ARMY TM11-5805-650-34&P
AIR FORCE TO 31W2-2TT-12

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

TELEPHONE SET TA-838/TT (NSN 5805-00-124-8678) AND TELEPHONE SET TA-838A/TT (NSN 5805-01-125-5976)

This copy is a reprint which includes current pages from Changes 1 through 4.

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

OCTOBER 1976

Change

No. 5

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Direct Support and General Support Maintenance Manual

TELEPHONE SET TA-838/TT (NSN 5805-00-124-8678) (EIC: HJR) AND TELEPHONE SET TA-838A/TT (NSN 5805-01-125-5976) (EIC: HOR)

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None	FO-21/(FO-22 blank)
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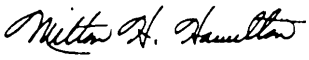

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TELEPHONE SET TA-838/TT
(NSN 5805-00-124-8678)
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4-13 and 4-14	4-13 and 4-14
4-19 and 4-20	4-19 and 4-20
4-23 through 4-24.6	4-23 through 4-24.6
A-l	A-1/(A-2 blank)
B-l through B-10	None
Figure FO-3	Figure FO-3
Figure FO-4 ① and F0-4 ②	Figures FO-4 ① and FO-4 ②
Figure FO-5	Figure FO-5
Figure FO-6	Figure FO-6
None	Figures FO-7 ① through FO-7 ③

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Including Repair Parts and Special Tools Lists

FOR

TELEPHONE SET TA-838/TT

(NSN 5805-00-124-8678)

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4-17through 4-22	4-17 through 4-22
A-1	A-1
Figure FO-3	Figure FO-3
Figure FO-4 ①	Figure FO-4 ①

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Maintenance Manual Including

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for

TELEPHONE SET TA-838/TT

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4-l and 4-2	4-1 through 4-2.1
4-3 through 4-24	4-3 through 4-24.7
B-11 and B-12	B-11 and B-12
Figure FO-4 ②	Figure FO-4 ②

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SHAD (3)
USA Dep (1)
Sig Sec USA Dep (l)
Sig Dep (1)
MAAG (1)
USARMIS (1)
USERDAA (1)
USERDAW (1)
Sig FLDMS (1)

ARNG & USAR: None

For explanation of abbreviations used, see AR 310-50.

TECHNICAL MANUAL
NO. 11-5805-650-34&P
TECHNICAL ORDER
NO. 31W2-2TT-12

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE

Washington, DC, 1 October 1976

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

TELEPHONE SET TA-838/TT (NSN 5805-00-124-8678) AND TELEPHONE SET TA-838A/TT (NSN 5805-01-125-5976)

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You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5007.

For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, T.O. 00-5-1. Forward direct to prime ALC/MST.

In either case, a reply will be furnished direct to you.

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LIST OF TABLES

CHAPTER 1
INTRODUCTION

1-1. Scope

This technical manual describes Telephone Set TA-838/TT and Telephone Set TA-838A/TT (fig. 1-1) and contains information pertinent to functioning, troubleshooting, testing, and removal and replacement of equipment components.

1-2. Maintenance Forms, Records and Reports

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750 as contained in Maintenance Management Update. Air Force personnel will use AFR 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting.

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

1-3. Reporting Equipment Improvement Recommendations (EIR)

a. Army. If your TA-838/TT or TA-838A/TT needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. We'll send you a reply.

b. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFR 900-4.

1-4. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

1-5. Administrative Storage

Administrative Storage of equipment issued to an used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness.

1-6. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

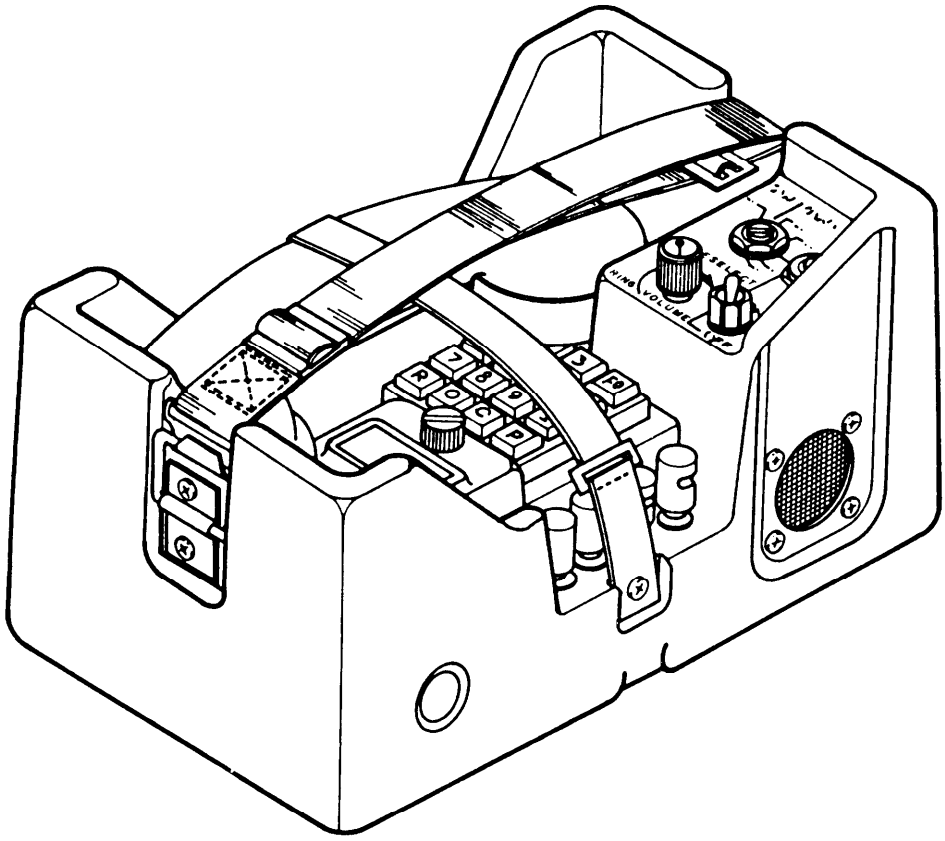

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Figure 1-1. Telephone Set TA-838/TT and TA-838A/TT

CHAPTER 2

FUNCTIONING OF EQUIPMENT

Section I. BLOCK DIAGRAM ANALYSIS FOR TELEPHONE SET TA-838/TT

2-1. Scope

This section provides a block diagram analysis for Telephone Set TA-838/TT, since repair of the circuit card assembly, hookswitch assembly, and keyset assembly is within the capabilities of direct/general support facilities.

2-2. General

(fig. FO-2 through FO-4 ②)

The major circuits of the telephone set are listed blow. Subsequent paragraphs discuss the functions of these major circuits in the order presented below.

a. MODE SELECT switch.

b. Hookswitch.

c. Keyset.

d. Tone encoder.

e. Tone filter and level shifter.

f. Send amplifier.

g. Extension control.

h. Receive amplifier.

i. 570-Hz clipper.

j. Ring trip circuit.

k. Ringer circuit.

l. DC/DC converter.

m. Voltage regulator circuit.

n. Detection and control network.

o. 2-wire common battery circuit.

2-3. Overall Description

a. The basic telephone set consists of a send amplifier, producing output signals from the telephone set, and a receive amplifier, accepting incoming signals to the telephone set. The send amplifier receives its signals from the microphone in the handset and the tone encoder. The produced signals of the tone encoder are the dialing (DTMF) and control signals (seize and release) required by the switching center to process a call The receive amplifier inputs are the voice signal and a series of control signals from the switching center, such as dial tones, ringing, busy, and acknowledge signals.

b. The operation of the telephone set is controlled by a MODE SELECT switch and a detection and control network. These devices allow the use of the telephone set in various combinations of the following modes of operation:

(1) AC or DC supervision.

(2) 2-wire or 4-wire connection.

(3) Common or Local Battery.

(4) With switching network or Point-to-Point.

c. Since the telephone set operates differently in each mode, several circuits serve several functions, depending on the mode in use.

2–4. MODE SELECT Switch

The MODE SELECT switch determines the telephone set mode of operation by interconnecting the functional circuits in the required manner and by applying control signals to the detection and control network. The network can then control the operation of the telephone set.

2–5. Hookswitch

The hookswitch provides the detection and control network with off-cradle or on-cradle information to allow programmed circuits to be enabled and/or disabled.

2-6. Keyset

The keyset consists of a set of 16 double-pole pushbutton switches. The switches are connected in a matrix of four vertical columns and four horizontal rows. One pole of every switch in each vertical column is connected to a single output line. The four columns, therefore, have four outputs (V1 through V4). The second pole of every

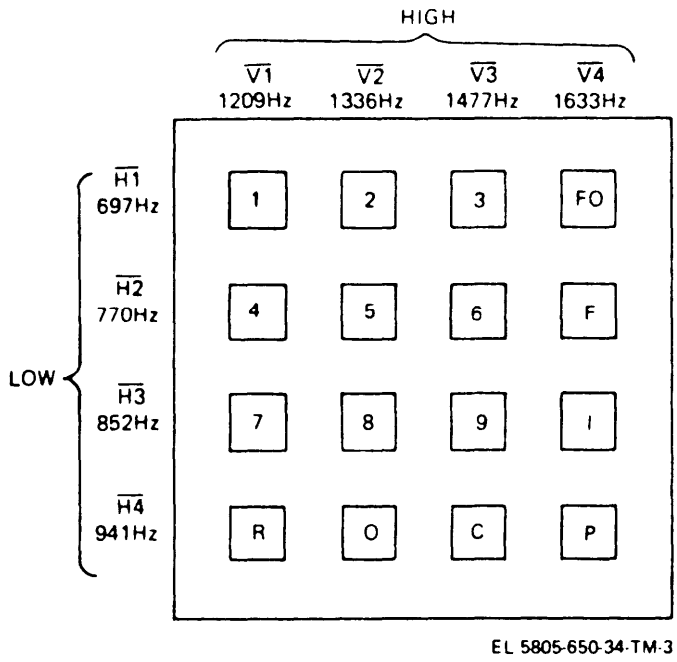


Figure 2-1. Tone/keyset reltionships.

switch in each horizontal row is connected to form a single output line. The four rows, therefore, produce four outputs (H1 through H4). Since the arms of all the switches are grounded by the extension control circuit when off-cradle, pressing any of the 16 switches will ground one vertical and one horizontal output line. The horizontal and vertical lines provide the grounds to the detection and control network to determine priority, and to the tone encoder to control the develop ment of the DTMF frequencies associated with the key (switch) depressed. Figure 2-1 shows the relationship between the keyset key codes and the corresponding high and low frequencies to be developed by the tone encoder circuit,

2-7. Tone Encoder

The tone encoder (U4, RA13 and RA14) receives four vertical (V1 through V4) and four horizontal (H1 through H4) input signals from the keyset. When enabled by a level and a 295-kilohertz (kHz) encoder clock from the detection and control network, the encoder will generate two audio outputs. The frequencies of the outputs are determined by the vertical or horizontal input lines which are grounded. The tone encoder also generates 2250-Hertz (Hz) seize signal, the 2,600–Hz release signal or the 570-Hz ring signal when requested by the detection and control network. The audio outputs (high and low frequency) of the tone encoder are applied to the send amplifier by way of the tone filter and level shifter circuit.

2-8. Tone Filter and Level Shifter Circuit

The tone filter and level shifter circuit (Q11, RA3 and RA6) receive the high and low frequency audio outputs of the tone encoder, filter the signals, mix them, and control their amplitude. The amplitude of DTMF tones are attenuated to ap proximately one-half of the amplitude of the supervision signal outputs (seize, release, etc). A control signal from the detection and control network informs the level shifter when a DTMF signal is being supplied by the tone encoder.

2–9. Send Amplifier

The send amplifier (A1) is a microcircuit, linear amplifier which receives signals from the tone encoder by way of the tone filter and level shifter circuit, and voice signals from the microphone of the handset. When the amplifier is enabled by the hookswitch being off-cradle, the input signals are amplified and provided to the output lines via output transformer T1.

2-10. Extension Control

The extension control circuit (Q4 and Q5) is a control circuit which inhibits the generation of seize or release signals when an extension phone is off-cradle, enables the keyset when off-cradle, and inhibits ringer amplifier when an extension is in use. When all extensions are on-cradle, each phone will operate normally, generating seize and release tones. When the hookswitch goes off-cradle at any extension, an inhibit signal is applied to all extensions.

2-11. Receive Amplifier

a. The receive amplifier (U1) is a single-stage, linear operational amplifier connected in a differential gain configuration, It is used to control voice and supervision signals received from an external source. The source of input signals is selected by the MODE SELECT switch. In the 2-wire mode, U1 receives inputs from transformer T1. In the 4-wire mode, transformer T2 provides the inputs. The amplifier adjusts the amplitude of the voice and supervisory signals supplied to the earphone element in the handset, The amplifier is turned on and off by a receive amp enable signal from the detection and control network (U3, pin 31). Disabling the amplifier output, during the reception of high power supervisory signals, prevents discomfort for the user and possible damage to the earphone.

b. The amplifier also contains a resistor net-

work, R-4, R12 and R53, which, under control of the hookswitch. connects either approximately 2700-ohm or 550-ohm resistance across the secondary of the input transformer T2. This change of resistance is reflected back through T2 to control the off-cradle input impedance of the telephone. When the handset is off-cradle, a 549-ohm resistor (R12) is connected across the secondary of transformer T2, causing the telephone input impedance to drop to about 600 ohms. When on-cradle, 2,678 ohms (R4 + R12 - R53) is connected across transformer T2, causing an input impedance of about 3,000 ohms.

2–12. 570-Hz Clipper

The 570-Hz (U2) clipper input is a sample of the input to the receive amplifier (U1). Whenever the receive amplifier receives a 570-Hz input, independent of the state of the receive amp enable signal, the 570–Hz clipper- produces a 570–Hz squarewave output of fixed amplitude. In normal ac supervised operation, the telephone receives pure 570-Hz signals as seize acknowledge, ring trip acknowledge, and release acknowledge signals from the switching center. The telephone set receives a modulated 570–Hz signal as a ring tone input signal. Each of these inputs will cause the squarewave output which is applied to the detection and control network (U3, pin 1) to inform the network of the receipt of the input signal.

2–13. Ring Trip Circuit

a. When the telephone set is in the 2-wire mode, the ring trip circuit (Q28 and Q30) is connected to the XMT terminals. When the receiver is on-cradle and the telephone is to be called, a 20–Hz, 2-wire ring signal is sent from the switching center to the XMT terminals and, therefore, to the ring trip circuit. The ring trip circuit senses the 20-Hz signal and produces a 2-wire ring signal which cycles low for 1 second and high for 2 seconds. This signal is applied to the detection and control network (U3, pin 11) to allow U3 to generate the ringer enable signal for the ringer circuit.

b. The circuit is disabled whenever the receiver is lifted off-cradle, or if the 20-Hz, 2–wire ring signal ends.

2–14. Ringer Circuit

The ringer circuit receives a ringer clock signal and a ringer enable signal from the detection and control network. The ringer clock signal (between 1,800 and 1,886 Hz) is amplified by the ringer circuit only when a ringer enable signal is present. The ringer enable signal is applied in 3-second cycles (during which it is present for 1 second and absent for 2 seconds) until the handset is lifted from the cradle. The amplified clock signal may be used to provide an aural ring signal, a visual ring signal, or both.

2-15. DC/DC Converter Circuit

When operating the telephone set in a 4-wire common battery mode, the DC/DC converter circuit converts the supply voltage from the switching facility to approximately 6 volts dc (VDD).

2-16. Voltage Regulator Circuit

The voltage regulator circuit supplies a highly regulated direct current (dc) voltage to the tone encoder. The regulator is also gated so that it is in operation only when the telephone set is off-cradle.

2–17. Detection and Control Network

The detection and control network is programmed by the MODE SELECT switch and performs all of the timing, sequencing, and logic functions required for proper operation of the telephone set. Table 2-1 lists the inputs to the microcircuit U3 and discusses the information that each contains; table 2-2 lists the outputs and discusses the manner in which they control other circuits of the telephone set. Section II of this chapter, Call Processing Analysis, describes timing and sequencing performed by this circuit. The internal oscillator of microcircuit U3 is maintained at 295 kHz by the crystal Y1 and its associated components.

2-18. Common Battery Circuit (2-Wire)

This circuit contains a diode bridge and two switching transistors. The diode bridge directs the common battery power to the proper positive and negative points regardless of input polarity. Negative is always connected, via diode. to ground, and positive is connected, via diode and switching transistor, to the telephone set positive terminal. The function of the second switching transistor is to decrease the current drain on the power circuit when the telephone set is being operated with a 2-wire extension telephone set.

Table 2-1. Detection and Control Network, Inputs

Signal name	*Function*
Extension Control Gate	Provides the circuit with off-cradle information from the extension control circuit.

