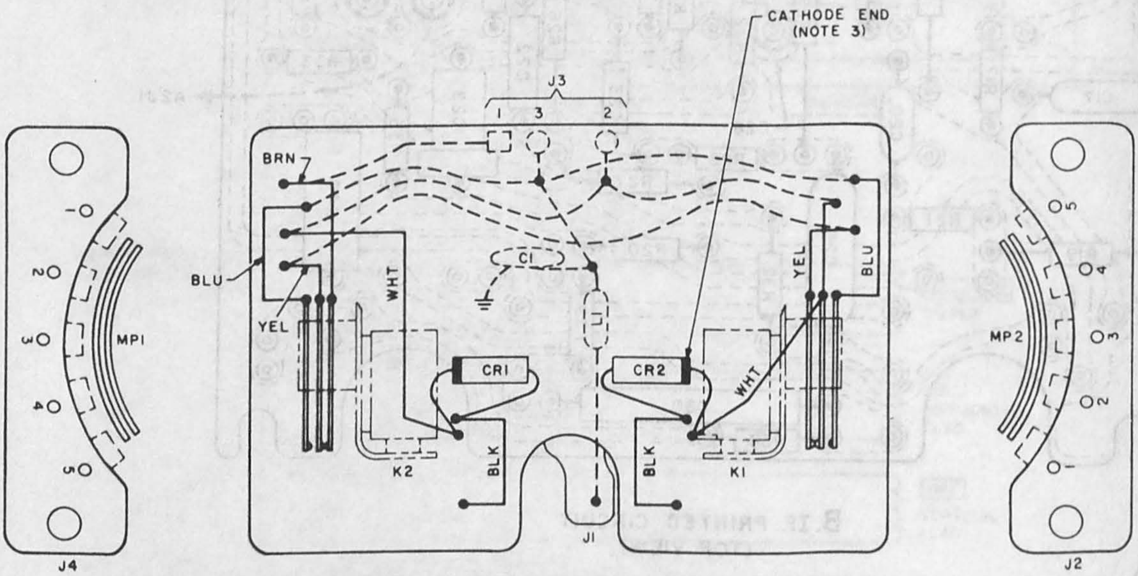



**NOTES:**

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION, A2; FOR EXAMPLE, A2C16.
2. BARE LEADS OF C1, C21, C24, AND C28 ARE COVERED WITH TEFLON TUBING (0.036 I.D.) OF SUFFICIENT LENGTH TO INSULATE THE LEADS FROM THE TOP RIMS OF THE CAPACITORS.
3. DARK BAND ON CRYSTAL DIODE INDICATES END NEAREST COLOR CODING BANDS.
4. — PARTS AND PIGTAILS ON FRONT OF BOARDS.
5. -- WIRING AND PARTS ON BACK OF BOARDS.

TM5826-215-35-38

*Figure 63. Receiver, Radio R-1021/ARN-30D af and if. printed circuits, wiring diagram.*



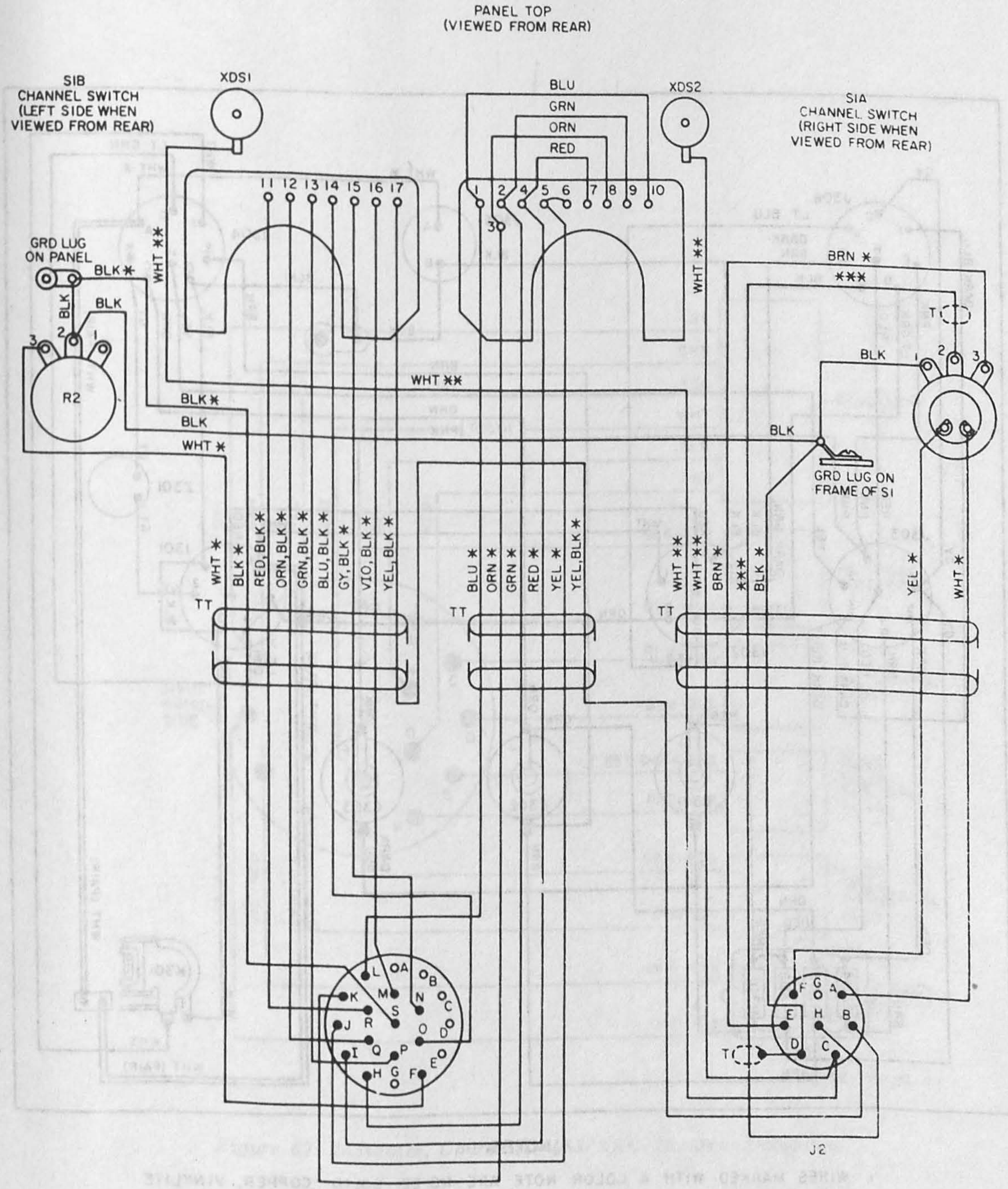

TOP VIEW
(J2 AND J4 DISPLACED)

NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION, A3; FOR EXAMPLE, A3J1.
2. WIRES MARKED WITH A COLOR NOTE ARE NO.24 SOLID COPPER, TEFLON INSULATED.
3. DARK BAND ON CRYSTAL DIODES INDICATES END NEAREST COLOR CODING BANDS.
4. — PARTS, PIGTAILS, AND WIRES ON FRONT OF ASSEMBLY.
5. -- PARTS, PIGTAILS, AND WIRES ON BACK OF ASSEMBLY.

TM5826-215-35-39

*Figure 64. Receiver, Radio R-1021/ARN-30D tuner assembly A3, wiring diagram.*

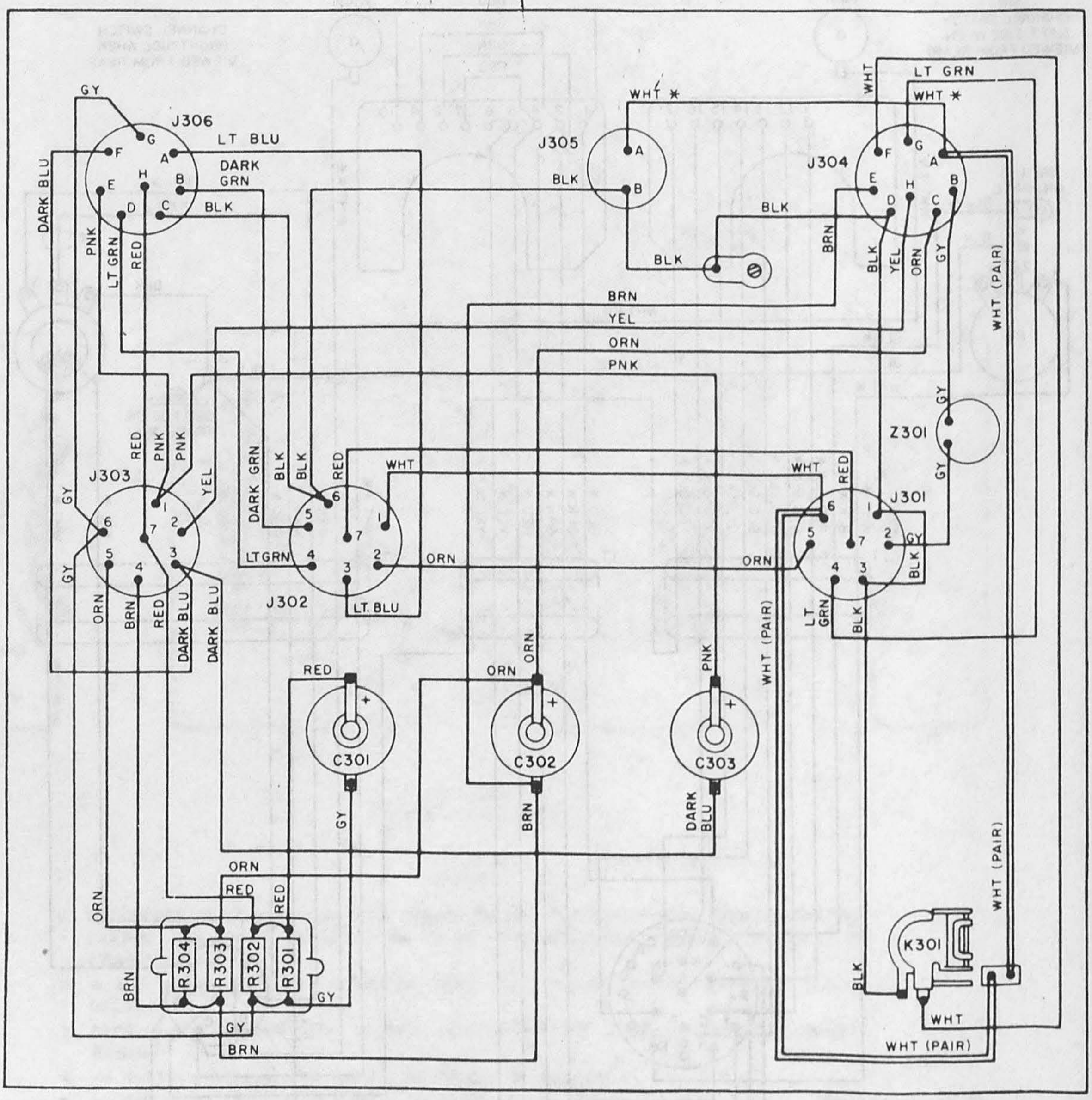



NOTES:

1. WIRES MARKED WITH A COLOR NOTE ARE NO. 24 SOLID COPPER,TEFLON INSULATED.
2. WIRES MARKED WITH A COLOR NOTE AND AN ASTERISK (*) ARE NO. 22 SOLID COPPER,TEFLON INSULATED.
3. WIRES MARKED WITH A COLOR NOTE AND A DOUBLE ASTERISK (**) ARE NO. 20 STRANDED COPPER, TEFLON INSULATED.
4. WIRE MARKED WITH A TRIPLE ASTERISK (***) IS NO.22 STRANDED COPPER, TEFLON INSULATED WITH BRAIDED COPPER SHIELD IN NATURAL FINISH.
5. UNMARKED WIRE IS NO.24 BARE,SOLID,TINNED COPPER
6. TRANSPARENT VINYLITE TUBING (1/8 IN. INNER DIAMETER) IS INSTALLED OVER GROUPS OF WIRE MARKED "T". NYLON SPIRAL-CUT TUBING (1/8 IN. INNER DIAMETER) IS INSTALLED OVER GROUPS OF WIRES MARKED "TT".

TM5826--215-35--41

*Figure 65. Control, Radio Set C-3436/ARN-30D, wiring diagram.*




**NOTES:**

1. WIRES MARKED WITH A COLOR NOTE ARE NO. 22 SOLID COPPER, VINYLITE INSULATED.
2. WIRE MARKED WITH A COLOR NOTE AND AN ASTERISK (*) IS NO 18 STRANDED COPPER, VINYLITE INSULATED.
3. UNMARKED WIRES ARE NO. 22 BARE, SOLID, TINNED COPPER.

TM5826-215-35-42

*Figure 66. Mounting MT-1175/ARN-30A, wiring diagram.*

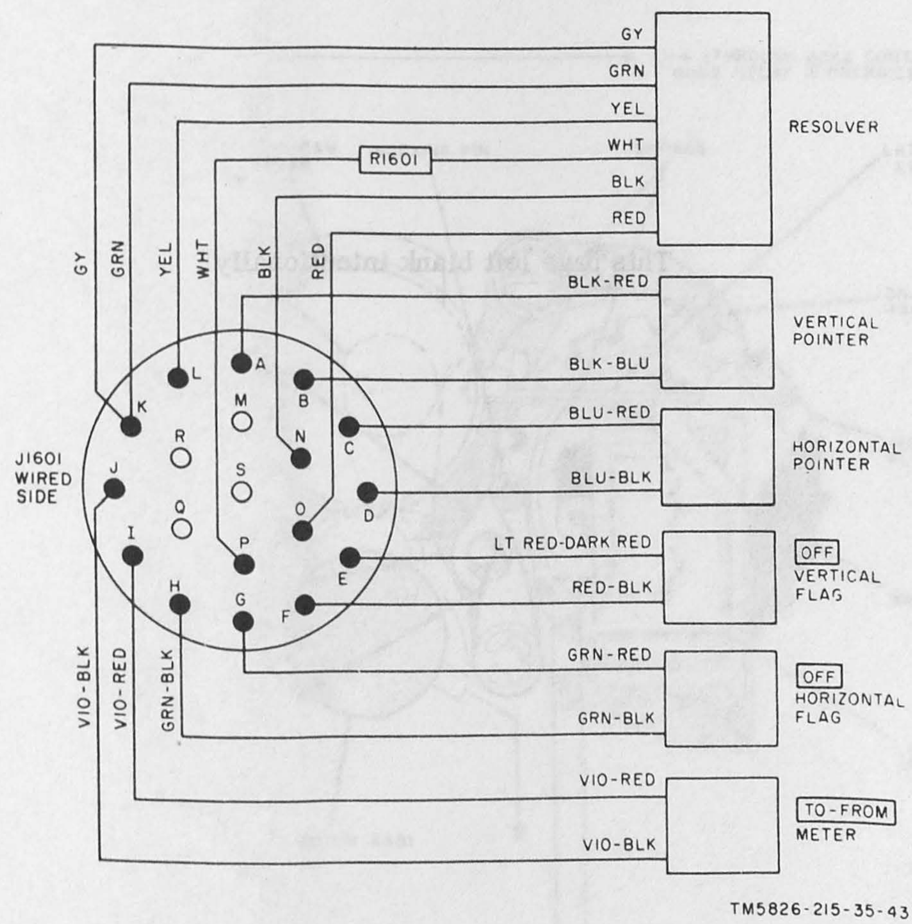



*Figure 67. Indicator, Course ID-453/ARN-30, wiring diagram.*

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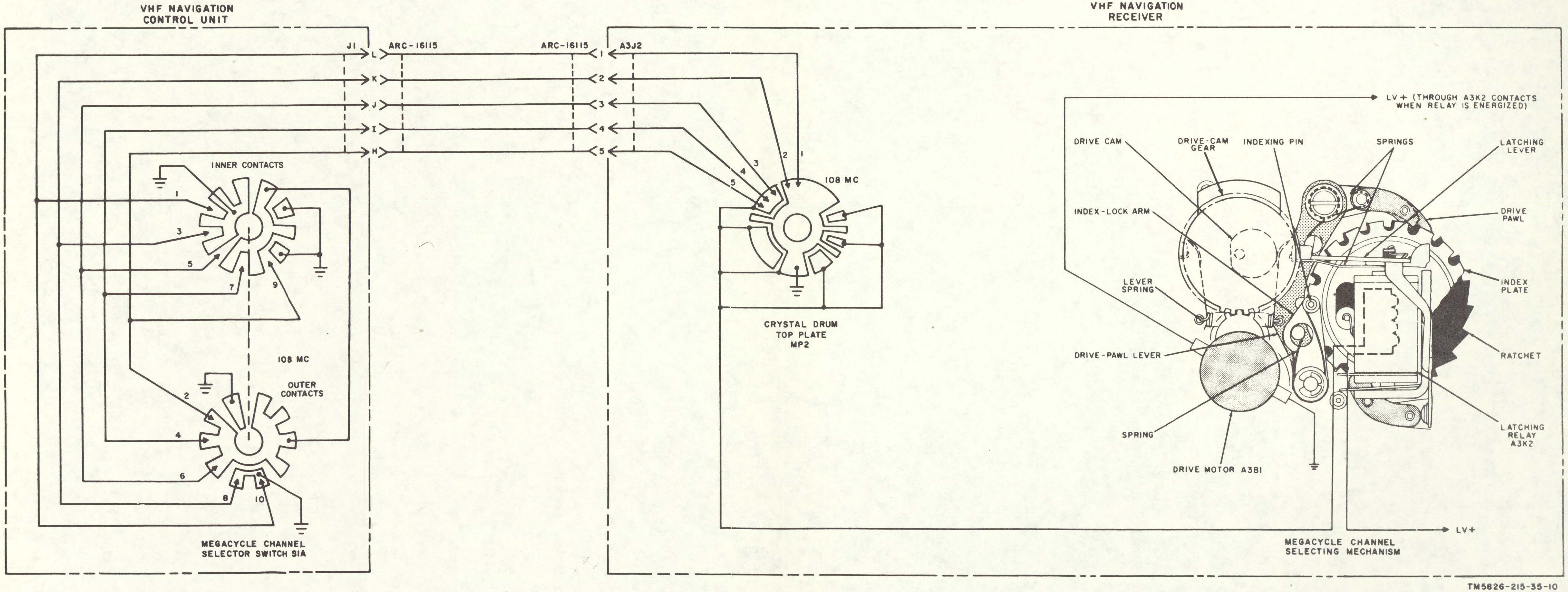
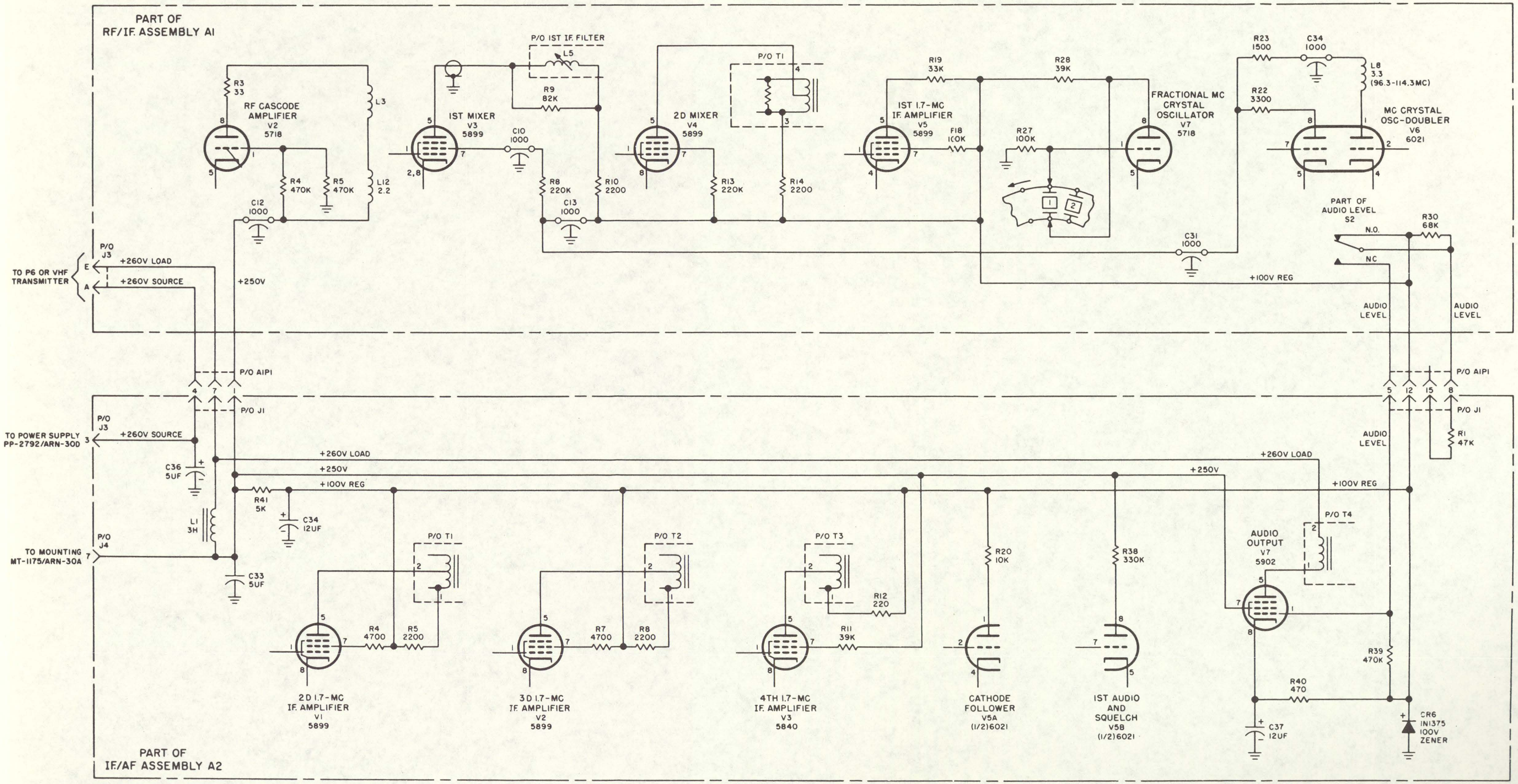