Table 2-1. Detection and Control Netwvrk, Inputs —Continued

Signal name	Function
$\overline{\text{Off Hook}}$	Provides the circuit with off-cradle information from the hookswitch, via transistor Q5.
Selected Mode	Provides the circuit with position information about the MODE SELECT switch.
$\overline{\text{2-Wire Ring}}$	Provides the circuit with ring cycle information to activate the ringer enable output.
$\overline{\text{V1}}$ (vertical 1)	Receives signal when keyset button 1, 4, 7, or R is depressed.
$\overline{\text{V2}}$	Receives signal when keyset button 2, 5, 8, or 0 is depressed.
$\overline{\text{V3}}$	Receives signal when keyset button 3, 6, 9, or C is depressed.
$\overline{\text{V4}}$	Receives signal when keyset button F0, F, I, or P is depressed.
$\overline{\text{H1}}$ (horizontal 1).	Receives signal when keyset button 1, 2, 3, or F0 is depressed.
Crystal In/Out	Receives 295-kHz signal from crystal Y1 to control the circuit internal oscillator.
570 Hz	Depending on the state of other circuit inputs and internal counting devices, this input will represent either a ring signal, seize acknowledge signal, or a release acknowledge signal.

Table 2-2. Detection and Control Network, Outputs

Signal name	Function
Encoder Clock	Provides 295 kHz, to be used by the tone encoder as a clock signal.
Regulator Enable	Enables voltage regulator circuit via transmitter Q7, when handset is removed from cradle.
Transmit Amplifier	Enables transmitter amplifier, via transistors Q8 and Q10, when handset is removed from cradle.

Table 2-1. Detection and Control, Network, Inputs— Continued

Signal name	Function
Voice Transmit Inhibit	Inhibits voice transmission via transistor Q9 during DTMF dialing.
Receive Amplifier Enable	Enables receive amplifier U1 when handset is removed from cradle.
Ringer Enable	Enables the ringer circuit via transistors Q20 and Q24 for 1 second out of every 3 seconds during telephone ring cycle.
Ringer Clock	Supplies 1850 Hz ring signal to the ringer circuit.
$\overline{\text{C4}}$	*a.* Causes tone encoder to produce a 2,250-Hz seize signal when handset is removed from cradle, if the extensions are on-cradle and the MODE SELECT switch is in an AC position. *b.* Enables the tone encoder to produce a 1,633-Hz tone for use in a DTMF priority signal, when a priority button is depressed on the keyset.
$\overline{\text{C3}}$	Causes tone encoder to produce a 2,600-Hz release signal when handset is replaced on cradle, if all extensions are also on-cradle. MODE SELECT switch must be in an AC mode.
$\overline{\text{R1}}$	Causes tone encoder to produce a 570-Hz ring signal when handset is removed from cradle, if the MODE SELECT switch is in the PT-PT position.
Sidetone Level Control	Controls the level of the sidetone signal, via transistor Q6. Seize sidetone and digit sidetone are lower than voice sidetone.
DTMF Level Control	Controls the level of tone signals being transmitted, via transistor Q11. Seize tone and release tone are higher than digit tones.

Section II. CALL PROCESSING ANALYSIS FOR TELEPHONE SET TA-838/TT

2–19. General

(fig. FO-2 through FO-4 ②)

This section describes the sequence of events when operating with Automatic Telephone Central Office AN/TTC-25 or AN/TTC-38. When required to operate into another system, the key digit requirements must be obtained from that system's manual.

a. Outgoing Call.

b. Incoming Call.

c. Point-to-Point Call.

d. DC Supervision.

e. 2–Wire Mode, Incoming Call.

NOTE

Unless otherwise stated, the telephone is assumed to be in the 4-Wire AC/CB mode. mode.

2–20. Outgoing Call

a. When the handset is lifted from its cradle, the hookswitch performs the following functions:

(1) Changes the input impedance of the telephone to approximately 600 ohms.

(2) Applies a positive potential (high) to the base of transistor Q5, causing aground potential (low) to be applied to the keyset and the detection control network. The low that is applied to the keyset enables it. The low that is applied to the detection and control network causes the network to enable the voltage regulator circuit and the transmit amplifier circuit. This low also inhibits the ringer circuit and causes the tone encoder to generate a seize signal (2,250 Hz) which is then applied to the tone filter and level shifter circuit. When seize (2,250 Hz) or release (2,600 Hz) tone is sent, the detection and control network conditions level shifter transistor Q11 for cutoff, resulting in no attenuation to these signals. The tone is then applied to send amplifier, amplified, and then coupled by transformer T1 to send pair for transmission to the switching center.

b. The switching center recognizes the request for service and transmits a receive acknowledge signal (570 Hz) to the telephone. The acknowledge signal is received on the receive terminals of the telephone and is inductively coupled to the input of the 570–Hz clipper circuit. The 570–Hz clipper output is then applied to the detection and control network which causes the tone encoder to discontinue generation of the seize signal.

c. The switching center recognizes the absence of the seize tone, stops sending the seize acknowledge signal (570 Hz), and starts sending a dial tone (425 Hz). The discontinuance of the 570–Hz seize acknowledge signal from the switching center causes the detection and control network to then enable the receive amplifier in preparation for reception of dial tone and/or voice. The dial tone is received on the receive terminals of the telephone, inductively coupled to the receive amplifier U1, and amplified and impressed across the receiver element.

d. The subscriber recognizes dial tone and depresses a pushbutton on the keyset representing the first digit of the number he wishes to dial. Depressing the pushbutton causes the tone encoder to apply the appropriate high and low frequency tones to the tone filter and level shifter circuit. When DTMF tones are being sent, the detection and control network conditions level shifter transistor Q11 to conduct, resulting in a 50% reduction in tone amplitude. The DTMF tones are combined and the composite signal applied to the send amplifier, amplified, and then coupled by transformer T1 to the send pair for transmission to the switching center.

e. The switching center recognizes the first dig-it and stops sending the dial tone to the telephone. The subscriber then sends the remainder of the digits. The switching center then processes the call to a free subscriber, or returns a busy tone if the desired subscriber is busy. If the called party is not busy, the call is connected and a talk path is established. The output of the microphone element is applied through a 20–kilohm variable resistor to the send amplifier, amplified, and coupled by transformer T1 to the send pair for transmission to the switching center.

f. At the termination of the call, the handset is replaced on the cradle which causes a signal to be applied, via the detection and control network, to the tone encoder, selecting a release signal (2,600 Hz) for transmission to the switching center. The 2,600–Hz signal is processed by the tone filter and level shift circuit with no reduction in amplitude. The release tone is timed out after 3 to 10 seconds if acknowledge signal is not received from the switching center.

g. The switching center recognizes the 2,600–Hz signal as a request for release and returns a 570–Hz acknowledge signal to the telephone. This signal is recognized by the 570–Hz clipper circuit and causes the application of a 570–Hz input signal to the detection and control network, which inhibits the transmission of the 2,600-Hz signal after a delay of approximately 300 milliseconds. The switching center notices the absence of the release signal and stops sending the release acknowledge signal after a delay of approximately 250 milliseconds. After the time period of the release sequence (approximately 550 milliseconds) the telephone is ready to accept incoming calls.

2-21. Incoming Call

a. When the switching center wishes to contact a telephone subscriber, a modulated 570–Hz signal is transmitted to the selected telephone. This signal appears on the receive pair of the telephone and is recognized by the 570–Hz clipper circuit which, in turn, causes the application of a 570–Hz input signal to the detection and control network. When the telephone is ready to accept incoming calls, (handset is on-cradle, and the telephone is not in a release sequence), a 570–Hz input signal causes a ringer clock signal and a ringer enable signal to be applied to the ringer circuit which, in turn, supplies an aural or visual ring signal. (Refer to paragraph 2-12.)

b. The call is answered when the subscriber lifts the handset from its cradle. A 2,250–Hz ring trip tone is transmitted to the switching center ex-

actly as described in paragraph 2–20a for seize tone.

c. The switching center recognizes the ring trip tone, inhibits the transmission of the ring tone, and transmits a steady 570-Hz ring trip tone. This tone is discontinued as soon as the telephone responds by discontinuing the ring trip tone (2,250 Hz). The receive amplifier is now active and a voice path is establisghed between telephone subscriber and the switching center.

d. When the subscriber replaces the handset on its cradle at the termination of the call, a release time (2,600 Hz) is transmitted to the switching center and the release sequence is repeated as described for termination of an outgoing call.

2–22. Point-to-Point Mode

When the telephones are connected for point-to-point mode operation, it is necessary for the calling telephone to signal the called telephone without the aid of the switching center. When the MODE SELECT switch is in the PT-PT position, lifting the handset of the calling telephone causes a 570-–HZ signal burst to be transmitted for a 2-second period. The calling telephone detects the 570-Hz signal in the same manner as for incoming calls and causes the telephone to ring for one signal burst. If the called telephone does not answer, the calling telephone must replace the handset on the cradle and lift it again, repeating the procedure. When the called telephone answers, a burst of 570-Hz tone is sent to the calling telephone. The calling telephone does not ring because the handset is not in the cradle. The voice path is now established between the two telephones and conversation can proceed.

2–23. Dc Supervision

a. With the MODE SELECT switch in any DC position, generation of seize tone (2,250 Hz) and release tone (2,600 Hz) are inhibited in the detection and control network.

b. With the MODE SELECT switch in a DC position, an off-cradle indication is supplied to the switching center by means of hookswitch S2 inserting a load resistor between the center tap of the receive transformer and the center tap of the send transformer when the handset is lifted from the cradle. This essentially insterts a load resistor between the send and receive transformers at the switching facility, causing an additional current drain on the switching facility power supply. This is recognized by the switching facility as a request for service or an answer, depending on whether it is an incoming call from the telephone or an outgoing call to the telephone. When the handset is replaced on the cradle the load resister is removed from the circuit and the switching center recognizes the on-cradle condition due to the reduced current drain.

2–24. Two-Wire Mode, Incoming Calls

a. When the MODE SELECT switch is in a 2-wire position, and the handset is on its cradle, the telephone send/receive signal is connected to the XMT (black) binding posts (E3 & E4). A 20–Hz polar ring signal from the switching facility causes the ring trip relay circuit to apply a 2–wire ring signal to the detection and control network. This causes the telephone to ring until it is either answered or the 20–Hz signal is discontinued (in the same manner as the 570–Hz input signal in a 4–wire mode incoming call; refer to paragraph 2–21*a*).

b. When the call is answered, an off-cradle indication is supplied to the switching center by means of the hookswitch inserting a dc load across the send/receive (XMT) terminals. This causes a dc drain on the switching center power supply and is recognized by the switching center as an off-cradle indication; the 20–Hz signal is discontinued. The receive amplifier is now activated and a voice path is established between the telephone subscriber and the switching center. The receive amplifier input consists of a high level sidetone signal (higher than that used in 4–wire operation), supplied to the receive amplifier from transformer T1. The output of the receive amplifier is applied to the earphone element in the handset.

c. The output of microphone element is applied directly to the send amplifier, amplified, and then transmitted, via transformer Tl, over the send/receive pair. Sidetones generated as a result of signals from the send amplifier are of reduced level, due to an RC network attached to the send amplifier.

d. When the handset is replaced on the cradle, the dc load is removed from the circuit. The switching center recognizes the on-cradle condition due to the reduced current drain and releases the line.

Section III. BLOCK DIAGRAM ANALYSIS FOR TELEPHONE SET TA-838A/TT

2-25. Scope

This section provides a block diagram analysis for Telephone Set TA-838A/TT, since repair of the circuit card assembly, the hookswitch assembly, the keyset assembly, and the circuit board is within the capabilities of rect/general support facilities.

2-26. General

(fig. FO-3 and FO-6 through FO-7 ③)

The major circuits of the telephone set are listed below. Subsequent paragraphs discuss the functions of these major circuits in the order presented below.

a. MODE SELECT Switch.

b. Hookswitch.

c. Keyset.

d. Circuit Board.

The circuit board can be divided into the following functions:

(1) Output Circuit.
(2) Input Circuit.
(3) Microcomputer Circuit.
(4) Control Signal Generator Circuit.
(5) Power Control Circuit.
(6) Ring Amplifier.
(7) DTMF Circuit.
(8) Voice Amplifier.
(9) Side Tone Circuit.
(10) Extension Control Circuit.
(11) 3.6 Volt Voltage Regulator.
(12) 4W/CB Switcher Circuit.
(13) 2W/DC/CB Voltage Regulator.

2-27. Overall Description

a. The telephone set basically consists of:

(1) A receive amplifier that receives signals incoming to the telephone set, while its output is applied to the receive element (the earphone) in the handset.

(2) A send amplifier that receives signals from three different sources:

(a) The microphone element.
(b) The control signal generator.
(c) The dual tone generator.

nd amplifier output is applied to the transmit transrmer.

(3) A microcomputer which coordinates all the actions of the telephone set and generates control signals through the control signal generator.

b. The operation of the telephone set is controlled by a MODE SELECT switch and a microcomputer. These devices allow the use of the telephone set in various combinations of the following modes of operation:

(1) AC or DC supervision.
(2) 2-wire or 4-wire connection.
(3) Common or local battery.
(4) With a switching center or point-to-point.

2-28. MODE SELECT Switch

The MODE SELECT switch determines the telephone set mode of operation by interconnecting the functional circuits in the required manner and by applying control signals to the detection and control network. The network controls the operation of the telephone set.

2-29. Hookswitch

The hookswitch provides the microcomputer with off-cradle or on-cradle information, changes the input impedance of the receive amplifier, and adds additional load in DC modes.

2-30. Keyset

The keyset consists of a set of 16 double-pole push-button switches. The switches are connected in a matrix of four vertical columns and four horizontal rows. One pole of every switch in each vertical column is connected to a single output line. The four columns, therefore, have four outputs (V1 through V4). The second pole of every switch in each horizontal row is connected to form a single output line. The four rows produce four outputs (H1 through H4). Since the arms of all the switches are grounded by the extension control circuit when off-cradle, pressing any of the 16 switches will ground one vertical and one horizontal output line. The horizontal and vertical lines provide the grounds to the tone encoder to control the development of the DTMF frequencies associated with the depressed key (switch). Figure 2-1 shows the relationship between the keyset key codes and the corresponding high and low frequencies to be developed by the tone encoder circuit.

2-31. Output Circuit

The output circuit includes op-amps U1 and U2 (located inside the send amplifier assembly), and the transformer T1.

The output circuit receives signals from three different sources: the DTMF circuit, the control signal generator, and the voice amplifier. U2 is the preamp-mixer,

and U1 is the driver stage. The diode VR1 is the clipping diode to ensure the the absolute maximum limit of the output signal at the XMT terminals is 4 volts pp. The resistor R18 sets the output impedance to 600 ohms, and the resistor R7 prevents oscillation of the output stage when it is unloaded. The transformer T1 isolates output with the rest of the circuit, and, in the case of the 2-wire mode, is used as both an output and an input transformer.

2-32. Input Circuit

The input circuit includes op-amps U1 (located inside the receive amplifier assembly), U20, U21, one-shot U22, and the transformer T2.

In the 4W mode, input signals (both voice and supervision signals) go through T2. U19 is the voice amplifier, and its output drives the receive element (the earphone). U20 is the 570 Hz conformer that shapes the 570 Hz signal into a square wave of the same frequency. U22 forms a high-pass filter to eliminate 425 Hz in a priority ring.

In the 2W mode, the ring signal of 20 Hz goes directly to U21 (the 20 Hz conformer), which shapes it into a square wave; the voice signal goes through the transformer T1, and the op-amp U1 remains as the voice amplifier.

The output of the conformers is directed to the microcomputer circuit.

2-33. Microcomputer Circuit

The microcomputer circuit includes the microcomputer U1, the buffer U13, and one portion of the buffer U10. Gates U2 and U1 monitor the MODE SELECT switch, the hookswitch, and signals from the conformers. The microcomputer circuit generates signals to supervise the control signal generator, the extension control circuit, and the power of all other parts of the board.

2-34. Control Signal Generator Circuit

The control signal generator circuit includes gates U4, U12 and U14; the counters U6, U7 and U8; the along switch U9; and the op-amps U17 and U18.

A signal of appropriate frequency is generated at counters U6, U7 and U8, and is directed to different destinations by selectors U12 and U9. U17 forms a low-pass filter to generate a 2250 Hz or a 2600 Hz sine wave; U18 forms a low-pass filter to generate a 570 Hz sine wave. The output signals of the filters are directed to the output circuit, and the ring signal of the 1830 Hz is directed to the ring amplifier.

2-35. Power Control Circuit

The power control circuit includes the latch U3, and the transistors Q9, Q11 and Q12. The power control signals come from the microcomputer and are latched at U3. U9 turns on/off the ring amplifier. Q11 turns on/off the voice amplifier U1 and the voice amplifier U19, Q12 turns on/off the filters U17 and U18, and the out put circuit.

2-36. Ring Amplifier

The ring amplifier includes the inverter U11, and the transistors Ql, Q2, Q3, Q4, Q5 and Q10. Q10 and U11 form a buffer. Q1, Q2, Q3 and Q4 form a bridge amplifier to drive the loudspeaker horn. Q5 drives the LED of the ring indicator.

2-37. DTMF Circuit

The DTMF circuit includes the single and dual tone generator U15 and the filter U16. U15 generates different dual tones or single tones, depending on keyboard input. The output of U15 is filtered at U16 and is directed to the output circuit. The keyboard also controls the power for the DTMF circuit.

2-38. Voice Amplifier

The op-amp U19 forms the voice amplifier. It receives signals from the transmit element (the microphone), and its output is directed to the output circuit.

2-39. Side Tone Control Circuit

The side tone control circuit includes the resistor network RA13, the coil L1, and the transistors Q13 and Q14. It serves to feed a small portion of the output signal back to the receive amplifier. Q13 and Q14 lower the side tone when a dual tone is sent out.

2-40. Extension Control Circuit

The extension control circuit includes the transistors Q6, Q7 and Q8. In the 4W/AC/LB mode and when the handset is lifted, the microcomputer monitors the existence of power between the XMT and RCV terminals via Q7. If power exists (which means that another set mounted in parallel is off-hook), the set does not generate a seize signal. The first set off-hook provides power between the terminals after its handset is lifted by turning on Q6 and Q8. Only when the last set goes on-hook, the microcomputer will detect no power at Q7 and generate a release signal.

2-41. 3.6 Volt Voltage Regulator

The 3.6 volt voltage regulator includes the op-amp U23. It generates 3.6 volts ± 5% from + Vcc to feed the microcomputer circuit and the control signal generator circuit.

2-42. 4W/CB Switcher

The 4W/CB switcher includes the transistors Q18, Q19, Q20 and Q21. It forms a switching regulator to generate Vcc (about 5 volts) from the common battery voltage (24 volts).

2-43. 2W/DC/CB Voltage Regulator

The 2W/DC/CB voltage regulator includes the diodes D11, D12, D13 and D14 (which form a rectifier bridge), and the transistors Q15 and Q16. The voltage regulator receives power from the 20 Hz ring signal to generate Vcc. When the handset is off-hook, it receives power from the common battery. The regulating element is Q16. Q15 provides the extra load signaling the switchboard that the set is off-hook.

Section IV. CALL PROCESSING ANALYSIS FOR TELEPHONE SET TA-838A/TT

2-44. General

(fig. FO-3 and FO-6 through FO-7 ③)

This section describes the sequence of events when operating with an Automatic Telephone Central Office AN/TCC-25 or AN/TCC-38, in the modes and order listed below. The key digit requirements must be obtained from the appropriate system's manual to operate the TA-838A/TT with another system,

a. Outgoing Calls.
b. Incoming Calls.
c. Point-to-Point Mode.
d. DC Supervision.
e. 2-Wire Mode, Incoming Calls.

NOTE

Unless otherwise stated, the telephone is assumed to be in the 4W/AC/CB mode.

2-45. Outgoing Calls

a. When the handset is lifted from its cradle, the hookswitch performs the following functions:

(1) It changes the input impedance of the telephone to approximately 600 ohms.

(2) It alerts the microcomputer, then generates the seize signal of 2250 Hz through the control signal generator.

b. The switching center recognizes the request for service and transmits a receive acknowledge signal (570 Hz) to the telephone. The acknowledge signal is received on the receive terminals of the telephone and is coupled inductively to the input of the 570 Hz signal conformer. The 570 Hz signal output is then applied to the microcomputer, which discontinues generation of the seize signal.

c. The switching center recognizes the absense of the seize tone and stops sending the seize acknowledge signal (570 Hz); it then starts sending a dial tone (425 Hz). The discontinuance of the 570 Hz seize acknowledge signal from the switching center causes the microcomputer to enable the receive amplifier in preparation for reception of a dial tone and/or voice signal. The dial tone (or voice signal) is received on the receive terminals of the telephone, inductively coupled to the receive amplifier AR2, amplified, and impressed across the receiver element.

d. The subscriber recognizes the dial tone and depresses a pushbutton on the keyset which represents the first digit of the number he wishes to dial. Depressing this pushbutton causes the tone encoder to apply the appropriate dual tones to the tone filter and to the send amplifier, and to be coupled by the transformer T1 to the send terminals for transmission to the switching center.

e. The switching center recognizes the first dialed digit and stops sending the dial tone to the telephone. The subscriber then sends the remainder of the digits. The switching center processes the call to a free subscriber, or returns a busy tone if the desired subscriber is busy. If the called party is not busy, the call is connected and a talk path is established. The output of the microphone element is amplified by the voice amplifier, then sent to the send amplifier, and then coupled by the transformer T1 to the send terminals for transmission to the switching center.

f. At the termination of the call, the handset is replaced on the cradle. Upon receiving a signal from the hookswitch, the microcomputer generates and outputs a release signal of 2600 Hz through the control signal generator. The release signal is timed out after 3 to 10 seconds if an acknowledge signal is not received from the switching center.

g. The switching center recognizes the 2600 Hz signal as a request for release and returns a 570 Hz acknowledge signal to the telephone. This signal is recognized by the 570 Hz conformer and causes the application of a 570 Hz input signsl to the microcomputer, which stops the transmission of the 2600 Hz signal after a delay of approximately 300 milliseconds. The switching center notices the absence of the release signal and stops sending the release acknowledge signal after a delay of approximately 250 milliseconds. After the release sequence the telephone is ready to accept incoming calls.

2-46. Incoming Calls

a. When the switching center wishes to contact a telephone subscriber, a modulated 570 Hz signal is transmitted to the selected telephone. This signal appears on the receive terminals of the telephone, shaped by the 570 Hz conformer; and its output is applied to the microcomputer. When the telephone is ready to accept incoming calls (the handset is on-hook and the telephone is not in a release sequence), the microcomputer sends a ring signal to the ring amplifier, which supplies a signal that generates a visual and/or audible indication. (Refer to paragraph 2-12).

b. The call is answered when the subscriber lifts the handset from its cradle. A 2250 Hz ring trip tone is transmitted to the switching center exactly as described in paragraph 2-20a for the seize tone.

c. The switching center recognizes the ring trip tone, inhibits the transmission of the ring tone, and transmits a steady 570 Hz ring trip tone. This tone is discontinued as soon as the telephone responds by discontinuing the ring trip tone (2250 Hz), The receive amplifier is now active and a voice path is established between the telephone subscriber and the switching center.

d. When the subscriber replaces the handset on its cradle at the termination of the call, a release tone (2600 Hz) is transmitted to the switching center and the release sequence is repeated as described for the termination of an outgoing call. (Refer to paragraph 2-45 f and g).

2-47. Point-to-Point Mode

When the telephone are connected for a point-to-point operation mode, it is necessary for the calling telephone to signal the called telephone without the aid of the switching center. When the MODE SELECT switch is in the PT-PT position, lifting the handset of the calling telephone causes a 570 Hz signal burst to be transmitted for a period of 2 seconds. The called telephone detects the 570 Hz signal (in the same manner as incoming calls) and causes the telephone to ring for one signal burst. If the called telephone does not answer, the calling telephone must replace the handset on the cradle and lift it again, repeating the procedure. When the called telephone answers, a burst of 570 Hz tone is sent to the calling telephone. The calling telephone does not ring because the handset is not in the cradle. The voice path is now established between the two telephones and conversation can proceed.

2-48. DC Supervision

a. No seize tone or a release tone is generated with the MODE SELECT switch in any DC position.

b. With the MODE SELECT switch in a DC position, an off-cradle indication is supplied to the switching center by means of the hookswitch S2, which inserts a load resistor between the center tap of the receive transformer (T2) and the center tap of the send transformer (Tl). This inserts a load resistor between the send and receive transformers at the switching facility, which causes an additional current drain on the switching facility power supply. The switching facility recognizes this as a request for service or as an answer, depending on whether it is an incoming call from the telephone or an outgoing call to the telephone.

When the handset is replaced on the cradle, the load resistor is removed from the circuit and the switching center can recognize the on-cradle condition due to the reduced current drain.

2-49. Two-Wire Mode, Incoming Calls

a. When the MODE SELECT switch is in a 2-wire position and the handset is on its cradle, the telephone send/receive signal is connected to the XMT (black) binding posts (E3 and E4). A 20 Hz ring signal from the switching facility causes the telephone to ring until either it is answered or the 20 Hz signal is discontinued (in the same manner as the 570 Hz input signal in a 4-wire mode incoming call; refer to paragraph 2-21a).

b. When the call is answered, an off-cradle indication is supplied to the switching center by means of the hookswitch inserting a DC load across the send/receive (XMT) terminals. This causes a DC drain on the switching center power supply and is recognized by the switching center as an off-cradle indication; the 20 Hz signal is then discontinued. The receive amplifier is now activated and a voice path is established between the telephone subscriber and the switching center, The receive amplifier input consists of a high level side tone signal (higher than that used a 4-wire operation), supplied to the receive amplifier from the transformer T1. The output of the receive amplifier is applied to the ear phone element in the handset.

c. The output of the microphone element is amplified by the voice amplifier, sent to the send amplifier, and then transmitted (via transformer T1) over the send/

receive terminals. Sidetones generated as a result of signals from the send amplifier are of a reduced level, due to an RC network attached to the send amplifier.

d. When the handset is replaced on the cradle, the DC load is removed from the circuit. The switching center recognizes the on-hook condition due to the reduced current drain, and it releases the line.

CHAPTER 3

DIRECT SUPPORT MAINTENANCE INSTRUCTIONS

Section I. GENERAL

3-1. Scope

The maintenance instructions provided in this chapter are for direct support maintenance only. The procedures that follow apply to the telephone set regardless of its location. Restrictions are imposed only by the immediate circumstances involved; the availability of spare parts, tools, test equipment, and the skill of the maintenance technicians.

3-2. Parts Location Diagrams

Refer to figures 3-1 through 3-4 for telephone set parts location diagrams for Telephone Set TA-838/TT. Refer to figures 3-1, 3-3, 3-4 and 3-10 for the telephone set parts location diagrams for Telephone Set TA-838A/TT.

3-3. Troubleshooting

Troubleshooting is based on symptoms that may occur when the telephone set is operated. The trouble/symptoms may be discovered through operation, or through incorrect indications on the preventive maintenance checks and services.

3-4. Troubleshooting Chart

When a trouble or symptom occurs, refer to table 3-1, Troubleshooting, to find possible trouble and corrective measures. Use wiring diagram, figure FO-3 during the course of the maintenance procedures.

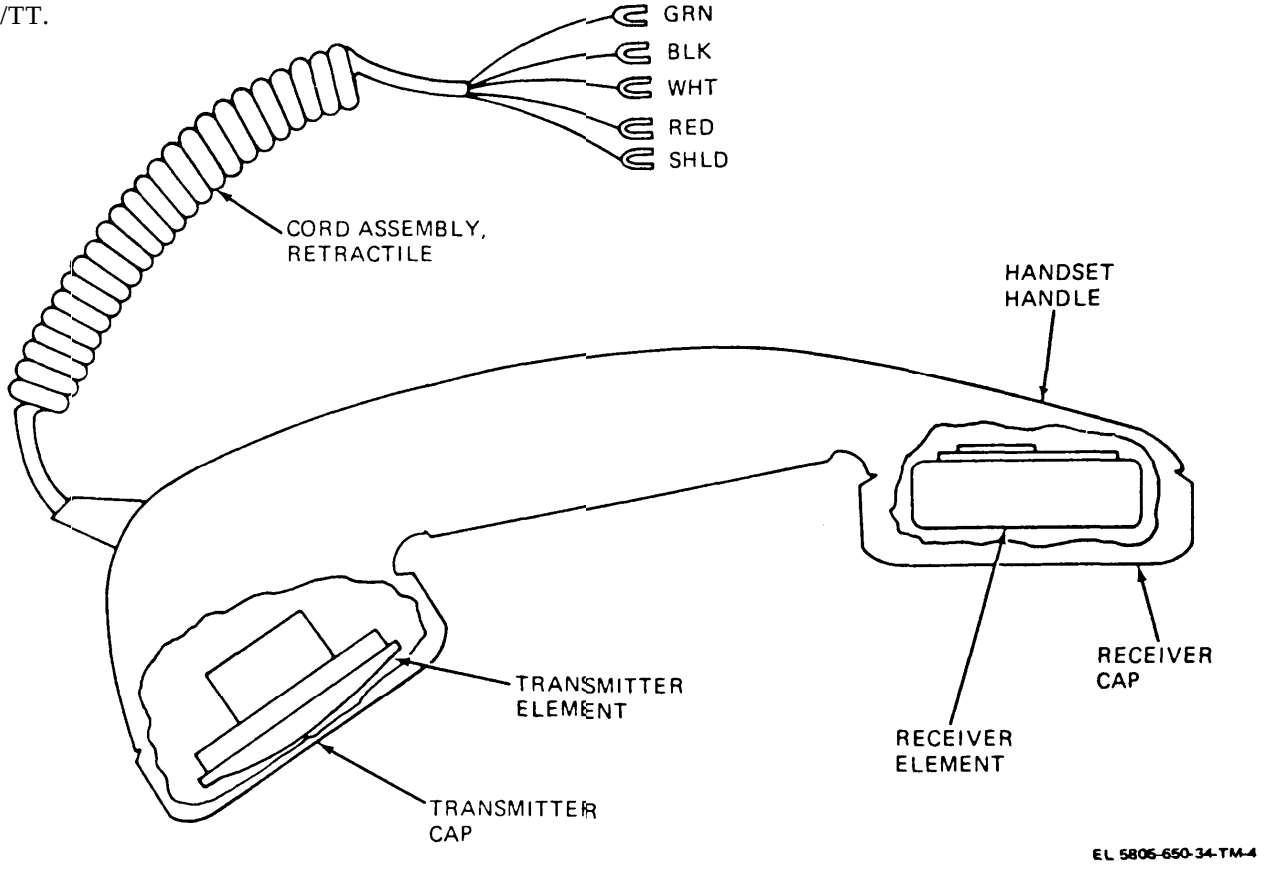


Figure 3-1. Handset and retractile cord assembly.