*Figure 68. Megacycle channel selector mechanism and associated control circuits, functional diagram for static condition.*

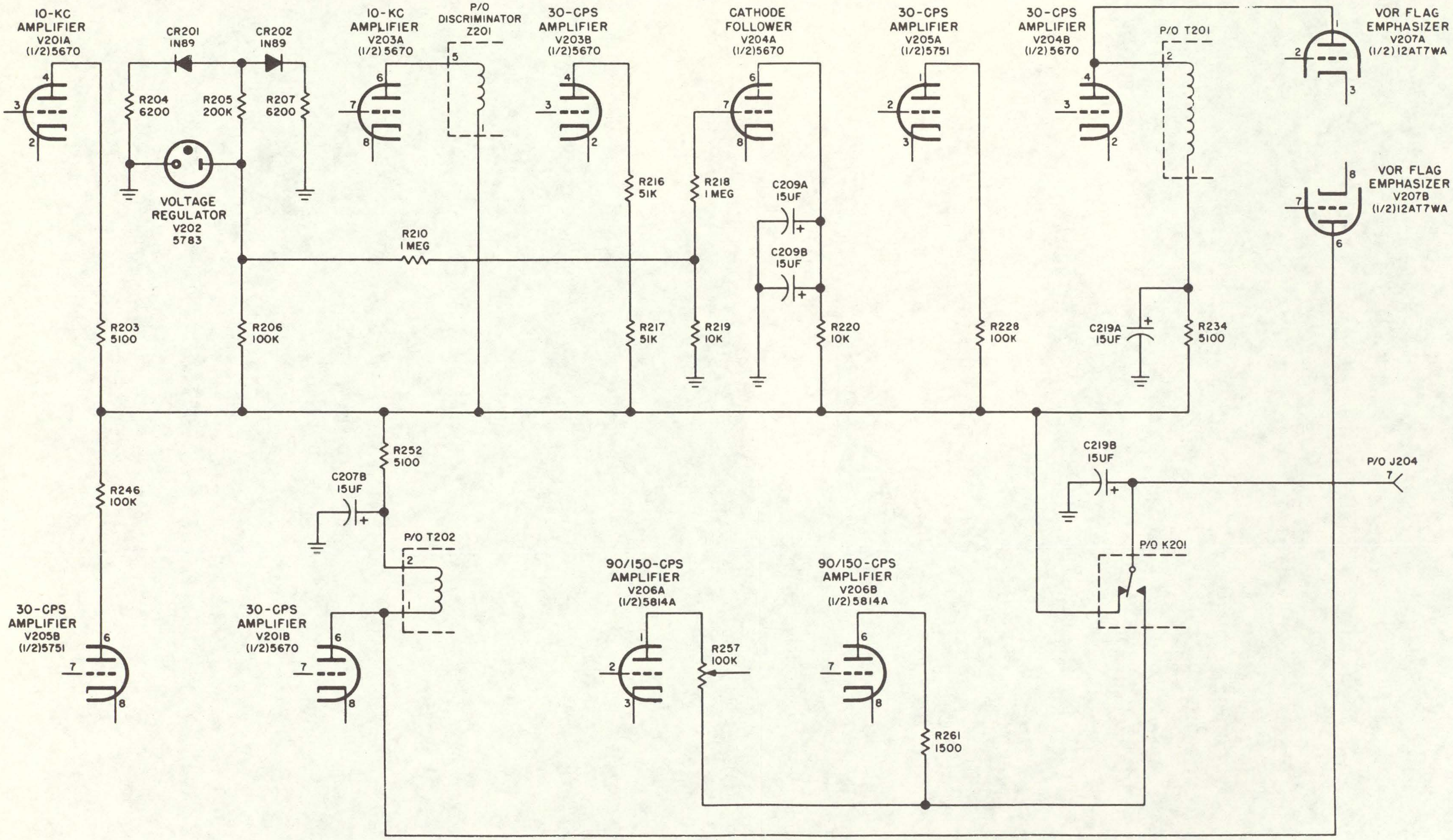



NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION A1 OR A2, WHICHEVER APPLIES; FOR EXAMPLE, A1J3.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, INDUCTANCES ARE IN MICROHENRIES

TM5826-215-35-77

*Figure 69. Vhf navigation receiver high-voltage (HV+) distribution diagram.*




NOTE:
UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.