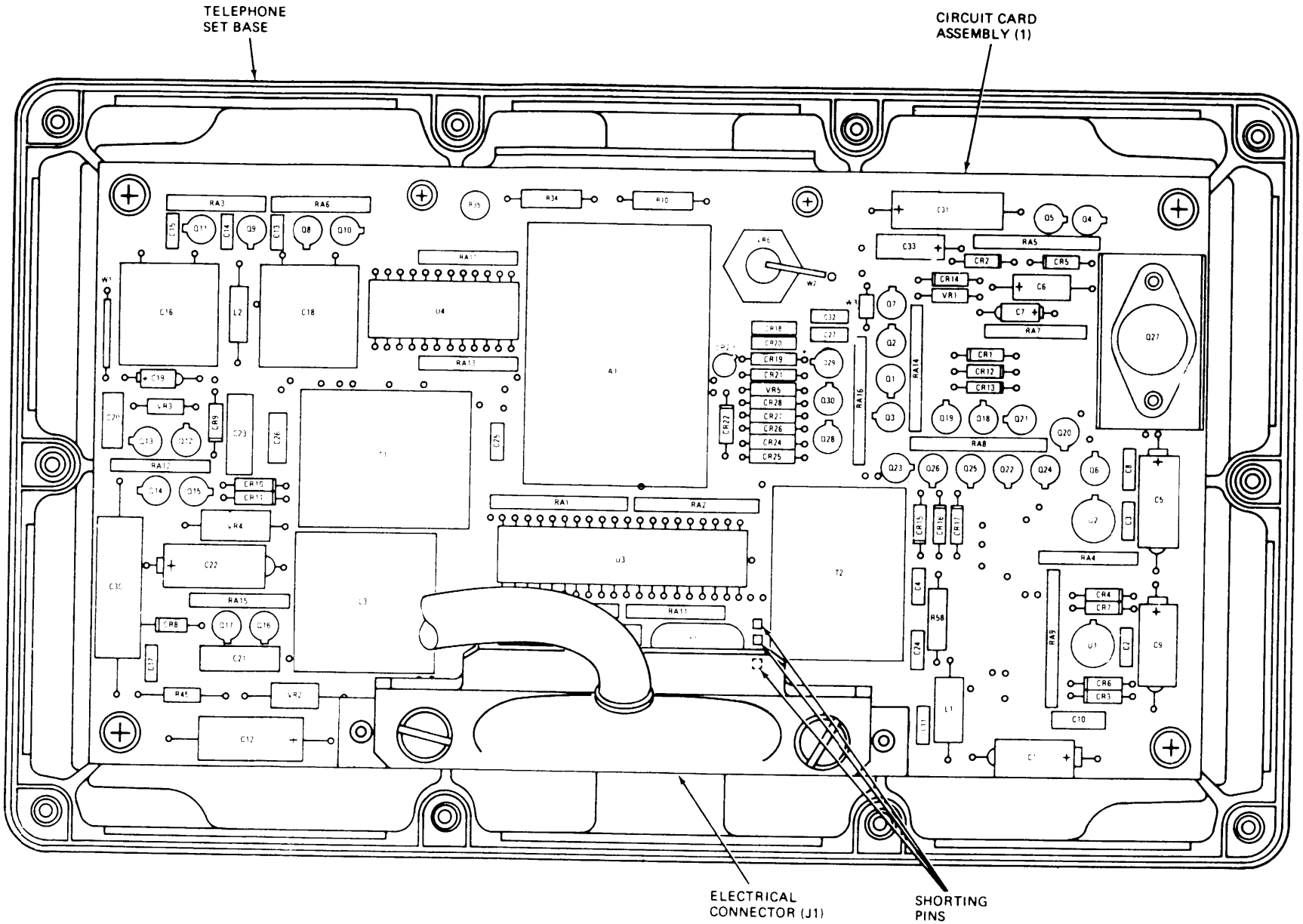
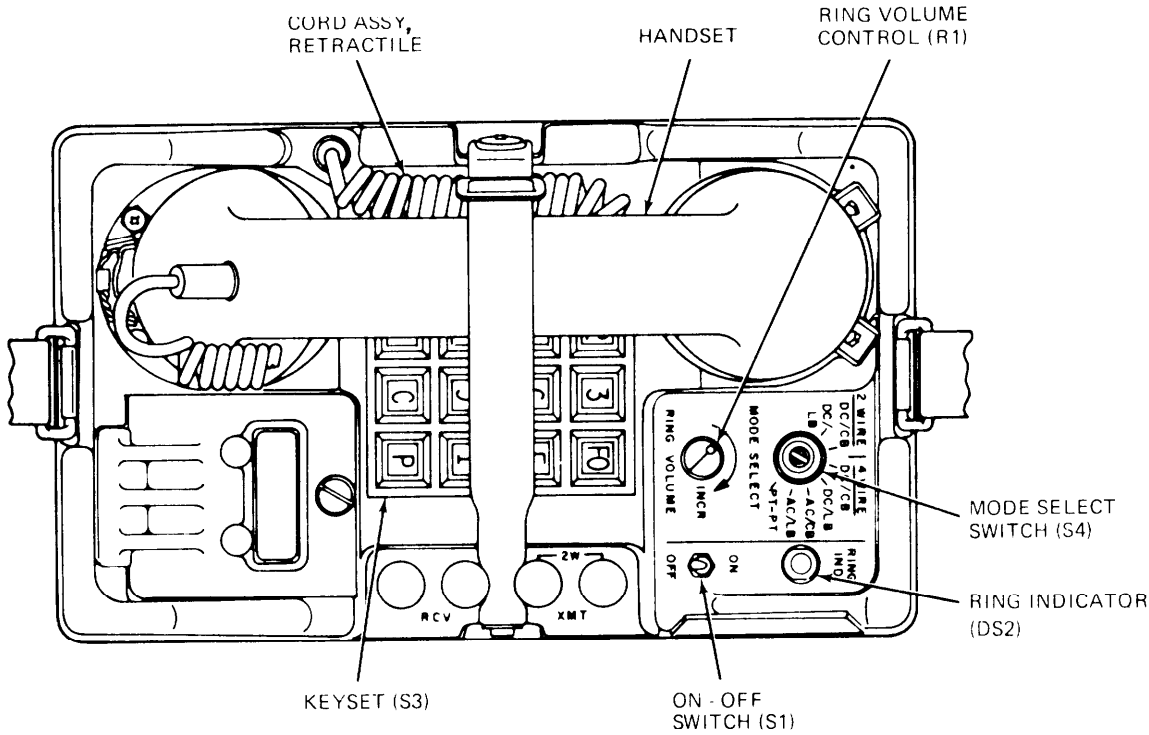
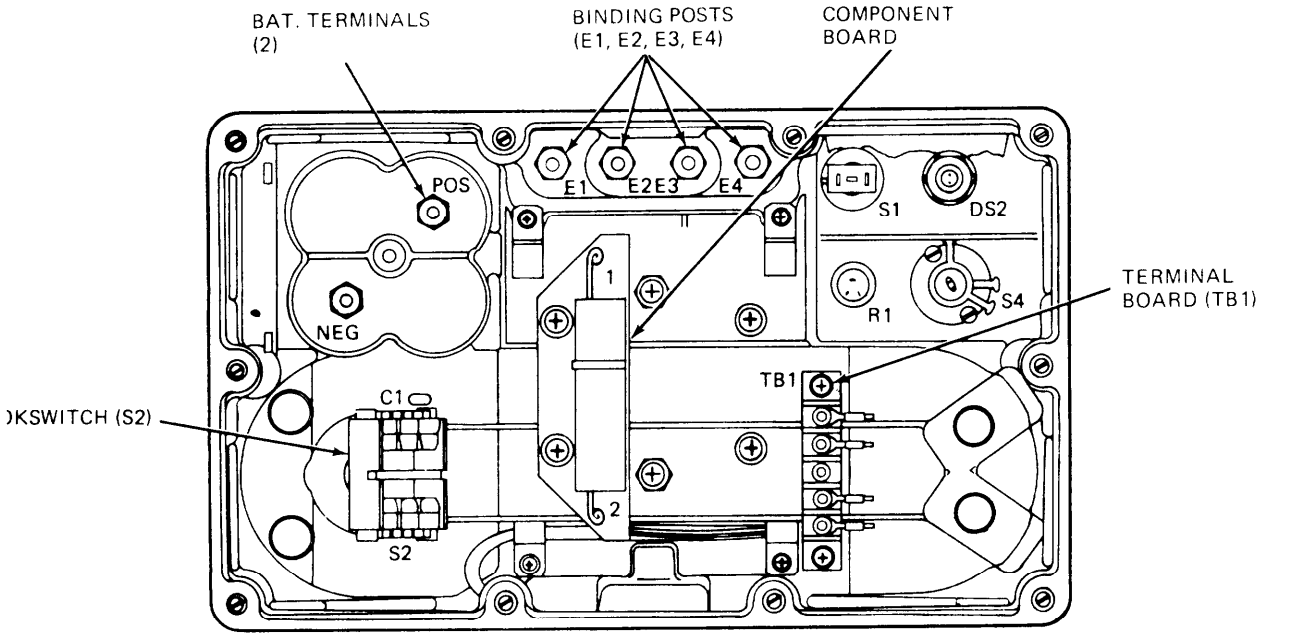


Figure 3-2. Telephone set base, parts location for Telephone Set TA-838/TT



TOP VIEW



BOTTOM VIEW
(BASE PLATE AND PRINTED CIRCUIT CARD REMOVED)

EL5805-650-34-TM-6

Figure 3-3. Telephone set, top and bottom views (base removed), parts location.

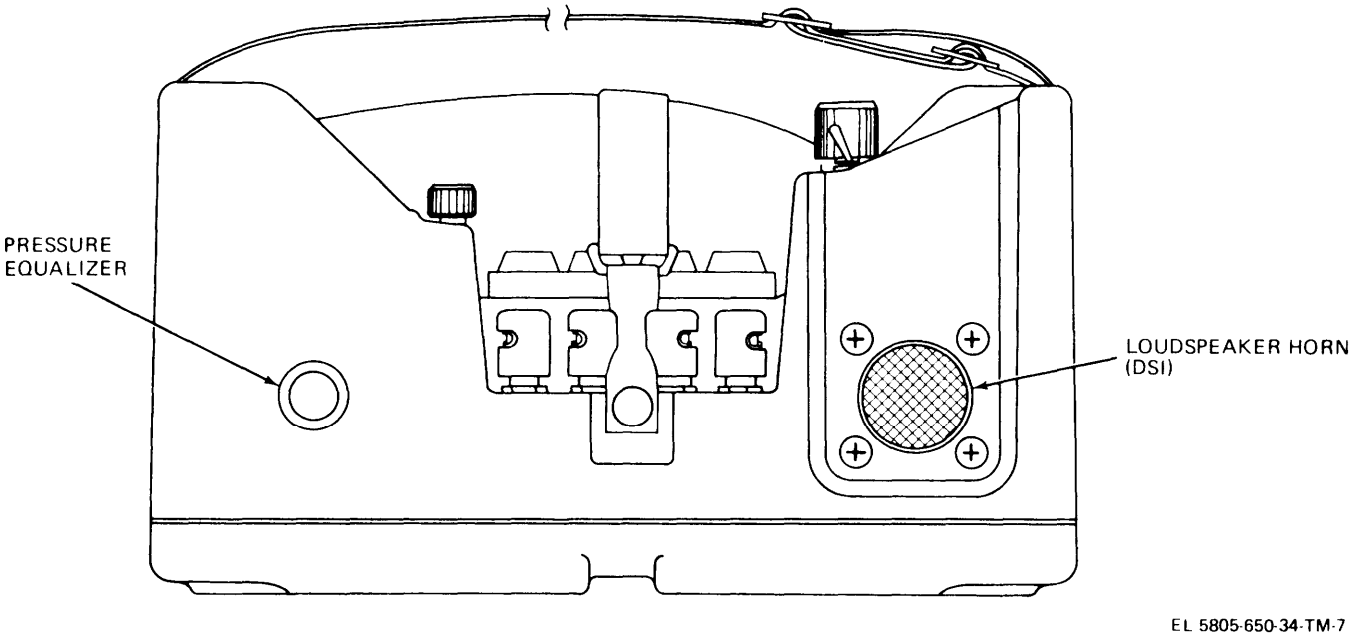


Figure 3–4. Telephone set, side view, parts location.

Table 3-1. Troubleshooting, Direct Support

Malfunction	Probable cause	Corrective action
1. Dial tone not returned from switching facility.	*a.* Faulty hookswitch (S2).	*a.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	b. Faulty circuit card assembly (A1).	*b.* Replace circuit card assembly.
2. Repeated wrong numbers and/or absence of ringback tone. Low digit sidetone level. Call times out.	*a.* Faulty keyset.	*a.* Refer telephone set to higher category maintenance.
	b. Faulty circuit card assembly (A1).	*b.* Replace circuit card assembly.
3. No ringing or intermittent ringing.	*a.* Loudspeaker horn (DS1) inoperative.	*a.* Replace loudspeaker horn (DS1).
	b. Ring indicator (DS2) or ON/OFF switch (S1) inoperative.	*b.* Replace ring indicator (DS2) or ON/OFF switch (S1).
	c. Ringer volume control (R1) defective.	*c.* Replace ringer volume control.
	d. Defective hookswitch (S2).	*d.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	e. Faulty circuit card assembly (A1).	*e.* Replace circuit card assembly.
4. No sidetone; voice transmission is normal.	Defective circuit card assembly (A1).	Replace circuit card assembly.
5. No voice reception or sidetone.	*a.* Faulty hookswitch (S2).	*a.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	b. Faulty circuit card assembly (A1).	*b.* Replace circuit card assembly.
6. Telephone set does not inhibit seize or release from extension telephones.	*a.* Defective hook-switch (S2).	*a.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	b. Defective circuit card assembly (A1).	*b.* Replace circuit card assembly.
7. Seize or release not inhibited by another off cradle extension telephone.	Defective circuit card assembly (A1).	Replace circuit card assembly.
8. Voice transmission low or non-existent.	*a.* Faulty transmitter element.	*a.* Replace transmitter element.
	b. Faulty circuit card assembly (A1).	*b.* Replace circuit card assembly.
9. No output or reduced output.	*a.* Faulty hookswitch (S2).	*a.* Perform testing procedure of paragraph 3-6 Replace hookswitch, if necessary.
	b. Defective circuit card assembly (A1).	*b.* Replace circuit card assembly.

Table 3-1. Troubleshooting, Direct Support-Continued

Malfunction	Probable cause	Corrective action
10. No release tone.	a. Faulty hookswitch (S2).	a. Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	b. Defective circuit card assembly (A1).	b. Replace circuit card assembly.
No digit tones or single frequency tone when keyset (S3) is depressed.	a. Defective keyset (S3).	a. Refer telephone set to higher category maintenance.
	b. Defective hookswitch (S2).	b. Perform testing procdure of paragraph 3-6. Replace hookswitch, if necessary.

Section II. MAINTENANCE OF TELEPHONE SET TA-838/TT

3-5. Visual Inspection

a. Visually inspect the telephone set for obvious faults. Inspect the following items for defects such as broken wires, loose connections, or physical damage.

(1) Telephone set housing.

(2) Handset (receiver and transmitter).

(3) Retractile cord.

(4) Keyset.

(5) Battery compartment.

b. Remove telephone set base and check the following

(1) Check for obvious physical damage to printed circuit card.

(2) Check wiring between all parts and assemblies.

(3) Check all switch contacts for obvious physical damage.

(4) Replace obvious damaged items.

3-6. Fault Isolation

Setting the ON/OFF switch (S1) in the ON position and the RING VOLUME control fully clockwise shall cause the telephone set to ring aurally and visually indicate when a call is received. A failing of either will indicate a defective loudspeaker horn (DS1), ring indicator (DS2), or ON/OFF switch (S1). A failing of both may indicate a defective circuit card assembly (A1). If a defective hookswitch is suspected, perform the following procedure:

CAUTION

Prior to disconnecting J1, connect a shorting wire to the the shorting pins (fig. 3–2) to prevent inadvertent damage to electronic components. Shorting wire must be removed after reconnecting J1 in order for unit to operate.

a. Disconnect connector J1 from circuit card assembly (A1), and remove telephone set base.

b. Set MODE SELECT switch to a 4–wire common battery position.

c. Refer to figure 3-3 and locate hookswitch (S2). Do not disconnect any wires.

d. Refer to schematic diagram (fig. FO-3) and connector (J1) test point location diagram (fig. 4-2) and perform continuity check with button released. Perform continuity check with button depressed.

3-7. Removal and Replacement Procedures

The procedures given in paragraphs 3–7 through 3–20 provide instructions for removal and replacement of parts found to be defective.

NOTE

Remove batteries before proceeding with any removal or replacement procedures.

CAUTION

Prior to disconnecting J1, connect a shorting wire to the three shorting pins (fig. 3-2) to prevent inadvertent damage to electronic components. Shorting wire must be removed after reconnecting J1 in order for unit to operate.

3-8. Transmitter Element, Removal and Replacement

(fig. 3-1)

a. Removal.

(1) Remove transmitter cap.

(2) Lift out transmitter element and disconnect the two wires.

b. Replacement.

(1) Connect wires to transmitter element as shown in figure 3-5.

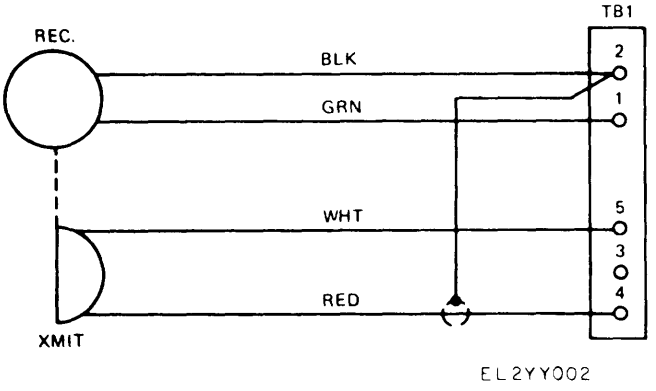


Figure 3-5. Handset cord, wiring diagram.

(2) Replace transmitter element in handset and install transmitter cap.

NOTE

When replacing transmitter element in handset avoid pinching the connecting wires.

3-9. Receiver Element, Removal and Replacement

(fig. 3-1)

a. Removal.

(1) Remove receiver cap.

(2) Lift out receiver and disconnect two wires.

b. Replacement.

(1) Connect wires to receiver element as shown in figure 3-5.

(2) Replace receiver element in handset and install receiver cap.

NOTE

When replacing receiver element in handset avoid pinching the connecting wires.

3-10. Telephone Set Base

(fig. 3-2)

The following procedures require that the telephone set base is removed. To accomplish this, perform the following:

a. Remove the ten screws from the outside edge of the telephone set base, going in one direction, using a partial screw removal method for each complete cycle. This requires approximately five cycles to clear all ten screws from case.

b. Attach shorting wire to shorting pins (fig. 3-2).

c. Disconnect electrical connector J1 by loosening two attaching screws. Lay unit on side to facilitate J1 removal.

d. The telephone set base is replaced by reversing the above procedure.

3-11. Retractile Cord, Removal and Replacement

(fig. 3-1, 3-3, and 3-5)

a. Removal.

(1) Remove telephone set base as described in paragraph 3-10.

(2) Remove two cable clamps and (disconnect five wires from terminal block TB1.

(3) Remove transmitter and receiver caps and disconnect wires from transmitter element and receiver element, as dcscribed in paragraphs 3-8 and 3-9.

(4) Remove the two screws, securing the access plate. Remove the access plate, packing, and cord.

b. Replacement.

(1) Run new cord through case, seat grommet and connect cord to terminal block TB1 as shown in figure 3-5.

(2) Replace two cable clamps.

(3) Connect wires to receiver and transmitter elements as shown in figure 3-5 and replace caps on handset.

(4) Replace packing, using RTV sealant. Replace access plate.

NOTE

If sealant in handset was damaged during removal, new sealant (RTV) is required to complete reassembly.

(5) Replace telephone set base as described in paragraph 3-10.

3–12. Loudspeaker Horn (DSI), Removal and Replacement

(fig. 3-4)

a. Removal.

(1) Remove telephone set base as described in paragraph 3-10.

(2) Remove four screws securing loudspeaker horn to telephone set housing.

(1) Disconnect two wires and remove loudspeaker horn.

b. Replacement.

(1) Connect wires to loudspeaker horn.

(2) Install loudspeaker horn in telephone set housing and secure, using four screws.

CAUTION

Observe hole alignment (o insure loudspeaker horn clearance with respect to MODE SELECT switch.

Do not overtighten screws when installing the loudspeaker horn DS1. This can cause cracking of the shell assembly.

(3) Replace telephone set base as described in paragraph 3-10.

3-13. Ring Indicator (DS2), Removal and Replacement

(fig. 3-3)

a. Removal.

(1) Remove telephone set base as described in paragraph 3-10.

(2) Remove loudspeaker horn as described in paragraph 3-12.

(3) Tag and disconnect two wires from ring indicator.

(4) Remove nut securing ring indicator to telephone set housing and lift out ring indicator.

b. Replacement.

(1) Secure ring indicator to telephone set ousing using nut removed in procedure a above.

(2) Connect two wires to ring indicator.

(3) Replace loudspeaker horn and telephone set base as described in paragraphs 3-10 and 3-12.