TM5826-215-35-76

*Figure 70. Converter high-voltage (HV+) distribution diagram.*

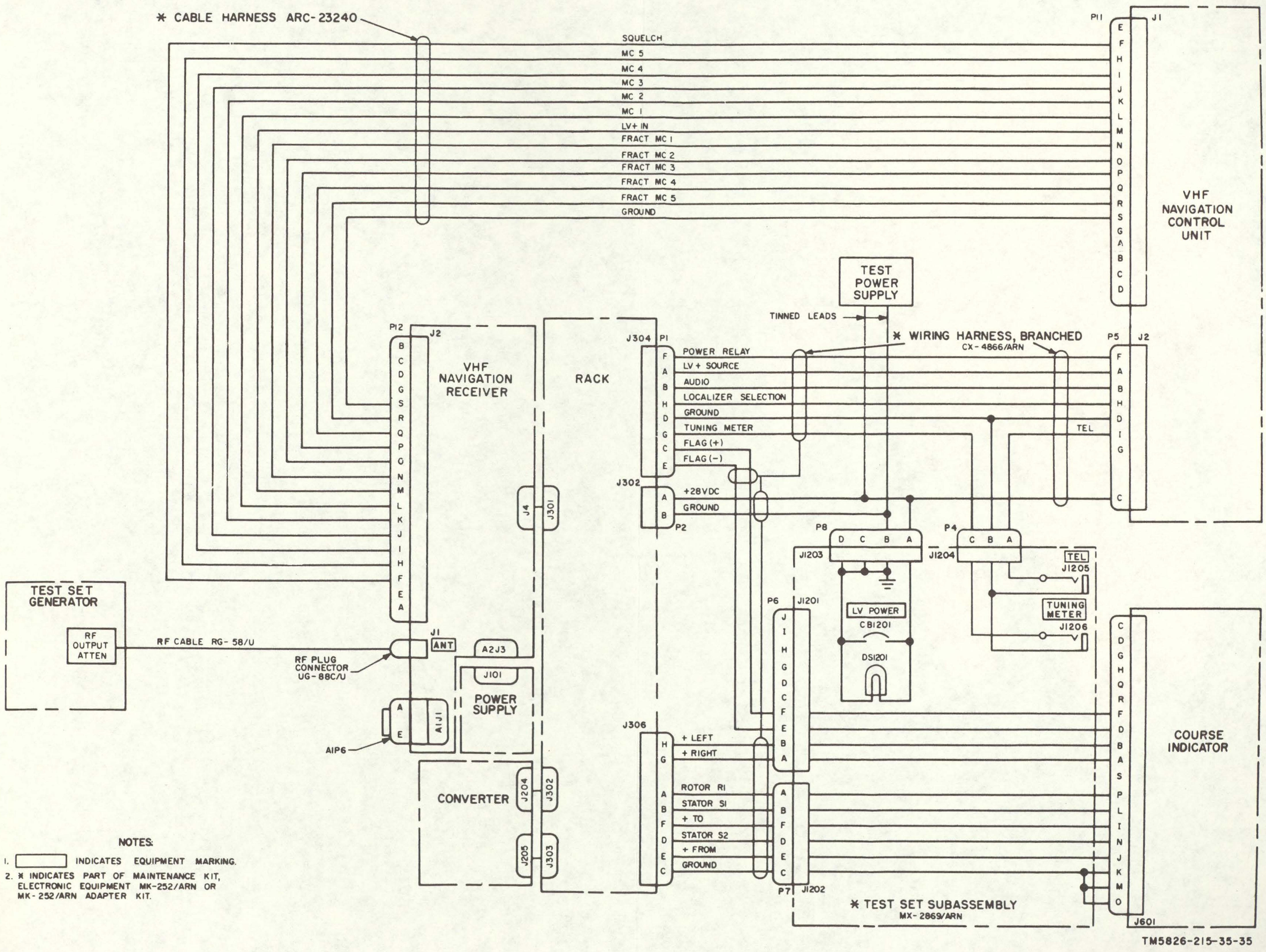



*Figure 71. Operational test setup.*

## NOTES:

1. VOLTAGE READINGS ABOVE LINE. RESISTANCES BELOW LINE.
2. NC INDICATES NO CONNECTION.
3. VOLTAGE VALUES ARE APPROXIMATE AND ARE BASED ON FOLLOWING CONDITIONS:
   (A) VALUES ARE WITH RESPECT TO CHASSIS GROUND.
   (B) 27.5 VOLTS DC MEASURED AT PIN 6 OF A2J4.
   (C) 20,000 OHMS-PER-VOLT VOLTMETER USED, UNLESS OTHERWISE NOTED
   (D) NO RF SIGNAL INPUT UNLESS OTHERWISE NOTED.
4. RESISTANCE VALUES ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CONDITIONS:
   (A) CABLES AND POWER SUPPLY DISCONNECTED.
   (B) WIRED PLUG ARC-11934 IN J2 ON FRONT PANEL.
   (C) 100-VOLT SUPPLY GROUNDED. (CONNECT A1C13 TO GROUND.)
   (D) NEGATIVE TERMINAL OF OHMMETER GROUNDED UNLESS OTHERWISE NOTED.
5. SECOND VALUE TAKEN WITH POSITIVE TERMINAL OF OHMMETER GROUNDED.
6. VALUE DEPENDS ON SETTING OF IF SENSITIVITY CONTROL A1R17. TYPICAL V READING — 1.5V, TYPICAL R READING — 1500.
7. NO SIGNIFICANT MEASUREMENT CAN BE MADE.
8. VALUE WILL DIFFER IF A2R44 IS OTHER THAN 200K OHMS.
9. VALUE DEPENDS ON SETTING OF SQUELCH CONTROL A1R20.
10. VOLTAGE IS −0.5 VOLT WITH RF SIGNAL OVER 5UV.
11. FIRST VALUE TAKEN FROM 108 TO 117 MC; SECOND FROM 118 TO 126 MC.

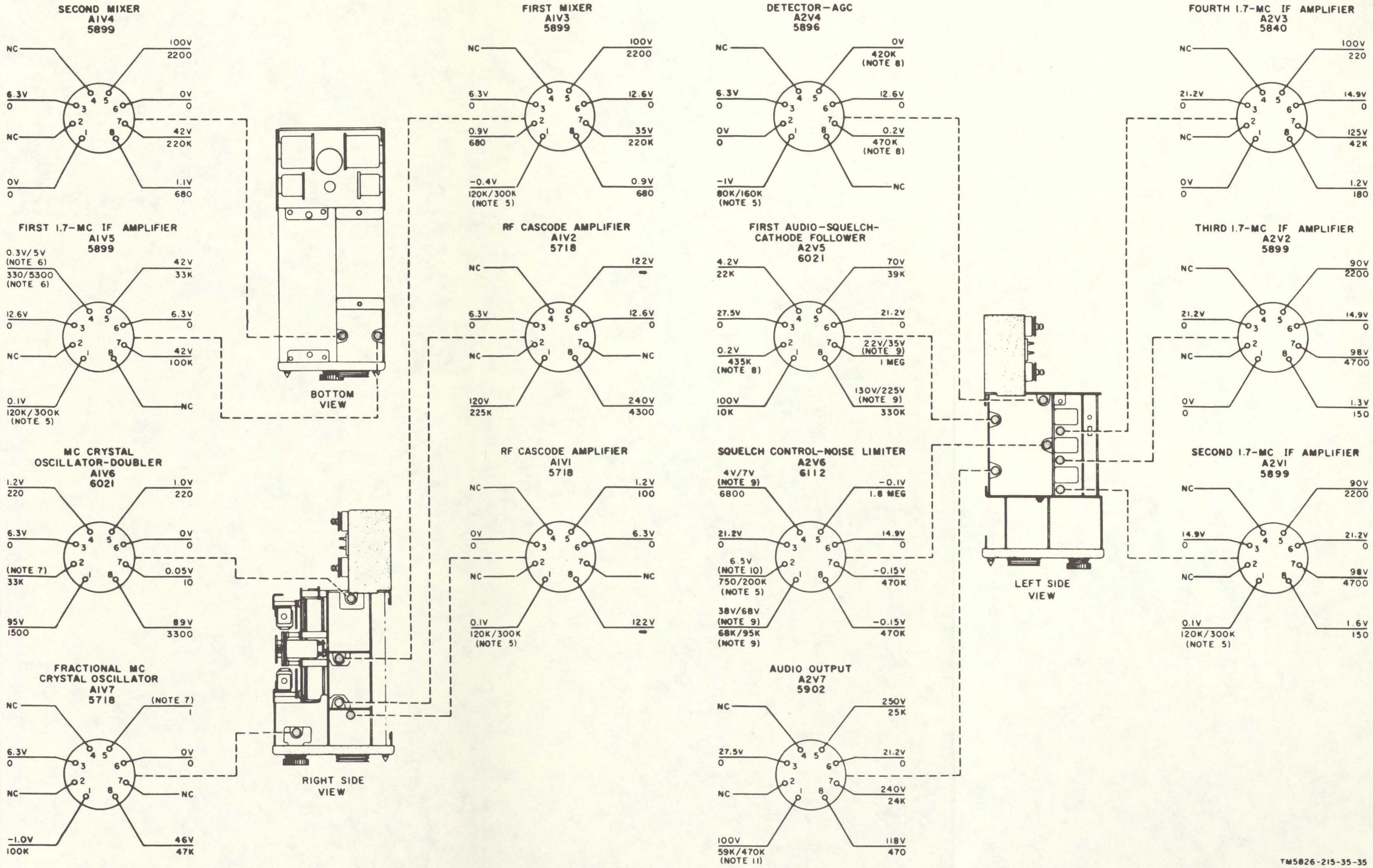
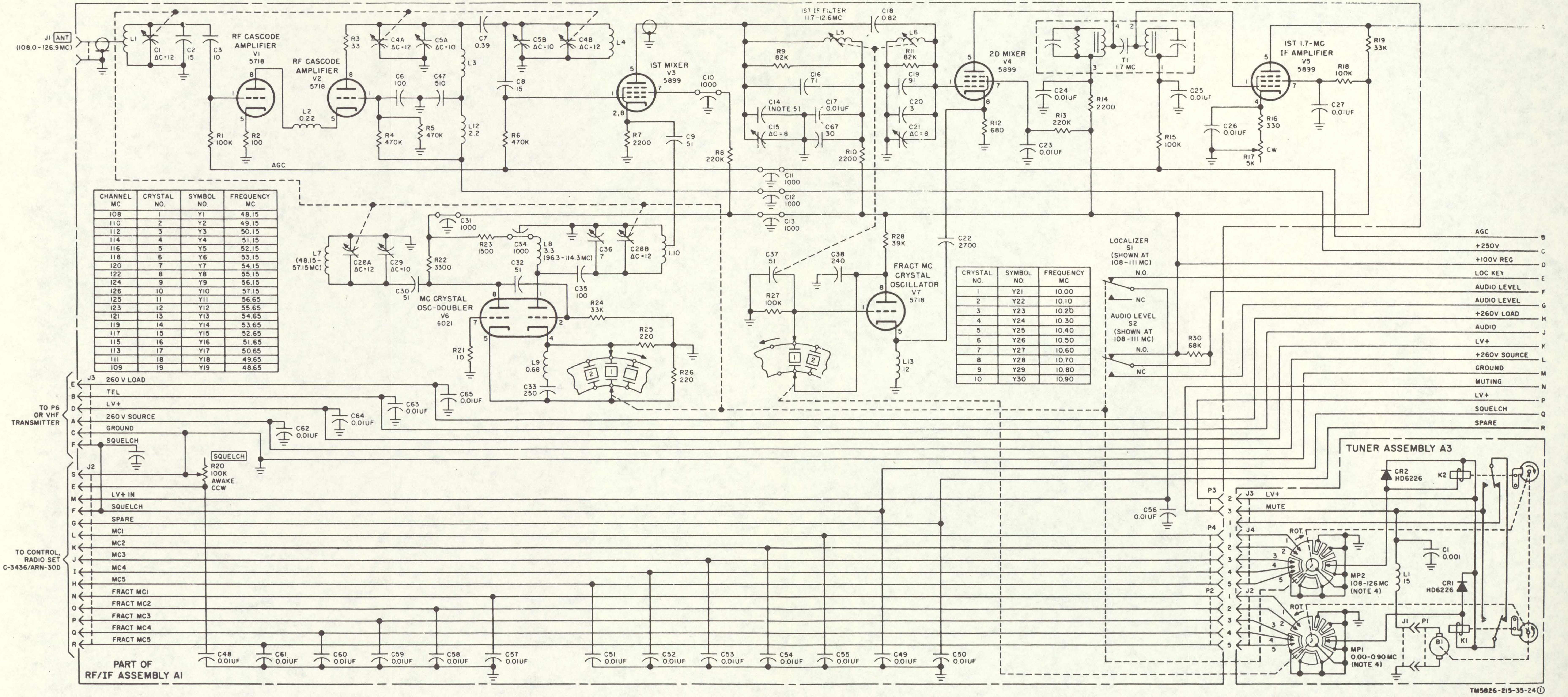


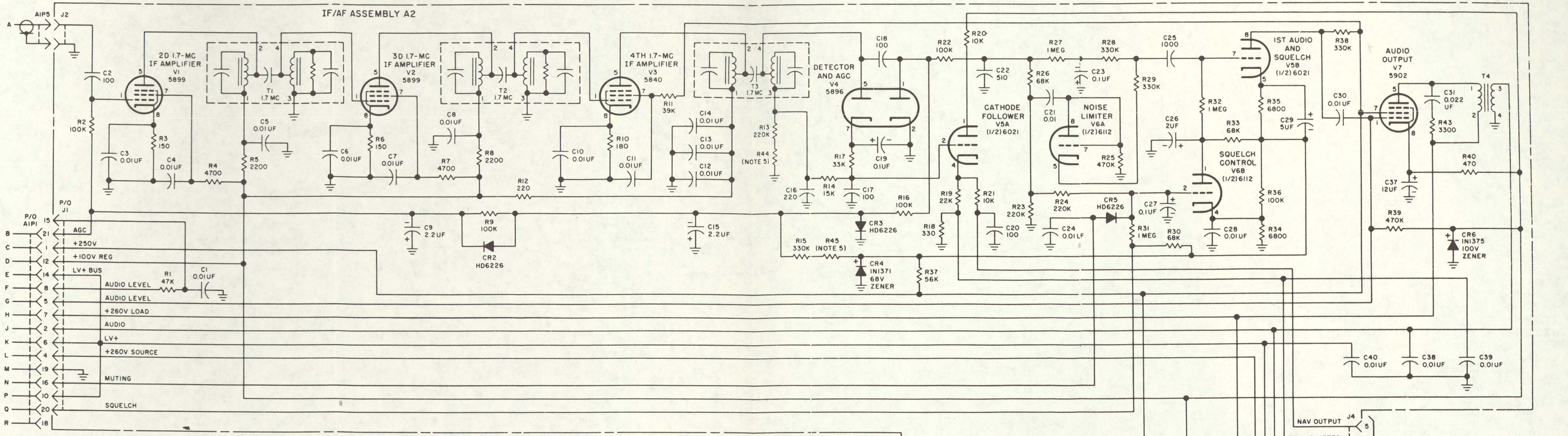

*Figure 72. Vhf navigation receiver, voltage and resistance diagram.*

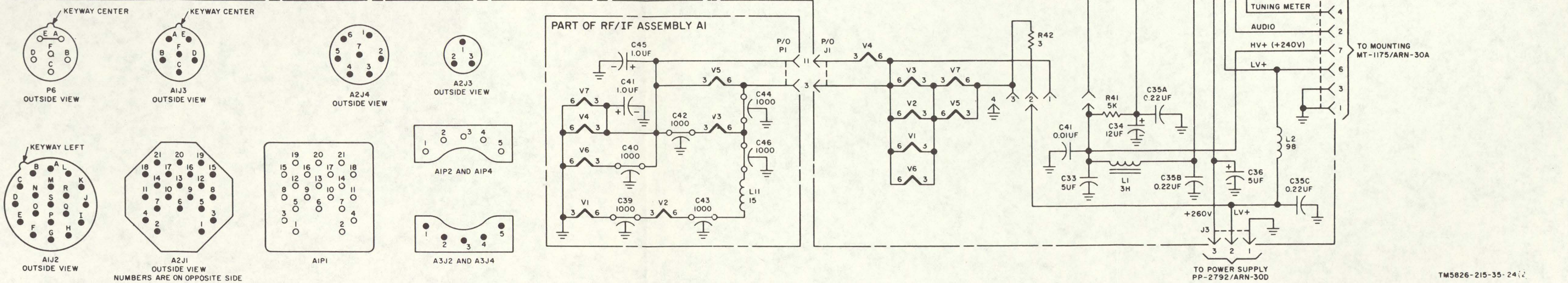



| CHANNEL MC | CRYSTAL NO. | SYMBOL NO. | FREQUENCY MC |
|---|---|---|---|
| 108 | 1 | Y1 | 48.15 |
| 110 | 2 | Y2 | 49.15 |
| 112 | 3 | Y3 | 50.15 |
| 114 | 4 | Y4 | 51.15 |
| 116 | 5 | Y5 | 52.15 |
| 118 | 6 | Y6 | 53.15 |
| 120 | 7 | Y7 | 54.15 |
| 122 | 8 | Y8 | 55.15 |
| 124 | 9 | Y9 | 56.15 |
| 126 | 10 | Y10 | 57.15 |
| 125 | 11 | Y11 | 56.65 |
| 123 | 12 | Y12 | 55.65 |
| 121 | 13 | Y13 | 54.65 |
| 119 | 14 | Y14 | 53.65 |
| 117 | 15 | Y15 | 52.65 |
| 115 | 16 | Y16 | 51.65 |
| 113 | 17 | Y17 | 50.65 |
| 111 | 18 | Y18 | 49.65 |
| 109 | 19 | Y19 | 48.65 |

| CRYSTAL NO. | SYMBOL NO. | FREQUENCY MC |
|---|---|---|
| 1 | Y21 | 10.00 |
| 2 | Y22 | 10.10 |
| 3 | Y23 | 10.20 |
| 4 | Y24 | 10.30 |
| 5 | Y25 | 10.40 |
| 6 | Y26 | 10.50 |
| 7 | Y27 | 10.60 |
| 8 | Y28 | 10.70 |
| 9 | Y29 | 10.80 |
| 10 | Y30 | 10.90 |

*Figure 73 1. Receiver, Radio R-1021/ARN-30D, schematic diagram (part 1 of 2).*

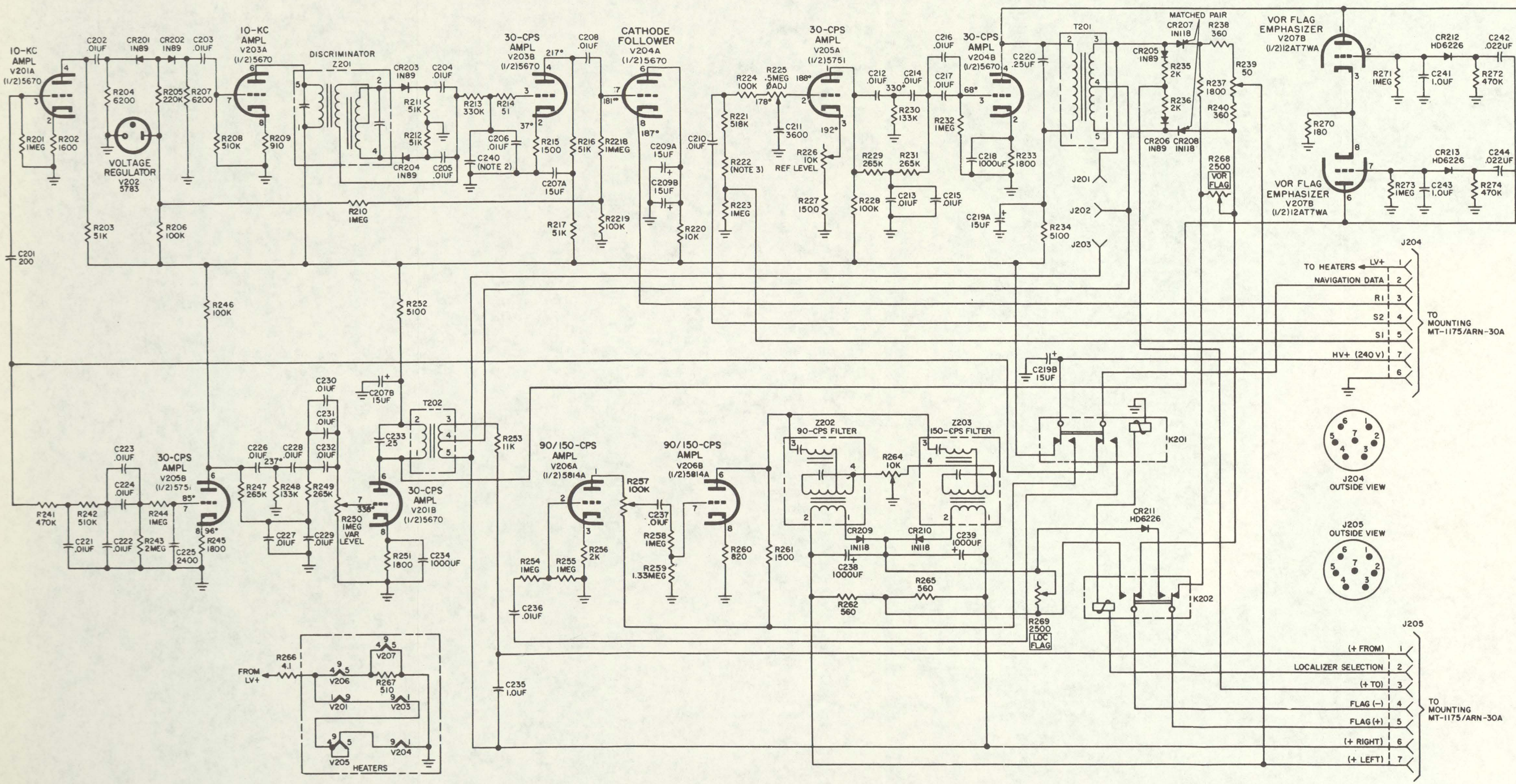



NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION A1, A2, OR A3, WHICHEVER APPLIES; FOR EXAMPLE, A1J2.
2. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF, INDUCTANCES ARE IN MICROHENRIES.
3. ▭ INDICATES EQUIPMENT MARKING.
4. TOP PLATES A3MP1 AND A3MP2 ARE SHOWN IN THE 0.00-MC AND 108-MC POSITIONS, RESPECTIVELY.
5. VALUES OF THE FOLLOWING PARTS ARE SELECTED AND INSTALLED DURING FINAL FACTORY ADJUSTMENT:
A2R44 47K TO 470K
A2R45 47K TO 470K
A1C14 3 TO 15