3-14. Ring Volume Control (R1), Removal and Replacement

(fig. 3-3)

a. Removal.

(1) Remove telephone set base as described in paragraph 3-10.

(2) Remove loudspeaker horn as described in paragraph 3-12.

(3) Tag and disconnect three wires from ringer volume control.

(4) Loosen setscrew and remove knob.

(5) Remove nut securing ring volume control to telephone set housing and lift out ring volume control.

b. Replacement.

(1) Install ring volume control in telephone set housing and secure with nut.

(2) Install knob on ring volume control shaft nd tighten setscrew.

(3) Connect three wires to ring volume control.

(4) Replace loudspeaker horn and telephone set base as described in paragraphs 3-10 and 3-12.

3-15. Switch (S1), Removal and Replacement

(fig. 3-3)

a. Removal.

(1) Remove telephone set base as described in paragraph 3-10.

(2) Remove loudspeaker horn as described in paragraph 3-12.

(3) Tag and disconnect two wires from ON/OFF switch.

(4) Remove nut securing ON/OFF switch to telephone set housing and lift out ON/OFF switch.

b. Replacement.

(1) Install ON/OFF switch in telephone set housing and secure with nut.

(2) Connect two wires to ON/OFF switch.

(3) Replace loudspeaker horn and telephone set base as described in paragraphs 3-10 and 3-12.

3-16. Hookswitch (S2), Removal and Replacement

(fig. 3-3)

a. Removal.

(1) Remove telephone set base as described in paragraph 3-10.

(2) Tag and disconnect wires from hookswitch.

(3) Remove nut and collar securing hookswitch to telephone set housing and lift out hookswitch.

b. Replacement.

(1) Install hookswitch in telephone set housing and secure, using nut and collar.

(2) Connect wires to hookswitch.

(3) Replace telephone set base as described in paragraph 3-10.

3-17. Circuit Cord Assembly (A1), Removal and Replacement

(fig. 3-2)

a. Removal.

(1) Remove telephone set base as described in paragraph 3-10.

(2) Remove two screws and carefully remove electrical connector J1. (See Caution in para 4-3.)

(3) Remove six screws and lift circuit card assembly from telephone set base.

b. Replacement.

(1) Set circuit card assembly in telephone set base and secure, using six screws.

(2) Install electrical connector J1 and secure, using two screws.

(3) Replace telephone set base as described in paragraph 3-10.

3-18. Terminal Board (TB1), Removal and Replacement

(fig. 3-3)

a. *Removal*

(1) Remove telephone set base as described in paragraph 3-10.

(2) Tag and disconnect wires from terminal board.

(3) Remove two screws and carefully remove terminal board.

b. Replacement.

(1) Install terminal board in telephone set housing and secure using two screws.

(2) Connect wires to terminal board.

(3) Replace telephone set base as described in paragraph 3-10.

3-19. Binding Posts (E1 through E4), Removal and Replacement

(fig. 3-3).

a *Removal*

(1) Remove telephone set base as described in paragraph 3-10.

(2) Unsolder wires from binding post terminals.

(3) Remove binding post, attaching nut, and connector lugs. Tag connector lugs.

b. Replacement.

(1) Install binding post in telephone set.

(2) Install connector lug and secure with attaching nut.

(3) Resolder wires to binding post terminals.

(4) Replace telephone set base as described in paragraph 3-10.

3-20. Battery Contacts (Upper and Lower), Removal and Replacement

(fig. 3-3)

a Removal.

(1) Open battery cover. Remove upper contact and attaching screw if desired.

(2) Remove batteries.

(3) Remove telephone set base as described in paragraph 3-10.

(4) Remove nuts and washers securing connector lugs to battery terminals and lift off connector lugs.

(5) Remove nuts securing lower contact assembly and lift assembly out of battery compartment.

b. Replacement.

(1) Install lower contact assembly in battery compartment and secure to telephone set housing using washers under attaching nuts.

(2) Install connector lugs on battery terminals and secure using washers under attaching nuts.

(3) Replace telephone set base as described in paragraph 3-10.

(4) Install upper contact and secure using attaching screw.

(5) Replace batteries.

Section III. TESTING PROCEDURES FOR TELEPHONE SET TA-838/TT

3-21. General

The testing procedures provided in this section are intended for use by direct support maintenance personnel to determine whether the performance of a repaired telephone set is satisfactory for return to use. All tests must be performed in accordance with the step-by-step procedures. Failure to meet acceptable performance constitutes **a** malfunction which should be located using applicable fault isolation procedures. Return the part to the category of maintenance responsible for repair in accordance with the maintenance allocation chart (TM 11-5805-650-12&P).

3-22. Physical Tests and Inspections

Refer to procedures in paragraph 3-5 and perform those checks prior to performing the test procedures in this section.

3-23. Signaling Tests

a Test Equipment and Materials.

(1) Ac voltmeter, ME-30( )/U, or equivalent.

(2) Electronic Counter, AN/USM - 207A, or equivalent.

(3) Oscilloscope, AN/USM-281, or equivalent.

(4) oscillator, TS-421, or equivalent.

(5) Decade Attenuator, TS-402, or equivalent.

(6) Interrupter, KY-834/U, or equivalent.

(7) Dc power supply, PP-351/U: 5.4 vdc ± 20%; and 24 vdc ±20%; and 48 vdc ± 20%.

(8) Test leads (6).

(9) Resistors 600-ohm, 1/2W (2).

(10) Switch, SPDT.

(11) Resistor, 270-ohm. 5W (2).

(12) Balanced transformer, C-161, or equivalent. 1:1 ratio, 600-ohm Input/Output, Frequency range of 50 to 3,500 Hz. (Lin number E48707) (NSN5950-00-235-8730).

(13) Capacitors. 300 µf. 60 vdc Polarized (2).
(14) Resistor, 2700-ohm 1/2W (1).

b. Test Connections and Conditions (fig. 3-6 through 3-9). When in the local battery (LB) mode during testing, the telephone set can operate from four batteries, BA-42 or BA-3042, or an equivalent power source. If using an equivalent power source, the output voltage must be 5.4 ± 1 vdc. In order to apply power from an equivalent power source, the telephone set base must be removed to allow access to the terminals.

c. Initial Test Equipment Settings. Connect the test equipment to the power source; allow a 10-minute warmup period before starting test procedures. Test equipment settings should be within the allowable range indicated by the expected performance standard.

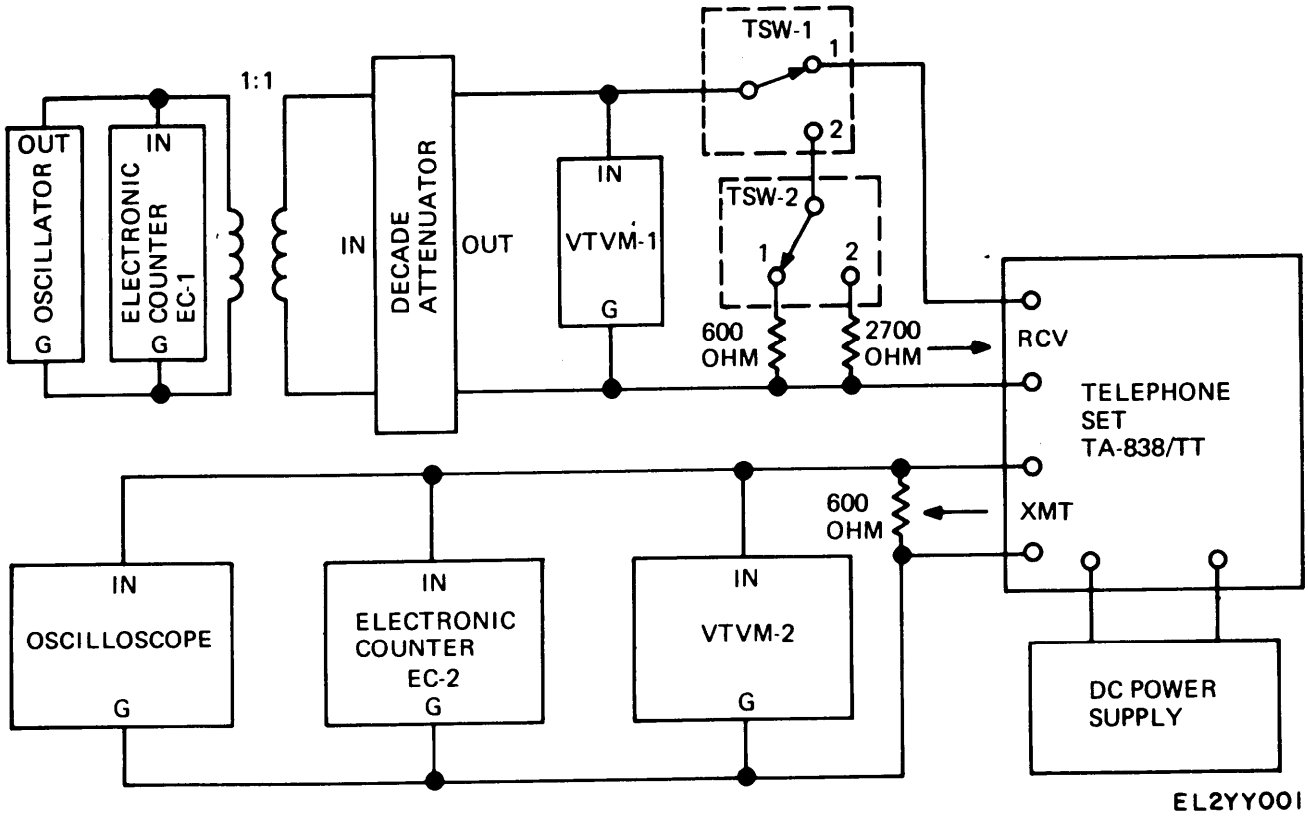


Figure 3-6. Signaling, test setup.

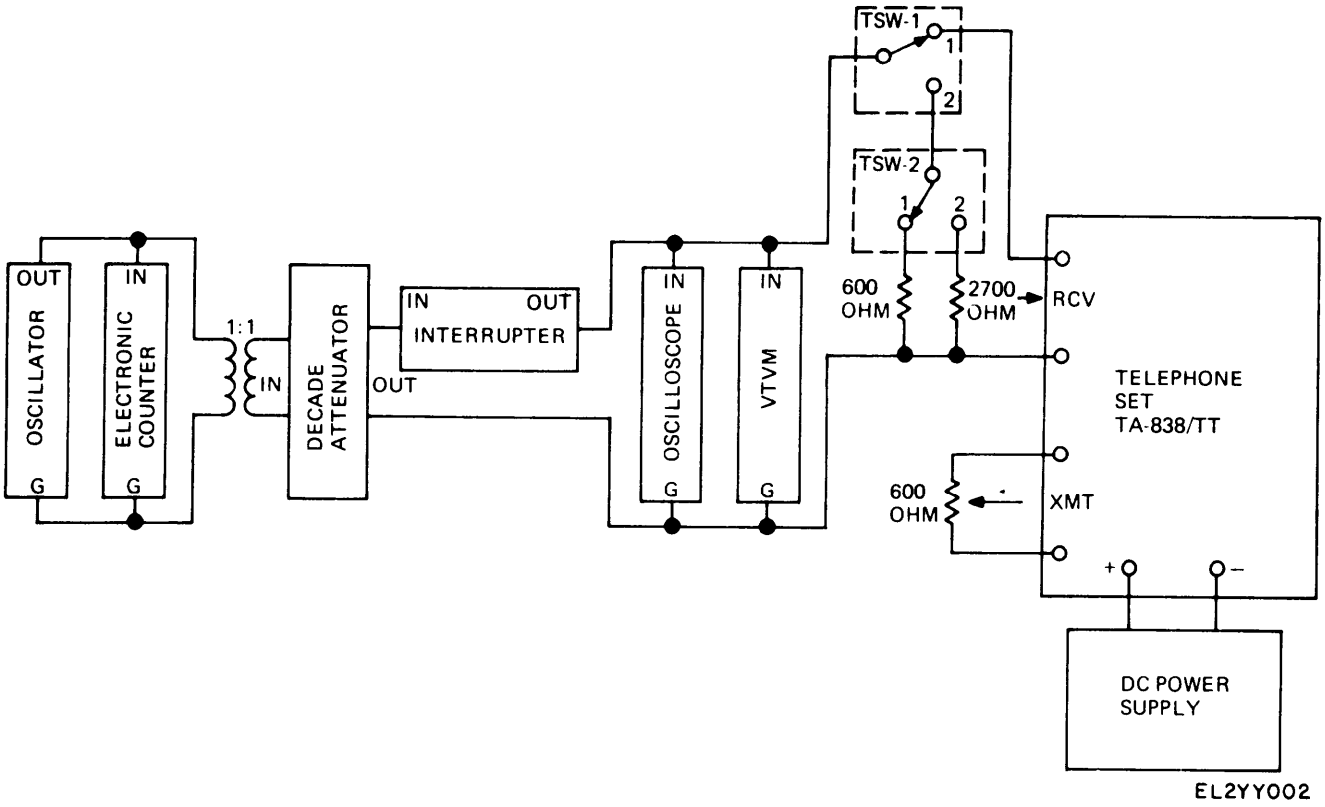


Figure 3-7. Local battery, ring and seize acknowledge, test setup.

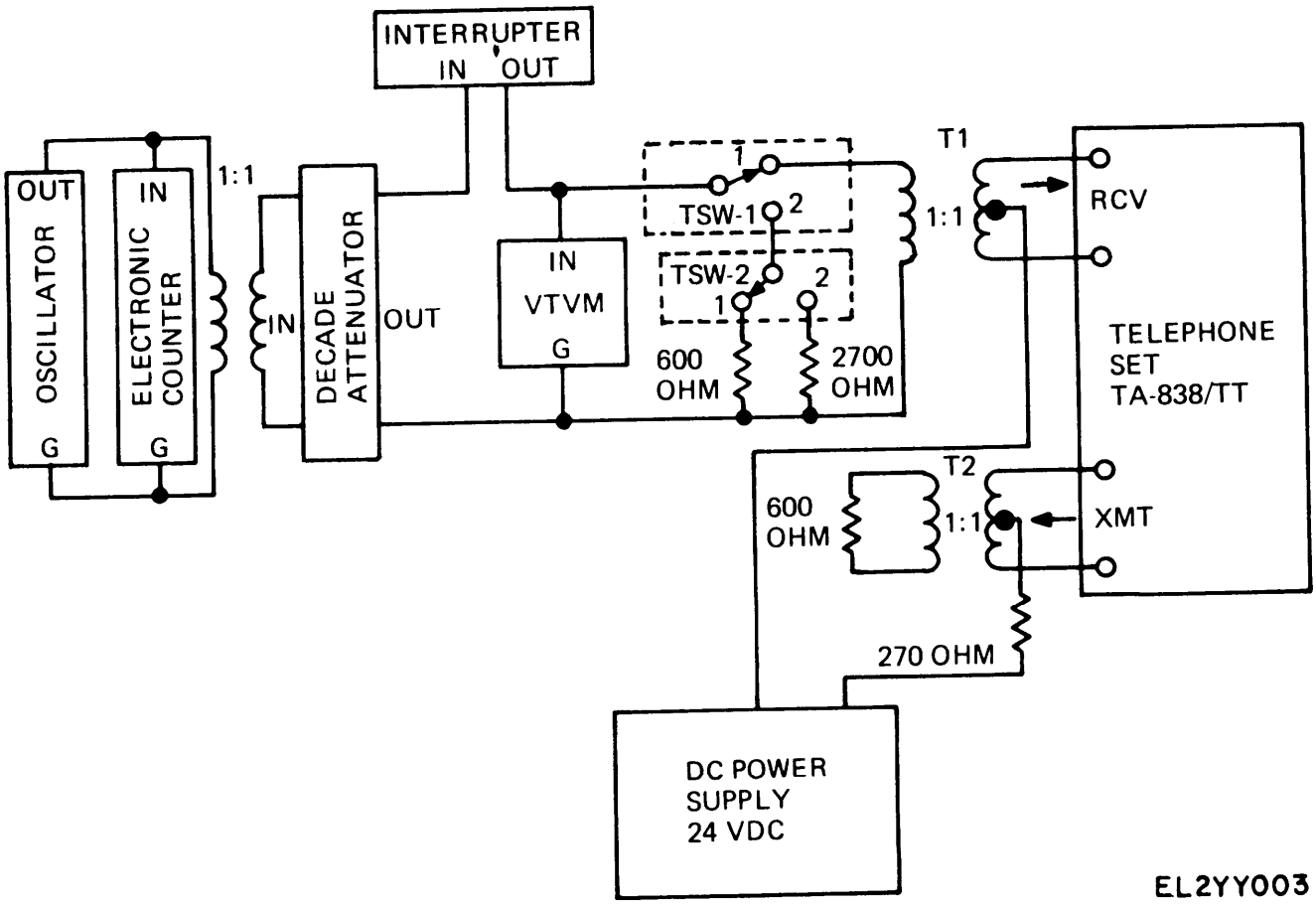


Figure 3-8. Common battery, 4-wire test setup.