*Figure 73(2). Receiver, Radio R-1021/ARN-30D, schematic diagram (part 2 of 2).*

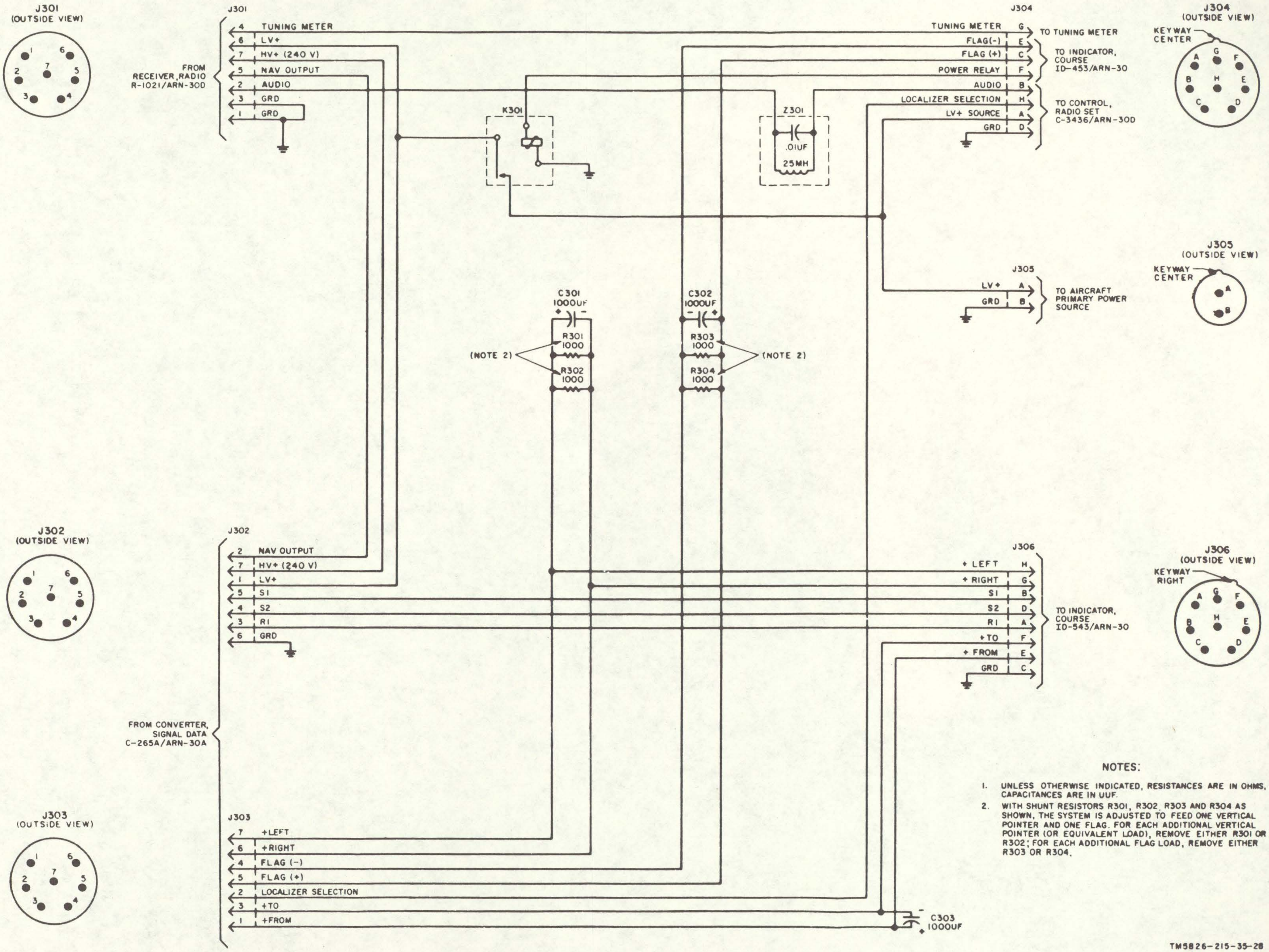



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. VALUES OF THE FOLLOWING PARTS ARE SELECTED AND INSTALLED AT TIME OF FINAL ADJUSTMENT:
   R222 0-20K
   C240 0-0.002UF
3. RELATIVE PHASE ANGLES OF VARIOUS 30-CPS VOLTAGES ARE MEASURED WITH RESPECT TO THE AF INPUT VOLTAGE WITH THE INDICATOR COURSE SELECTOR SET FOR A 191° ON-COURSE (TO) INDICATION.
4. [box] INDICATES EQUIPMENT MARKING.

TM5826-215-35-25

*Figure 74. Converter, Signal Data CV-265A/ARN-30A, schematic diagram.*




NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, CAPACITANCES ARE IN UUF.
2. WITH SHUNT RESISTORS R301, R302, R303 AND R304 AS SHOWN, THE SYSTEM IS ADJUSTED TO FEED ONE VERTICAL POINTER AND ONE FLAG. FOR EACH ADDITIONAL VERTICAL POINTER (OR EQUIVALENT LOAD), REMOVE EITHER R301 OR R302; FOR EACH ADDITIONAL FLAG LOAD, REMOVE EITHER R303 OR R304.

*Figure 75. Mounting MT-1175/ARN-30A, schematic diagram.*

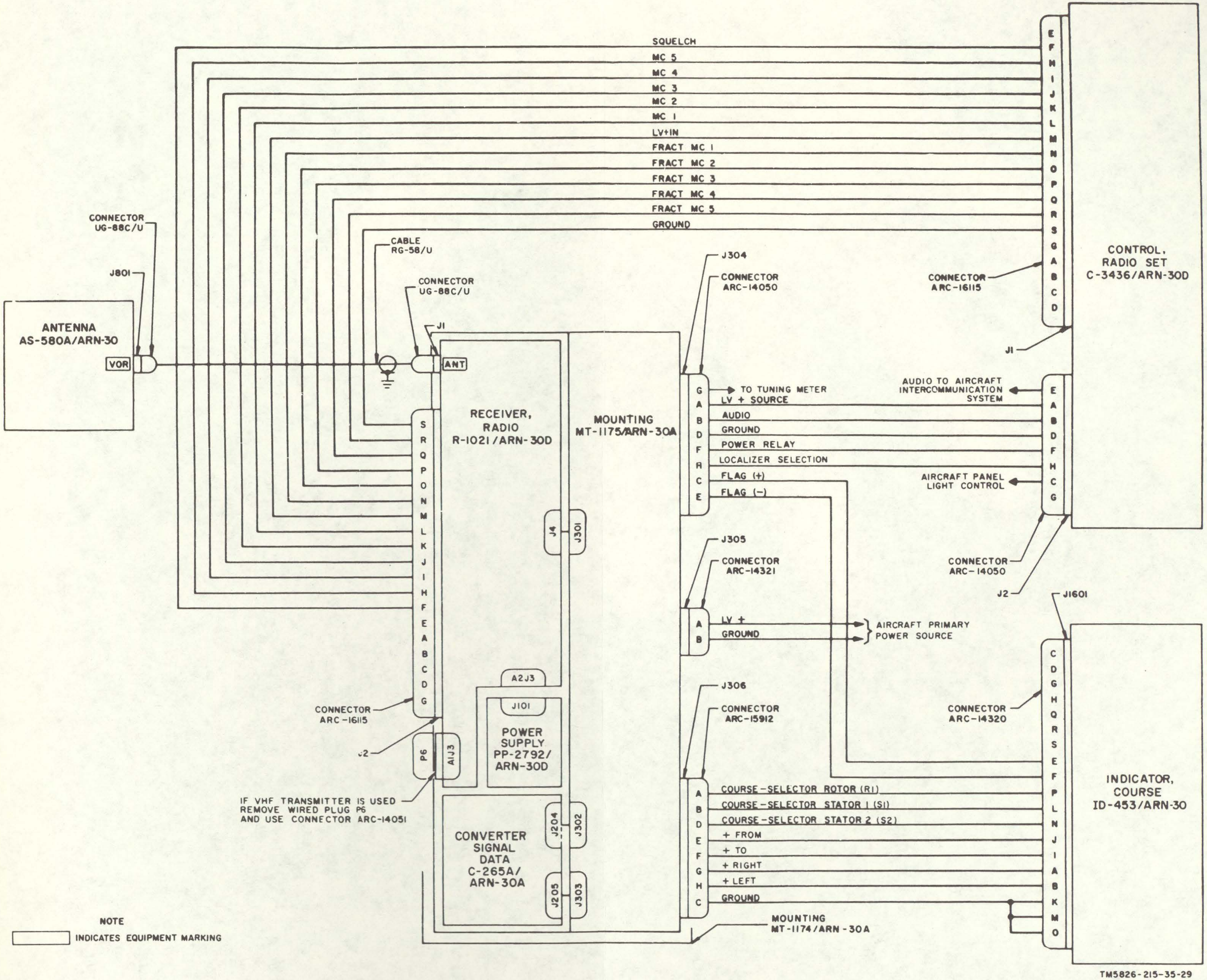



*Figure 76. Receiving Set, Radio AN/ARN−30D, interconnection diagram.*

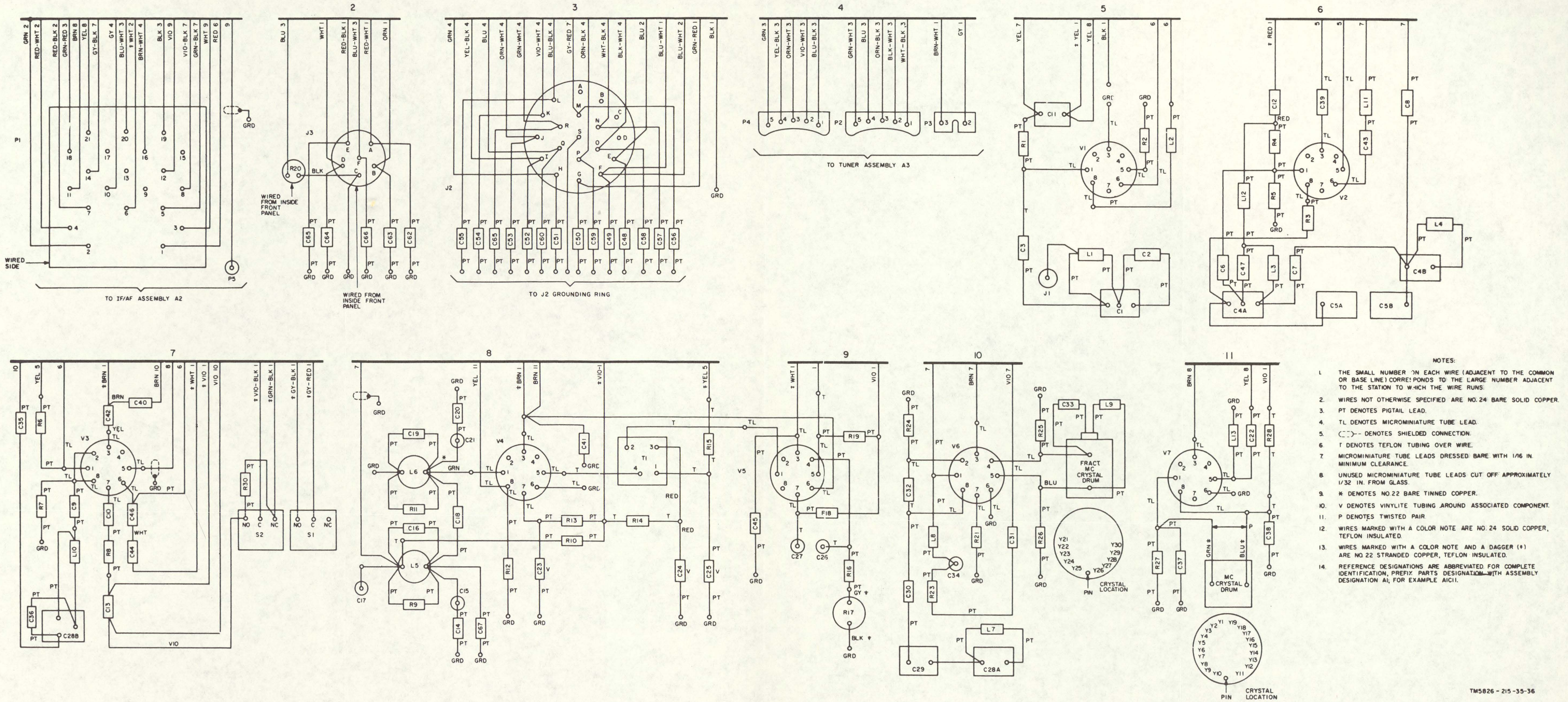
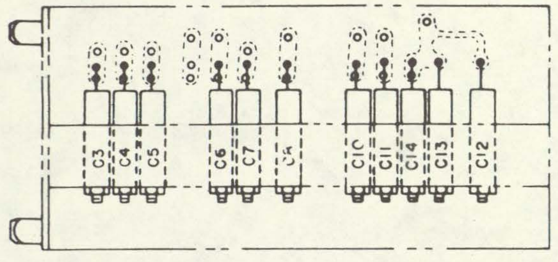


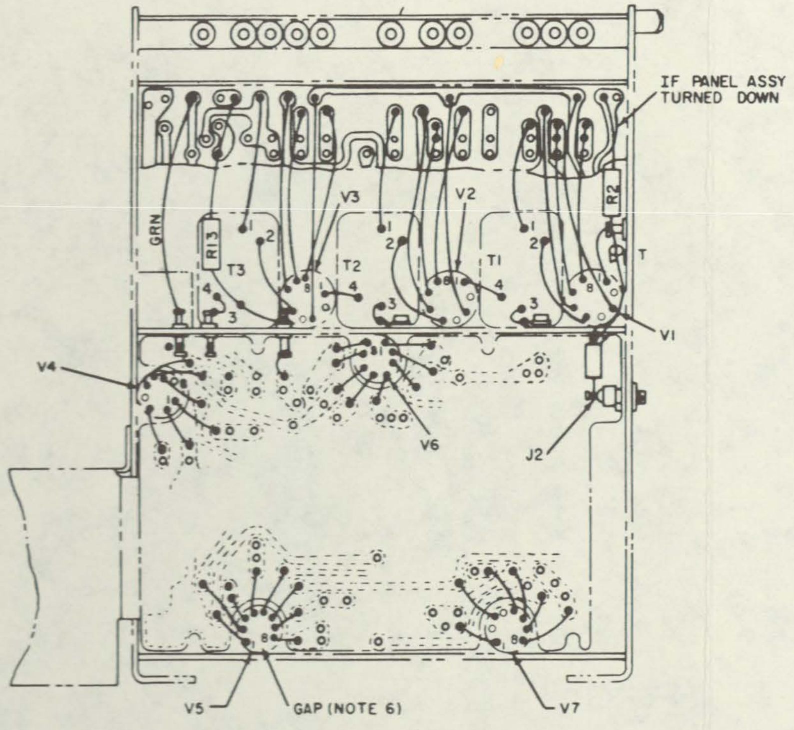

*Figure 77. Receiver, Radio R-1021/ARN-30D, rf/if. assembly A1, wiring diagram.*

## NOTES:

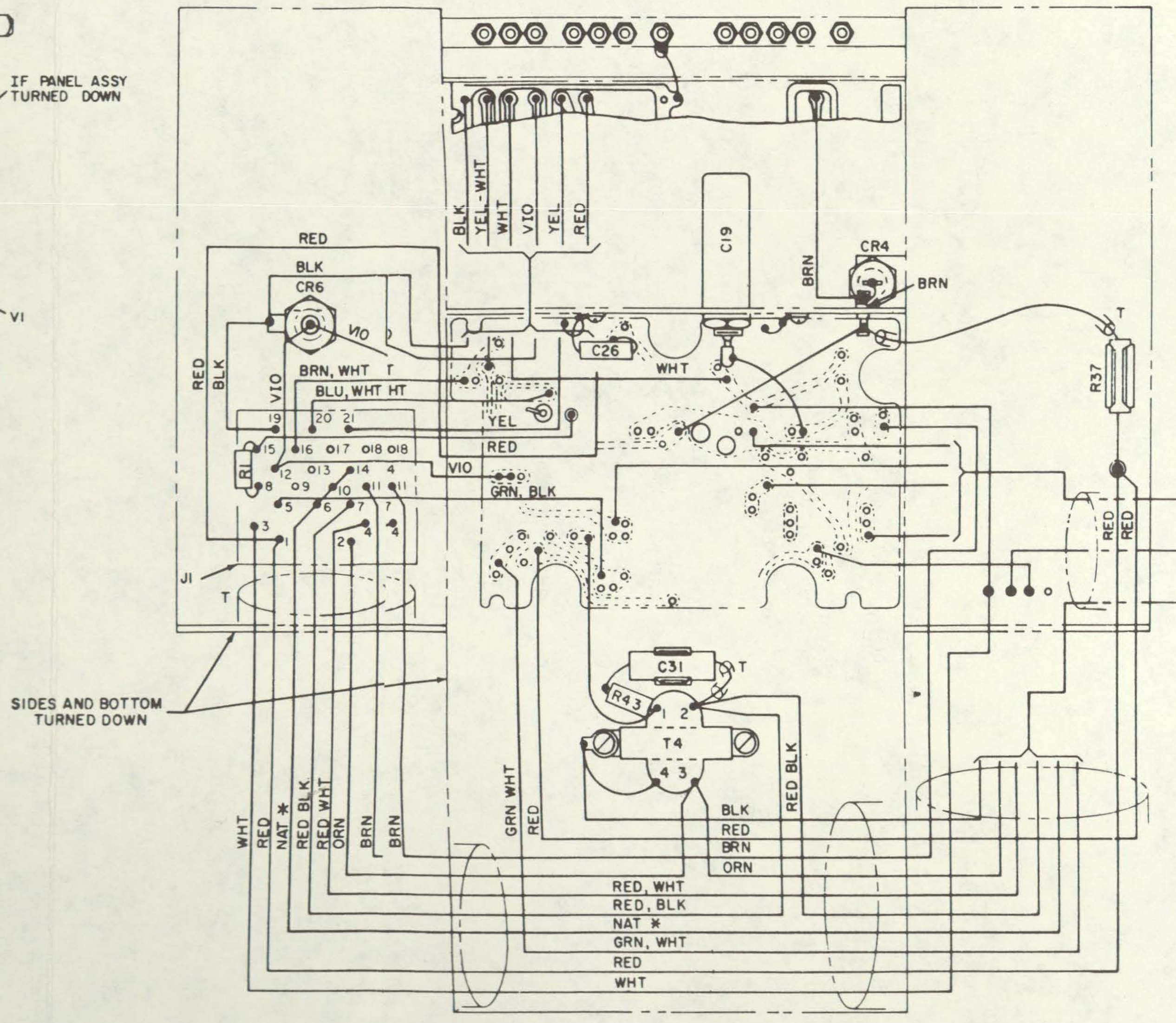
1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION, A2; FOR EXAMPLE, A2C1.
2. WIRES MARKED WITH A COLOR NOTE ARE NO. 24 SOLID COPPER, TEFLON INSULATED.
3. WIRES MARKED WITH A COLOR NOTE AND AN ASTERISK (*) ARE NO. 20 STRANDED COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 BARE, SOLID, TINNED COPPER.
5. TEFLON TUBING OF APPROPRIATE SIZE AND LENGTH IS INSTALLED OVER WIRES MARKED "T".
6. VACUUM TUBES ARE VIEWED TOWARD BASE IN LEFT SIDE VIEW. ORIENT TUBES IN CLIP AS SHOWN. DRESS BARE TUBE LEADS WITH 1/16 IN. MINIMUM CLEARANCE. CUT OFF UNUSED LEADS APPROXIMATELY 1/32 IN. FROM GLASS.
7. TEFLON TUBING IS INSTALLED OVER LEADS OF V1, V2, AND V3.