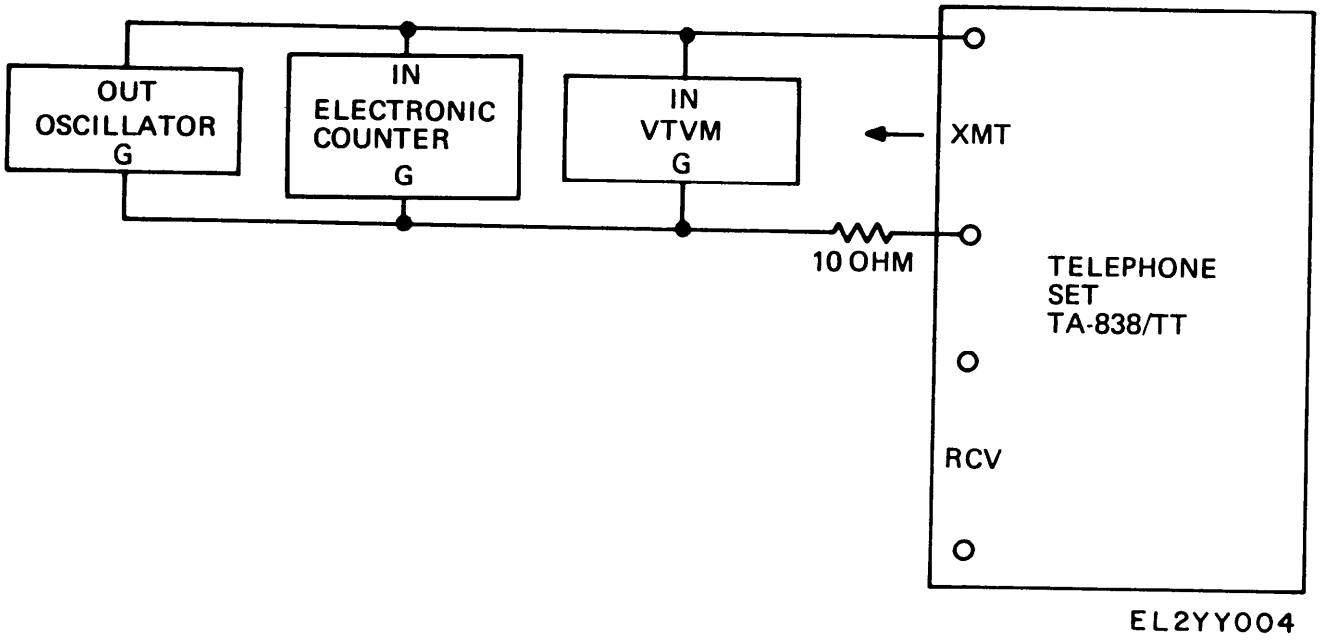


Figure 3-9. Common battery, 2-wire, test setup.

d. Procedure.

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
1.	*a.* Set up in accordance with figure 3-6. Set TSW-1 to position 2, and TSW-2 to position 1. Adjust oscillator to provide Seize Acknowledge Signal, 570 ± 10 Hz on electronic counter EC-1, 49 mv (-24 dBm) on VTVM-1. Power Supply: batteries or 5.4 ± 1 vdc.	*a.* MODE SELECT switch to AC/LB and handset on-hook.	*a.* Go off-hook.	*a.* Seize Siganl: electronic counter EC-2 indicates 2250 ± 30 Hz; VT-VM-2 indicates -4 dBm, +2, -3 dB.
			b. Momentarily set TSW-1 to position 1.	*b.* Seize Signal is no longer present on oscilloscope.
			c. Press and hold the following DTMF keyset keys, one at a time; 1, 2, 3, FO 4, 5, 6, F 7, 8, 9, I R, O, C, P	*c.* DTMF signal is present on oscilloscope. VTVM-2 indicates -4 dBm, +2, -3 dB.
			d. Go on-hook. Release Signal will time-out between 3 to 10 seconds. Repeat off-hook to on-hook as required.	*d.* Release Signal is present on oscilloscope and electronic counter EC-2 indicates 2600 ± 34 Hz; VT-VM-2 indicates -4 dBm, +2, -3 dB.
	e. Set TSW-1 to position 2, and TSW-2 to position 2. Adjust oscillator to provide Release Acknowledge Signal, 570 ± 10 Hz on EC-1, and 104 mv (-17.5 dBm) on VTVM-1.	*e.* Off-hook, then on-hook.	*e.* Momentarily place switch TSW-1 to position 1 before release signal ceases.	*e.* Release Signal ceases on Oscilloscope.
2	*a.* Set up in accordance with figure 3-7. With TSW-1 in position 2, and TSW-2 in position 2, set interrupter to "Continuous" Mode. Set oscillator to 555 ± 10 Hz, and adjust attenuator for a reading of 104 mv (-17.5 dB) on VTVM. Set interrupter to "Interrupted" mode, and adjust for 10-Hz rate. Power supply: Batteries or 5.4 ± 1 vdc. (1) Set TSW-1 to position 1. (2) Same as *a.* except oscillator frequency set to 585 ± 10 Hz, 104 mv (-17.5 dB). Set TSW-1 to position 1.	*a.* MODE SELECT switch to AC/LB. On-hook.	*a.* Incoming Ring Detector.	*a.* None. (1) Ring indicator (DS2) and loudspeaker horn (DS1) respond at a 10-Hz rate. (2) Same as (1).

Step No.	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
	(3) Same as *a.* except oscillator frequency set to 3500 ± 70 Hz, 104 mv (-17.5 dB). Set TSW-1 to position 1.		(3) Adjust oscillator downward until ring is audible.	(3) Electronic counter indicates between 585 Hz and 615 Hz.
	(4) Same as *a.* except oscillator frequency set to 200 ± 4 Hz, 104 mv (-17.5 dB). Set TSW-1 to position 1.		(4) Adjust oscillator upward until ring is audible.	(4) Electronic counter indicates between 525 Hz and 555 Hz.
	(5) Same as *a.* except oscillator frequency set to 200 ± 4 Hz, 20.7 mv (-31.5 dB). Set TSW-1 to position 1.		(5) Adjust oscillator upward to 3500 Hz.	(5) Ring indicator (DS1) and loudspeaker horn (DS2) do not respond.
	b. With TSW-1 in position 2 and TSW-2 in position 1, set interrupter to "Continuous", and set oscillator to 3500 ± 70 Hz. Adjust attenuator for a reading of 49 mv (-24 dBm) on VTVM. Set TSW-1 to position 1. Remove oscilloscope from RCV terminals and connect to XMT terminals.	*b.* Off-hook	*b.* Seize Acknowledge Detector.	(1) 2250 Hz Seize Signal is present on oscilloscope.
	(3) Same as *b.* except oscillator frequency set to 200 ± 4 Hz, 49 mv (-24 dBm).		(2) Adjust oscillator downward until Seize Signal ceases. (3) On-hook, wait for Release Signal time-out, then off-hook.	(2) Electronic counter indicates between 585 Hz and 615 Hz. (3) 2250 Hz Seize Signal is present on oscilloscope.
	(5) Same as *b.* except oscillator frequency set to 200 ± 4 Hz, 20.7 mv (-31.5 dBm).		(4) Adjust oscillator upward until Seize Signal ceases. (5) On-hook, wait for Release Signal time-out, then off-hook. (6) Adjust oscillator upward to 3500 Hz.	(4) Electronic counter indicates between 525 Hz and 555 Hz. (5) 2250 Hz Seize Signal is present on oscilloscope. (6) Electronic counter indicates 3500 Hz. 2250 Hz Seize Signal remains present on oscilloscope.
3	Set up in accordance with figure 3-8. *a.* With TSW-1 in position 2, and TSW-2 in position 2, set interrupter to "Continuous" mode, and set oscillator to 555 ± 10 Hz. Adjust attenuator for a reading of 104 mv (-17.5 dB) on VTVM. Set interrupter to "Interrupted" mode, and adjust for 10 Hz rate. Power Supply: 24 ± 5 vdc. *b.* Set TSW-1 to position 1.	*a.* MODE SELECT switch to AC/CB. On-hook.	*a.* Incoming Ring Detector.	*a.* None. *b.* Ring indicator (DS2) and loudspeaker horn (DS1) respond at a 10-Hz rate.

Step No	Control settings: Test equipment	Control settings: Equipment under test	Test procedure	Performance standard
	c. Set TSW-1 to position 2. d. Set TSW-1 to position 1.	c. MODE SELECT switch to 4 wire DC/CB. On-hook.	c. Repeat a.	c. None. d. Ring indicator (DS2) and loudspeaker horn (DS1) respond at a 10-Hz rate.
4	Set up in accordance with figure 3-9. a. Using low amplitude oscillator output level, adjust for 20-Hz frequency as read on electronic counter. Remove counter from test setup. b. Adjust oscillator output for 60 volts as indicated on VTVM.	a. MODE SELECT switch to 2 WIRE DC/CB. On-hook.	a. Incoming Ring Detector.	a. None. b. Ring indicator (DS2) and loudspeaker horn (DS1) respond at 20-Hz rate.

3-24. Operational Tests

a. Test Equipment and Materials.

(1) Resistors, 1000 ohm ± 10%, 1/2W (2).

(2) Battery BA-42 or BA-3042 Type C cell (4).

b. Procedure, Perform preinstallation operational check presented in TM 11-5805-650-12&P. If a Switchboard connection is available, the switchboard operational installation check can also be performed, although performance of this check is not a requirement to return the unit to service.

Section IV. MAINTENANCE OF TELEPHONE SET TA-838A/TT

3-25. General

All paragraphs in Section II in this chapter apply to Telephone Set TA-838A/TT except paragraph 3-6 and the caution in paragraph 3-7. Refer to figure 3-10 when working on Telephone Set TA-828A/TT.

3-26. Fault Isolation

a. Perform self test in accordance with Section V.

b. If unit passes self test, perform the following procedure:

(1) Disconnect connector J1 from circuit card assembly A1, and remove the telephone set base.

(2) Set the MODE SELECT switch to a 4-wire common battery position.

(3) Refer to figure 3-3. Do not disconnect any wires.

(4) Refer to schematic diagram figure FO-3 and to connector J1 test point location diagram figure 4-2 and perform a continuity check with the hook switch button released.

(5) Then perform the continuity check with the hook switch button depressed.

Section V. TESTING PROCEDURES FOR TELEPHONE SET TA-838A/TT

3-27. General

When testing Telephone Set TA-838A/TT, refer to paragraphs 3-21 through 3-24 and figures 3-6 through 3-10 in Section Ill in this chapter.

3-28. Self-testing provisions in Telephone Set TA-838A/TT

a. Load the battery compartment with known good batteries.

b. Set the MODE SELECT switch to the 4 wire AC/LB position, the LED ON-OFF switch to ON and the RING VOLUME control to mid range.

c. Loosen all of the base assembly screws and remove the base assembly from the case assembly without disconnecting the cable assembly from J1.

d. Place the handset on-hook.

e. Place a shorting clip lead across the two P1 terminals (near U2) and a shorting clip lead across the two P2 terminals (near the LED on the Circuit Card Assembly).

f. Go off-hook and listen at the handset earphone.

g. Remove one end of the shorting clip lead from across one of the P1 terminals.

h. The following sequence of events should occur:

(1) The LED on the Circuit Card Assembly and the LED on the Case Assembly should operate three times.

(2) The Loudspeaker Horn should sound three times simultaneously with the LED operation.

(3) A tone should be heard three times in the earphone following the LED and Loudspeaker operation.

i. The first set of three rings indicates that the digital circuit section (U1, U3, U4, U5, U6, U7, U8, U9, U10, U12) and the ring amplifier (U11, Q1, Q2, Q3, Q4, Q5, Q9, Q10) are operating.

j. The second set of three earphone tones indicates that the digital circuit section (U1, U3, U4, U5, U6, U7, U8, U9, U10) and the linear circuit section (U18, Send Amplifier and Receive Amplifier) are operating.

k. To repeat the self test place the handset back on hook, the shorting clip lead back across the two terminals of P1 and repeat steps f and g above.

Section VI. DESCRIPTION OF REPLACEMENT CIRCUIT CARD ASSEMBLY FOR TELEPHONE SET TA-838/TT AND TA-838A/TT

3-29. Scope

This section describes the replacement of circuit card assembly part number A3188334 that applies to both Telephone Set TA-838/TT and TA-838A/TT. Should the circuit card assembly malfunction replace the entire assembly as its component parts are not authorized for replacement.

3-30. General (fig. FO-3, FO-6 and FO-8)

Chapter 3 Direct Support Maintenance Instructions Sections I, II, III and IV also applies to the TA-838/TT and TA-838A/TT with replacement circuit card assembly A3188334, with the exception of references to self test and circuit symbol designations.

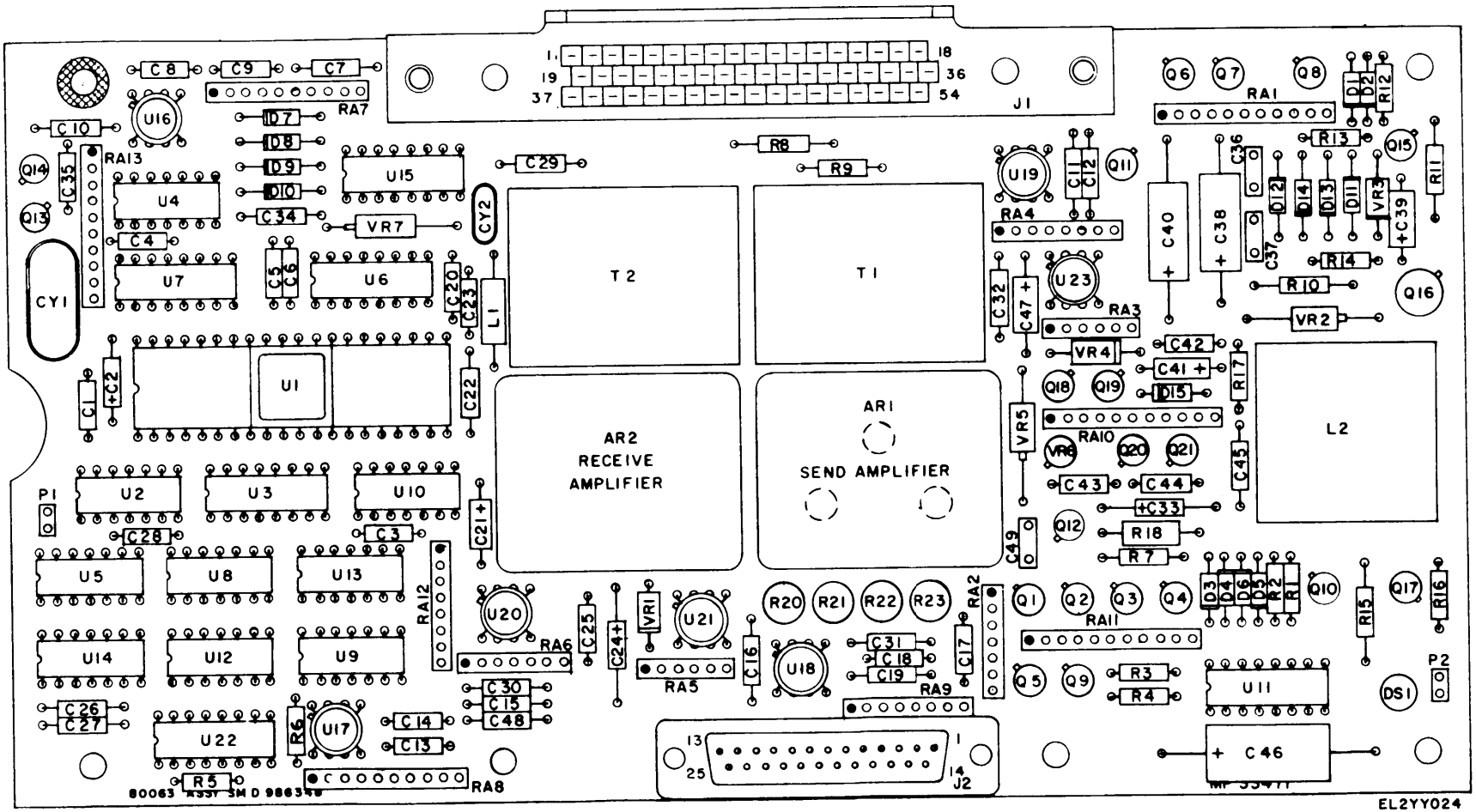


Figure 3-10. Parts location on Circuit Card Assembly (A1) for Telephone Set TA-838A/TT

CHAPTER 4

GENERAL SUPPORT MAINTENANCE INSTRUCTIONS

4-1. General

a. Limitations. The maintenance instructions provided in this chapter are for general support maintenance only. The procedures that follow apply to the telephone set regardless of its location. Restrictions are imposed only by the immediate circumstances involved, the availability of spare parts, tools, test equipment, and the skill of the maintenance technicians.

b. Maintenance diagrams. Maximum use of wiring, schematic, and parts location diagrams should be made during performance of general support maintenance procedures. figure FO-1 shows how to interpret the military standard color code markings used in this equipment.

(1) For Telephone Set TA-838/TT: The wiring diagram and schematic diagram, figures FO-3, FO-4 (1) and FO-4 (2), are used to aid in fault isolation and signal tracing. The locations of serviceable components in the telephone set and on the circuit card assembly are shown on the parts location diagrams, figures 3-1 through 3-4. Refer to figure 4-11 for methods of determining pin locations on microcircuit components mounted on the circuit card assembly.

(2) For Telephone Set TA-838A/TT: The wiring diagram and schematic diagram, figures FO-3, FO-7 (1), FO-7 (2), and FO-7 (3), are used to aid in fault isolation and signal tracing. The locations of serviceable components in the telephone set and on the circuit card assembly are shown on the parts location diagrams, figures 3-1, 3-3, 3-4 and 3-10.

(3) The schematic diagram figure FO-8 applicable to circuit card assembly part number A3188334 is for reference only. Paragraphs 4-2 through 4-12 only are applicable as there are no serviceable components on this circuit card assembly.

4-2. Troubleshooting

Troubleshooting is based on symptoms that may occur when the telephone set is operated. The troubles/symptoms may be discovered through operation, or through incorrect indications on the preventive maintenance checks and services.

4-3. Troubleshooting Chart

When a trouble or symptom occurs, refer to table 4-1, Troubleshooting, to find possible trouble and corrective measures.

CAUTION

When troubleshooting Telephone Set TA-838A/-TT, prior to disconnecting J1, connect a shorting wire to the three shorting pins (fig. 3-2) to prevent inadvertent damage to electronic components. Shorting wire must be removed after reconnecting J1.

Table 4-1. Troubleshooting, General Support

Malfunction	Probable cause	Corrective action
1. Dial tone not returned from switching facility.	*a.* Faulty hookswitch (S2).	*a.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	b. Faulty circuit card assembly (A1).	*b.* Replace circuit card assembly. (Perform circuit card test procedure (para 4-12).
2. Repeated wrong numbers and/or absence of ringback tone. Low digit sidetone level. Call times out.	*a.* Faulty keyset.	*a.* Perform testing procedures of paragraph 4-6. Replace keyset, if necessary.
	b. Faulty circuit card assembly (Al).	*b.* Replace circuit card assembly. Perform circuit card test procedure (para 4-12).

Table 4-1. Troubleshooting, General Support-Continued

Malfunction	Probable cause	Corrective action
3. No ringing or intermittent ringing.	*a.* Loudspeaker horn (DS1) inoperative.	*a.* Replace loudspeaker horn (DS1).
	b. Ring indicator (DS2) or ON/OFF switch (S1) inoperative.	*b.* Replace ring indicator (DS2) or ON/OFF switch (S1).
	c. Ringer volume control (R1) defective.	*c.* Replace ringer volume control.
	d. Defective hookswitch (S2).	*d.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	e. Faulty circuit card assembly (A1).	*e.* Replace circuit card assembly. Perform circuit card test procedure (para 4-12).
4. No sidetone; voice transmission is normal.	Defective circuit card assembly (A1).	Replace circuit card assembly. Perform circuit card test procedure (para 4-12).
5. No voice reception or sidetone.	*a.* Faulty hookswitch (S2).	*a.* Perform testing procedure of paragraph 3-6. Replace hookswitch. if necessary.
	b. Faulty circuit card assembly (A1).	*b.* Replace circuit card assembly. Perform circuit card test procedure (para 4-12).
6. Telephone set does not inhibit seize or release from extension telephones.	*a.* Defective hookswitch (S2).	*a.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	b. Defective circuit card assembly (A1).	*b.* Replace circuit card assembly. Perform circuit card test procedure (pare 4-12).
7. Seize or release not inhibited by another off cradle extension telephone	Defective circuit card assembly (A1).	Replace circuit card assembly. Perform circuit card test procedure (para 4-12).
8. Voice transmission low or nonexistent.	*a.* Faulty transmitter element.	*a.* Replace transmitter element.
	b. Faulty circuit card assembly (A1).	*b.* Replace circuit card assembly. Perform circuit card test procedure (para 4-12).
9. No output or reduced output.	*a.* Faulty hookswitch (S2).	*a.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	b. Defective circuit card assembly (A1).	*b.* Replace circuit card assembly. Perform circuit card test procedure (para 4-12).
10. No release tone.	*a.* Faulty hookswitch (S2).	*a.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.
	b. Defective circuit card assembly (A1).	*b.* Replace circuit card assembly. Perform circuit card test procedure (para 4-12).
11. No digit tones or single frequency tone when keyset (S3) is depressed.	*a.* Defective keyset (S3).	*a.* Perform testing procedure of paragraph 4-6. Replace keyset, if necessary.
	b. Defective hookswitch (S2).	*b.* Perform testing procedure of paragraph 3-6. Replace hookswitch, if necessary.

4-4. Fault Isolation

This section contains procedures for fault isolating the following components of the telephone set:

a. Keyset (S3).

b. MODE SELECT switch (S4).

c. Wiring harness.

4-5. Preliminary Setup

a. Disconnect leads from RCV and XMT terminals.

b. Set MODE SELECT switch to any common battery (CB) position.

c. Remove ten attaching screws and remove telephone set base assembly to obtain access to inside of telephone. Do not disconnect J1.

CAUTION

Exercise care when moving electrical components, as damage to wiring harness may result.

NOTE

At the completion of test, restore telephone set to its original condition and place a call to ensure telephone set is functioning properly.

4-6. Keyset (S3) Test

a. Remove two attaching screws and move component board (A2) to obtain access to keyset connections.

b. Perform continuity check of keyset as listed in table 4-2. See wiring diagram (fig. FO-3) and Keyset (S3) test point location diagram (fig. 4-1).

Table 4-2. Keyset Continuity Check

Keyset (S3) pushbutton	*Keyset pins (F common)*
1	A and G
2	A and B
3	A and C
FO	A and E
4	D and G
5	D and B
6	D and C
F	D and E
7	H and G
8	H and K
9	H and J
I	H and E
R	L and G
O	L and K
C	L and J
P	L and E

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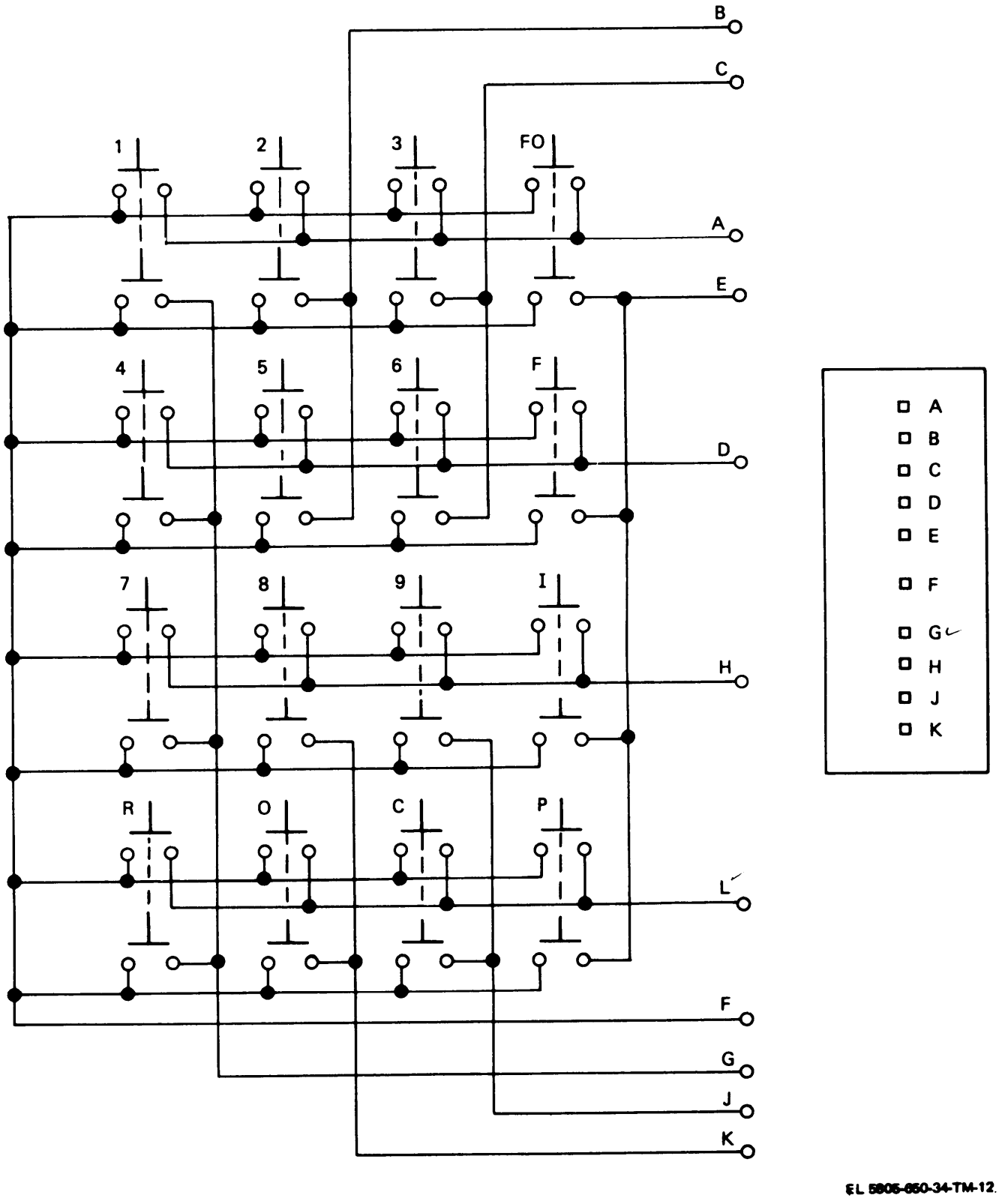

Figure 4-1. Keyset (S3), test point locations.

4-7. MODE SELECT Switch (S4) Test

NOTE

Before testing the MODE SELECT switch, performance of the hook-switch test (para 3-6) should be completed.

a. Remove handset (HS1) from cradle (off-hook).

b. Remove telephone set base and disconnect connector J1.

c. Check for continuity between pins of J1 (and other points) as listed in the chart below for each position of the MODE SELECT switch. (See figure FO-3 and figure 4-2 for test point locations.) When the switch is moved from the indicated position, the continuity should be lost unless the same pins are also listed for the new position. The chart also indicates the particular deck and area of switch S4 through which each continuity check is made.

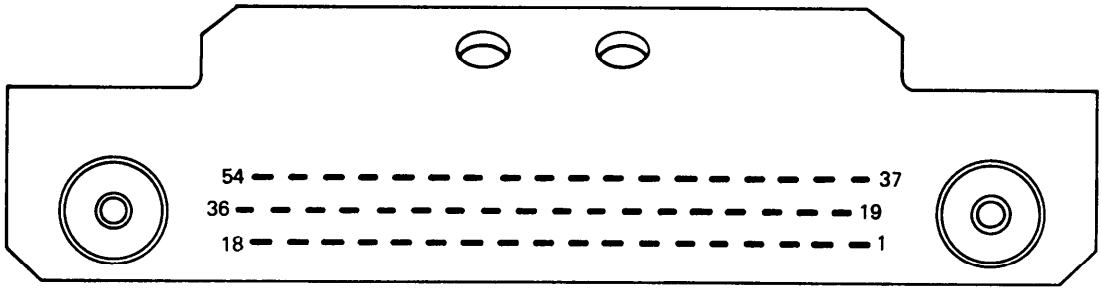

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Figure 4-2. Connector (J1), test point locations.

MODE SELECT switch S4 position	Deck 1		Deck 2		Deck 3	
	Front	Rear	Front	Rear	Front	Rear
2 WIRE DC/LB	36-11	1-37-19	39-26	20-18-+BAT	26-31 30-39	2-34
2 WIRE DC/CB	36-11	1-37-19	26-50 18-29	21-20	26-31 30-39	2-34
4 WIRE DC/CB	36-24	19-54	18-16		30-31-15	35-19 2-3
4 WIRE DC/LB	36-24			20-18-+BAT	30-31	19-45 2-3
4 WIRE AC/CB	36-43	19-54	18-36		30-31-15	2-3
4 WIRE AC/LB	36-25	19-36		20-18-+BAT	30-31-5	2-3
4 WIRE PT-PT	36-44			20-18-+BAT	30-31	2-3

4-8. Removal and Replacement Procedures

The procedures given in paragraphed 4-9, 4-10, and 4-11 provide instructions for removal and replacement of parts found to be defective.

4-9. Component Board (A2), Removal and Replacement

(fig. 3-3)

a. Removal.

(1) *Remove* telephone set base as described in paragraph 3-10.

(2) Remove two screws securing component board to keysender; tag and disconnect the two wires; and remove board.

b. Replacement.

(1) Replace the component board by connecting the two wires and securing in place using two screws.

(2) Replace telephone set base as described in paragraph 3-10.

4-10. Keyset (S3), Removal and Replacement

(fig. 3-3).

a. Removal.

(1) Remove component board as described in paragraph 4-9.

(2) Remove six nuts securing keyset to telephone set housing and lift off keyset.

b. Replacement.

(1) Replace the keyset by placing it in position on the telephone set housing and securing, using six nuts.

(2) Replace the component board (A2) as described in paragraph 4-9.

4-11. MODE SELECT Switch (S4), Removal and Replacement

(fig. 3-3)

a. Removal

(1) Remove telephone set base as described in paragraph 3-10.

(2) Remove loudspeaker horn as described in paragraph 3-12.

(3) Remove two screws and two nuts securing switch to telephone set housing and lift out MODE SELECT switch.

(4) Tag and disonnnect wires from MODE SELECT switch.

b. Replacement.

(1) Connect wires to MODE SELECT switch.

(2) Secure MODE SELECT switch to telephone set housing using two screws and two nuts.

(3) Replace loudspeaker horn and telephone set base as described in paragraphs 3-10 and 3-12.

4-12. Circuit Card Test Procedure

a. To verify malfunctions, aid in troubleshooting, and as a post-repair test of circuit card A1, perform the circuit card test procedures contained in table 4-3. (See figures 4-3 through 4-10.) Each step of the test procedure is independent and maybe performed out of sequence. Each step is related to a corresponding procedural step in troubleshooting table 4-4 (with the same step number), which provides troubleshooting data for the circuits causing a failure of that particular test.

b. To perform either the circuit card performance test or troubleshooting test, a common test fixture setup is required. This test fixture, figure FO-5, may be fabricated using components normally used in a TA-838/TT Telephone Set. Table 4-5 lists other required test equipment, the quantities required, and the reference designations used to identify the equipment on the test setup disgrams (fig. 4-3 through 4- 10).

NOTE

Suitable substitute test equipment may be used.

c. Prior to performing any step of the circuit card test procedures, the following pretest procedure must be performed:

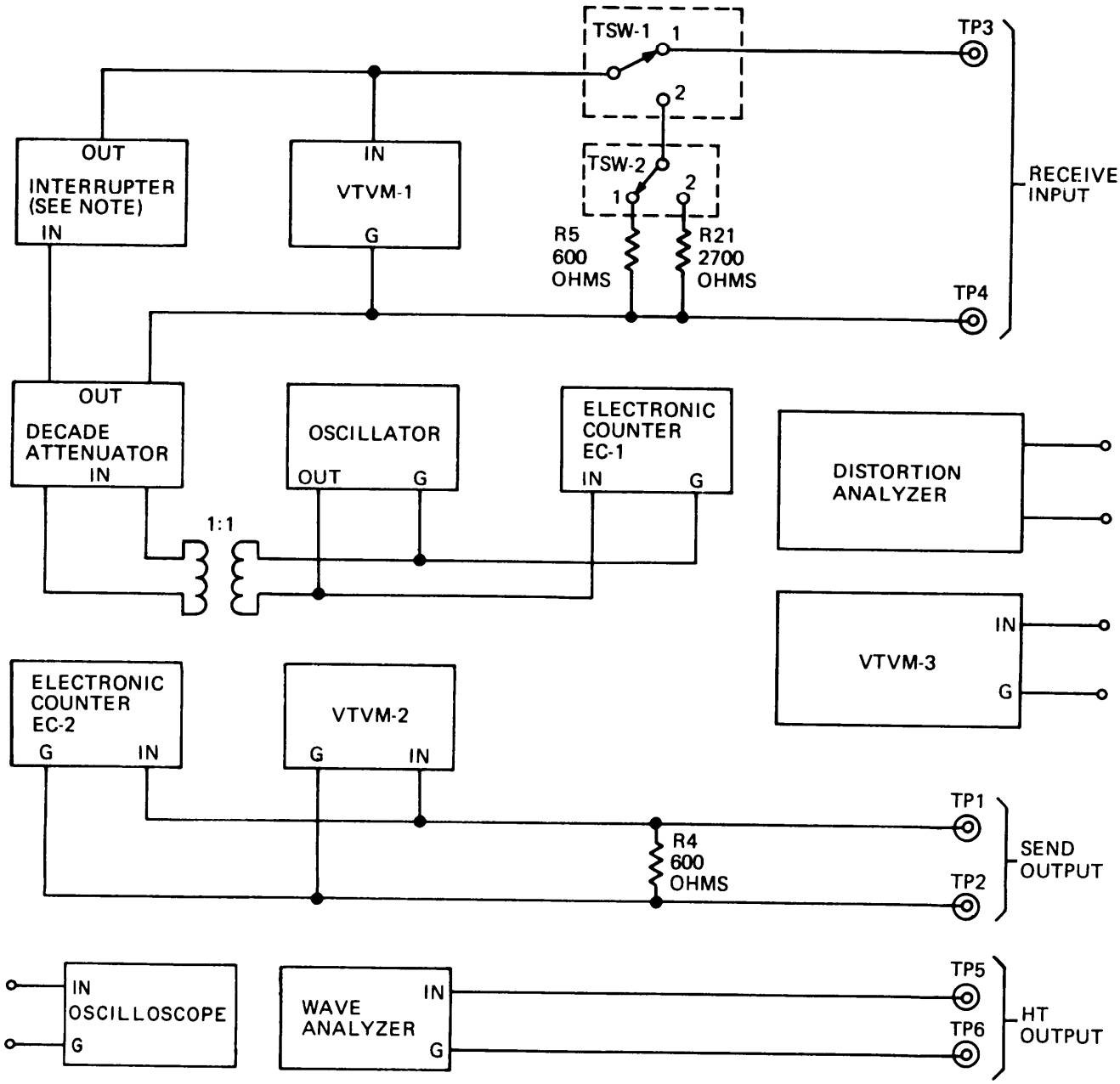
(1) Fabricate the test fixture as indicated in figure FO-5.