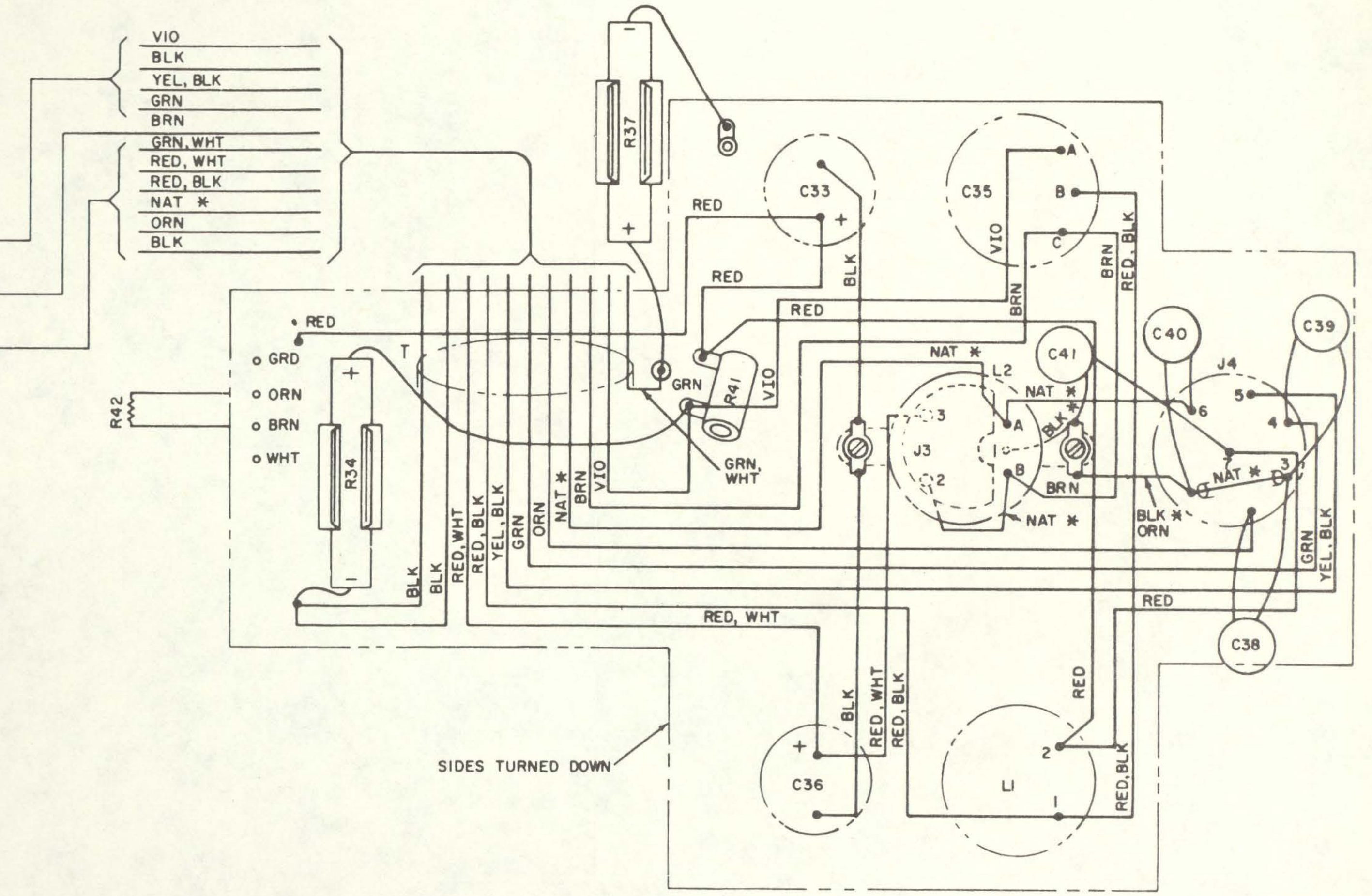

A. TOP VIEW




B. LEFT SIDE VIEW



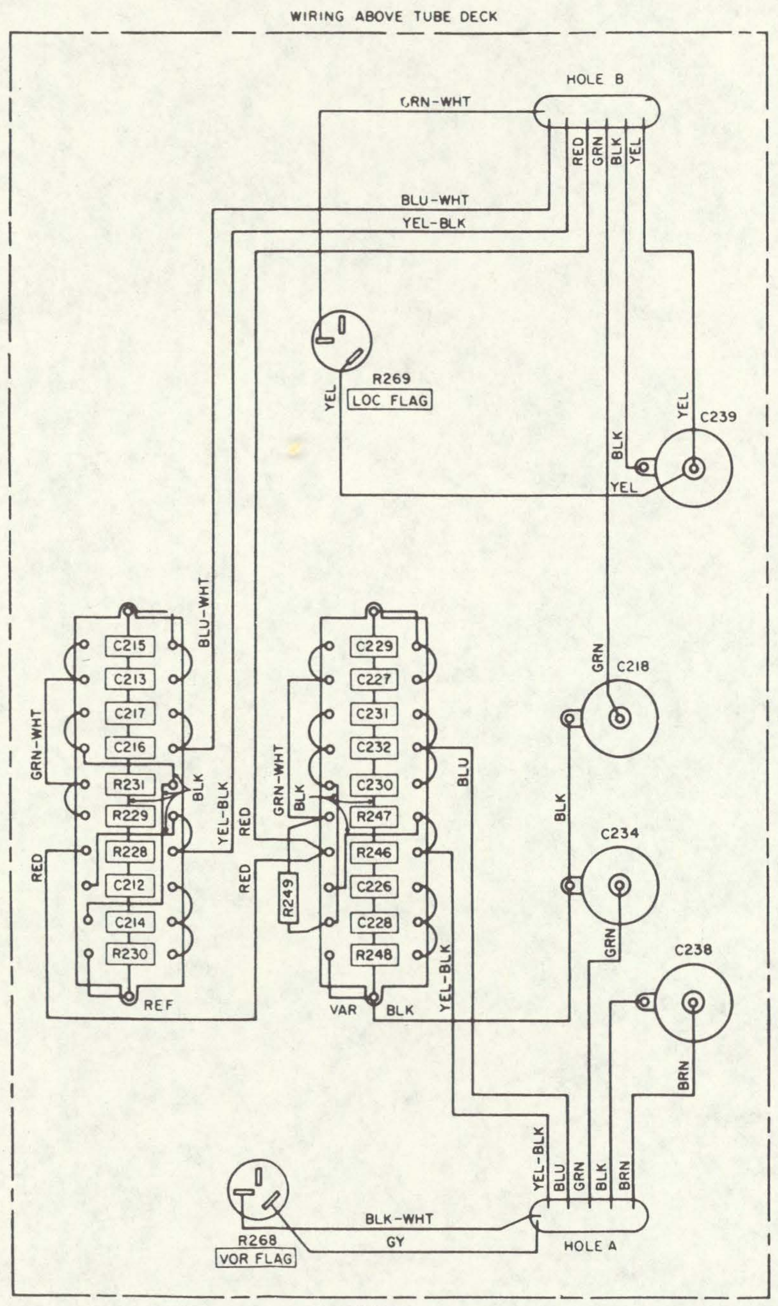

C. RIGHT SIDE VIEW




D. BOTTOM VIEW

TM5826-215-35-37

*Figure 78. Receiver, Radio R-1021/ARN-30D, i.f./a.f assembly, A2, wiring diagram.*




NOTES:

1. WIRES MARKED WITH A COLOR NOTE ARE NO. 24 SOLID COPPER, TEFLON INSULATED.
2. WIRES MARKED WITH A COLOR NOTE AND AN ASTERISK (*) ARE NO. 22 SOLID COPPER, TEFLON INSULATED.
3. UNMARKED WIRES ARE NO. 24 BARE, SOLID, TINNED COPPER.
4. VINYLITE TUBING OF APPROPRIATE SIZE IS INSTALLED OVER WIRES MARKED "T".
5. DARK BAND ON CRYSTAL DIODE INDICATES END NEAREST COLOR CODING BANDS.
6. ▭ INDICATES EQUIPMENT MARKING.
7. SOLDERED DIRECTLY TO MOUNTING PLATE.

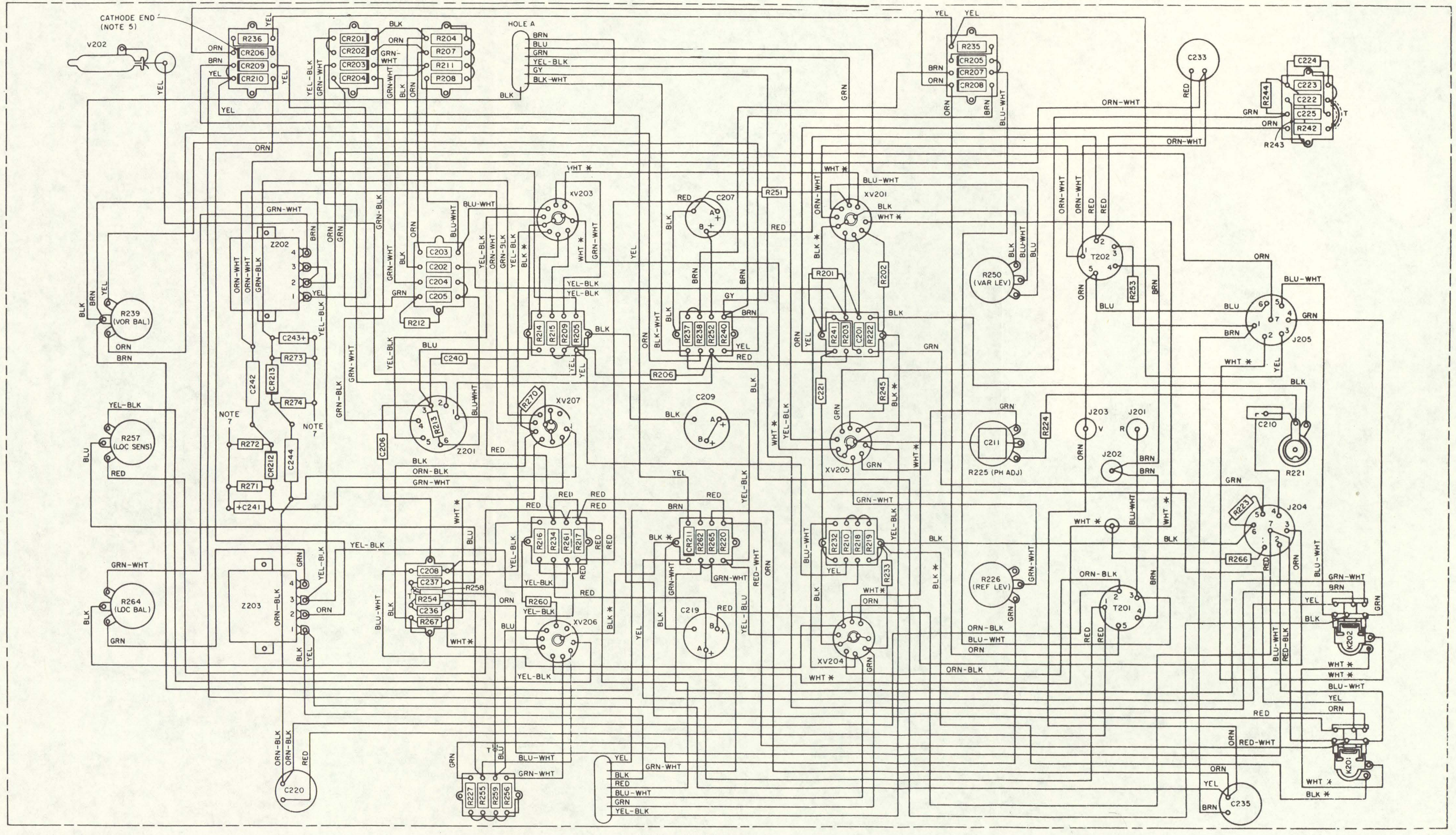



*Figure 79. Converter, Signal Data CV-265A/ARN-30A, wiring diagram.*

By Order of Secretary of the Army:

G. H. DECKER,
*General, United States Army,*
*Chief of Staff.*

Official:

J. C. LAMBERT,
*Major General, United States Army,*
*The Adjutant General.*

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