(2) Connect the circuit card to be tested to the test fixture by way of connector J1.

(3) Remove the shorting straps from the unit under test.

(4) Connect all test equipment requiring power to their power source using isolation plugs.

d. After completion of troubleshooting, the performance test should be performed in its entirety and upon completion of the performance test, the shorting straps should be replaced prior to disconnecting the card from the test fixture.



NOTE: THE INTERRUPTER IS ANY DEVICE THAT WILL PERFORM THE FOLLOWING FUNCTIONS WITH A CONTINUOUS SIGNAL APPLIED TO ITS INPUT:

1. NON-OPERATED – OUTPUT IS AN OPEN CIRCUIT.
2. OPERATED CONTINUOUS – OUTPUT SIGNAL IS SAME AS INPUT.
3. OPERATE INTERRUPTED – OUTPUT SIGNAL INTERRUPTED AT 10 HZ RATE.

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Figure 4-3. General Circuit card, test setup.

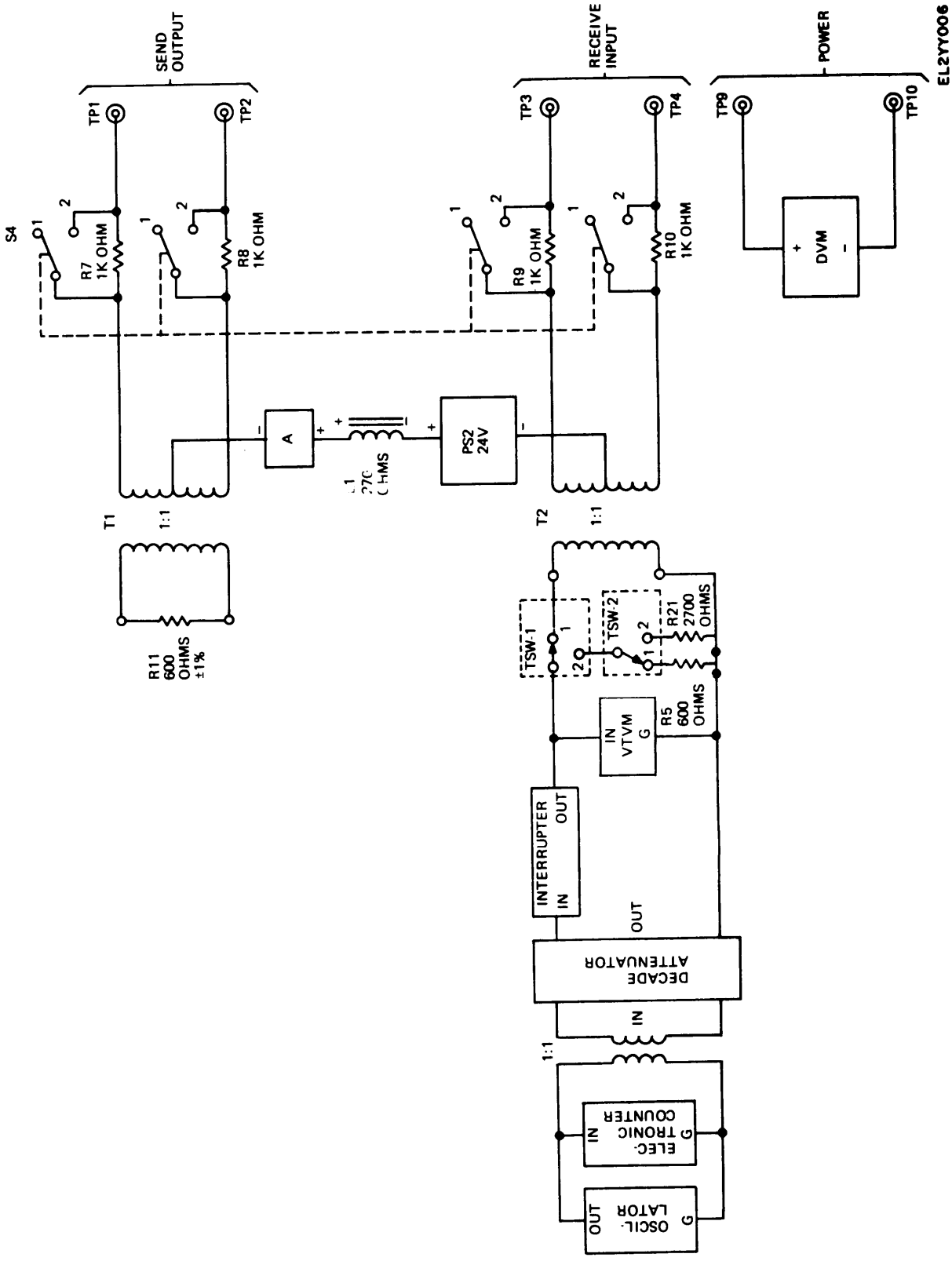

Figure 4-4. Common/local battery, test setup.

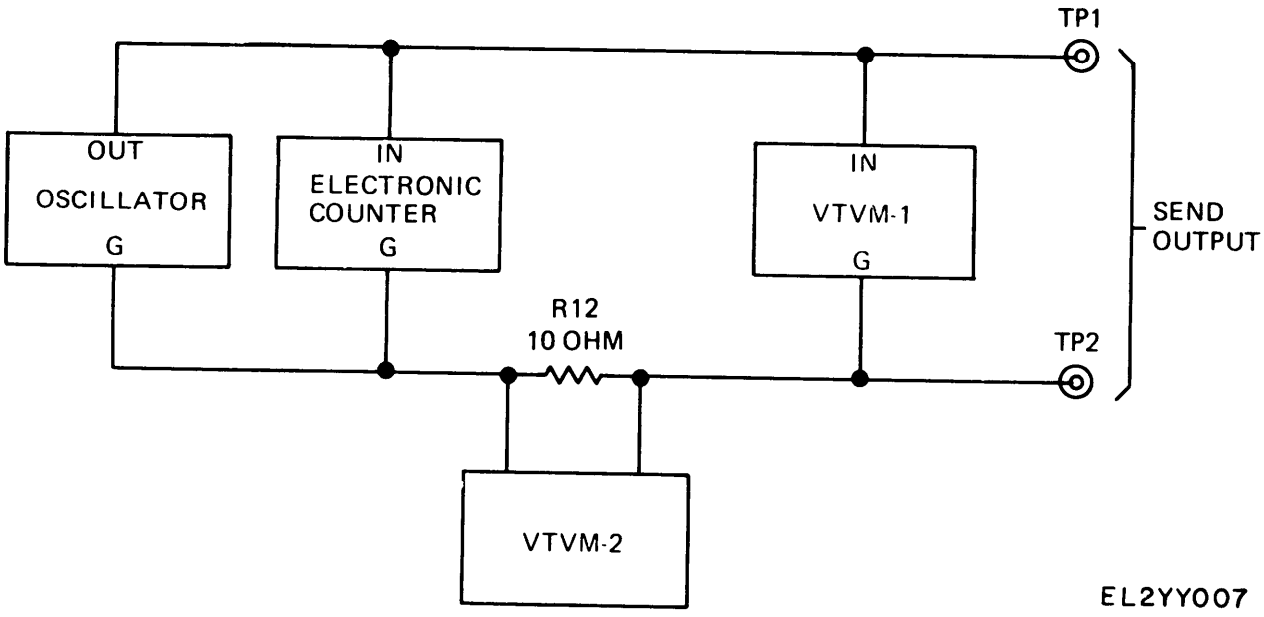

Figure 4-5. Ring circuit, test setup.

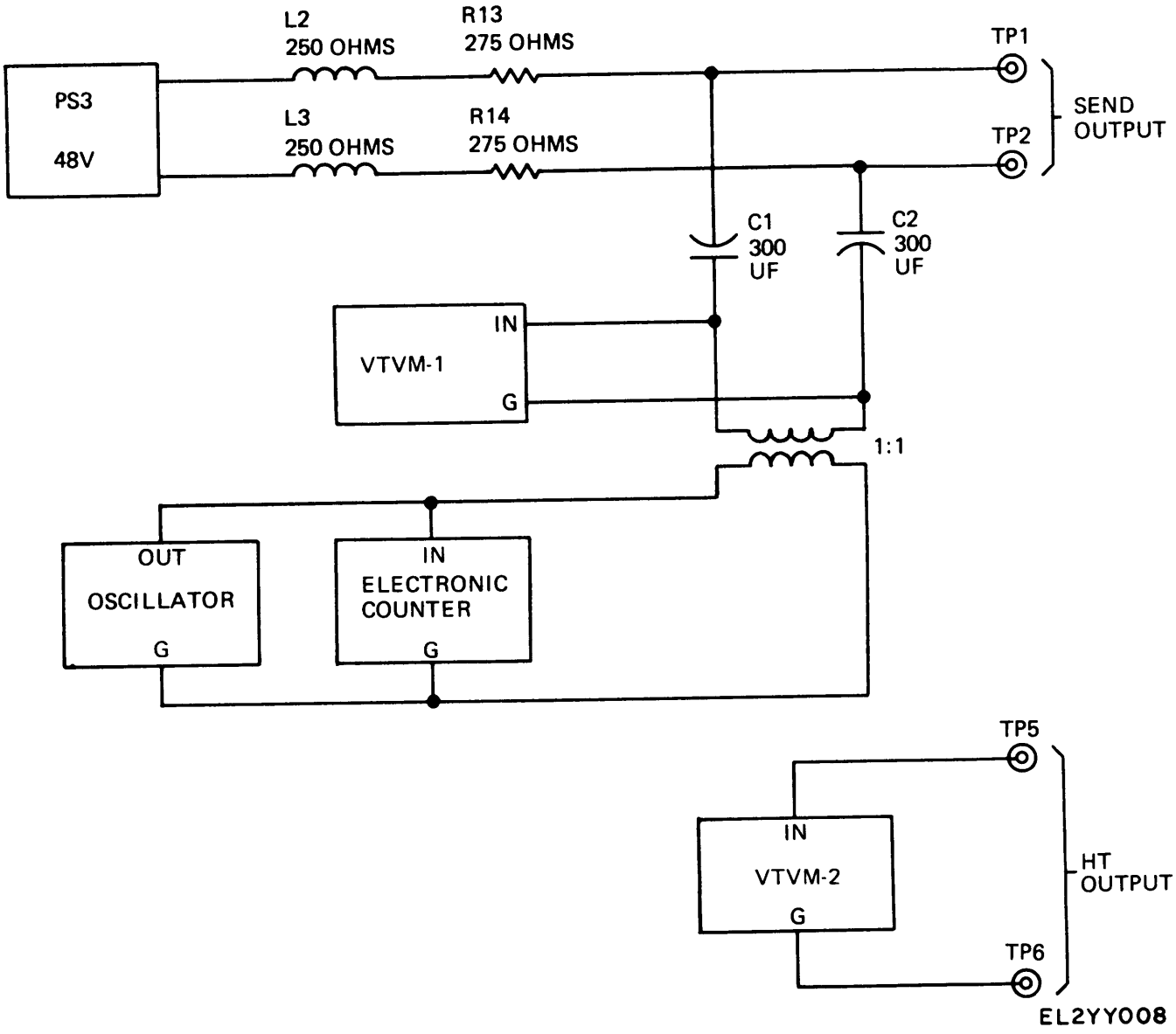

Figure 4-6. Receive circuit, test setup.

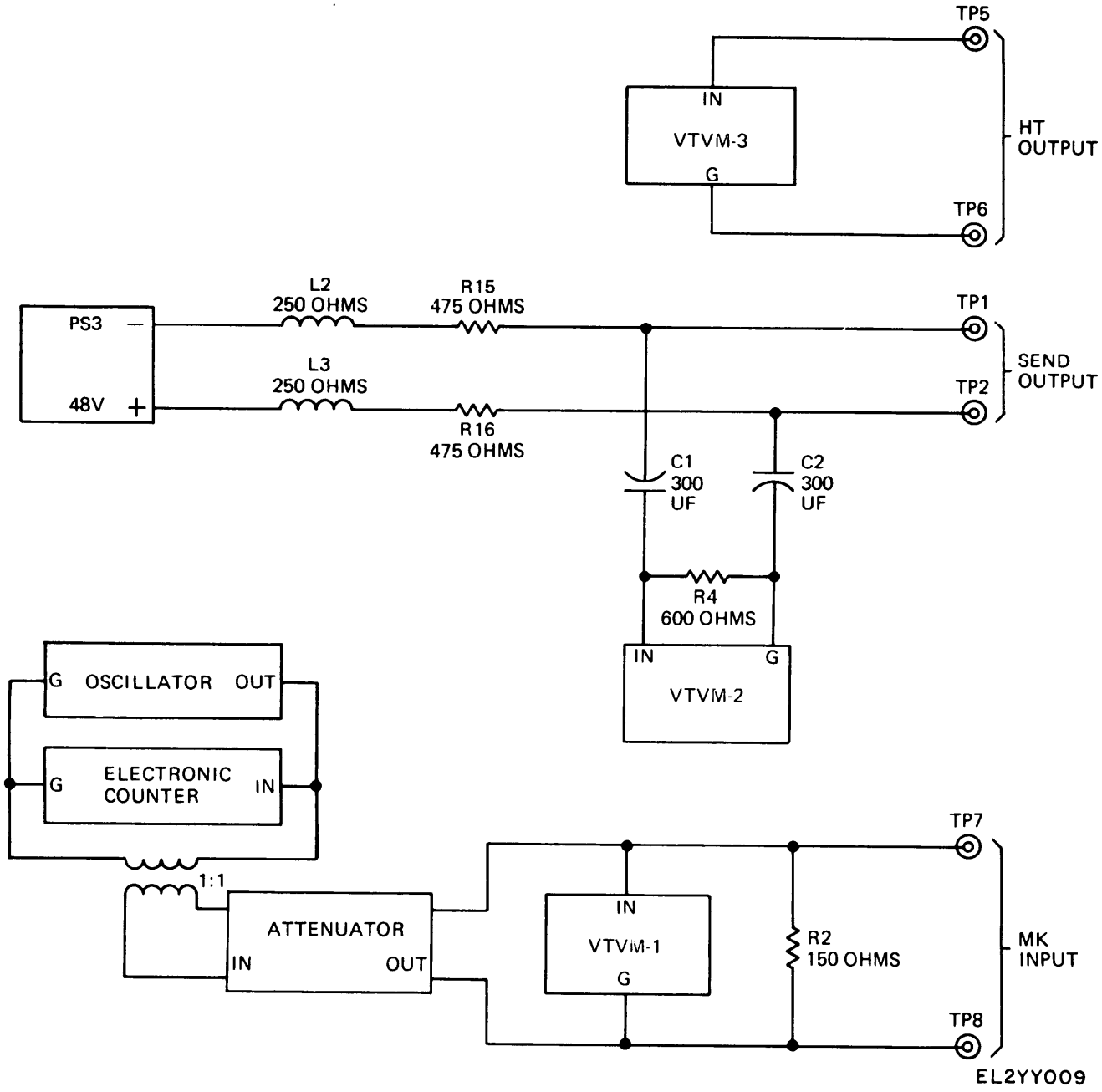

Figure 4-7. Send output, test setup.

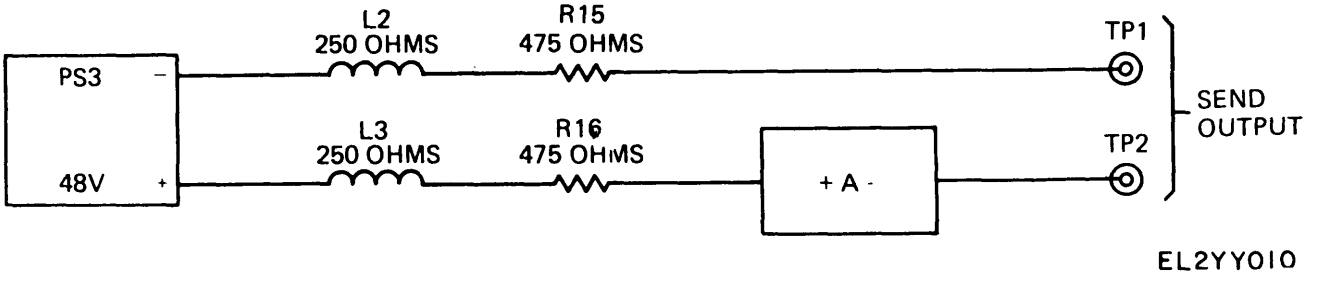

Figure 4-8. Loop resistance, test setup.

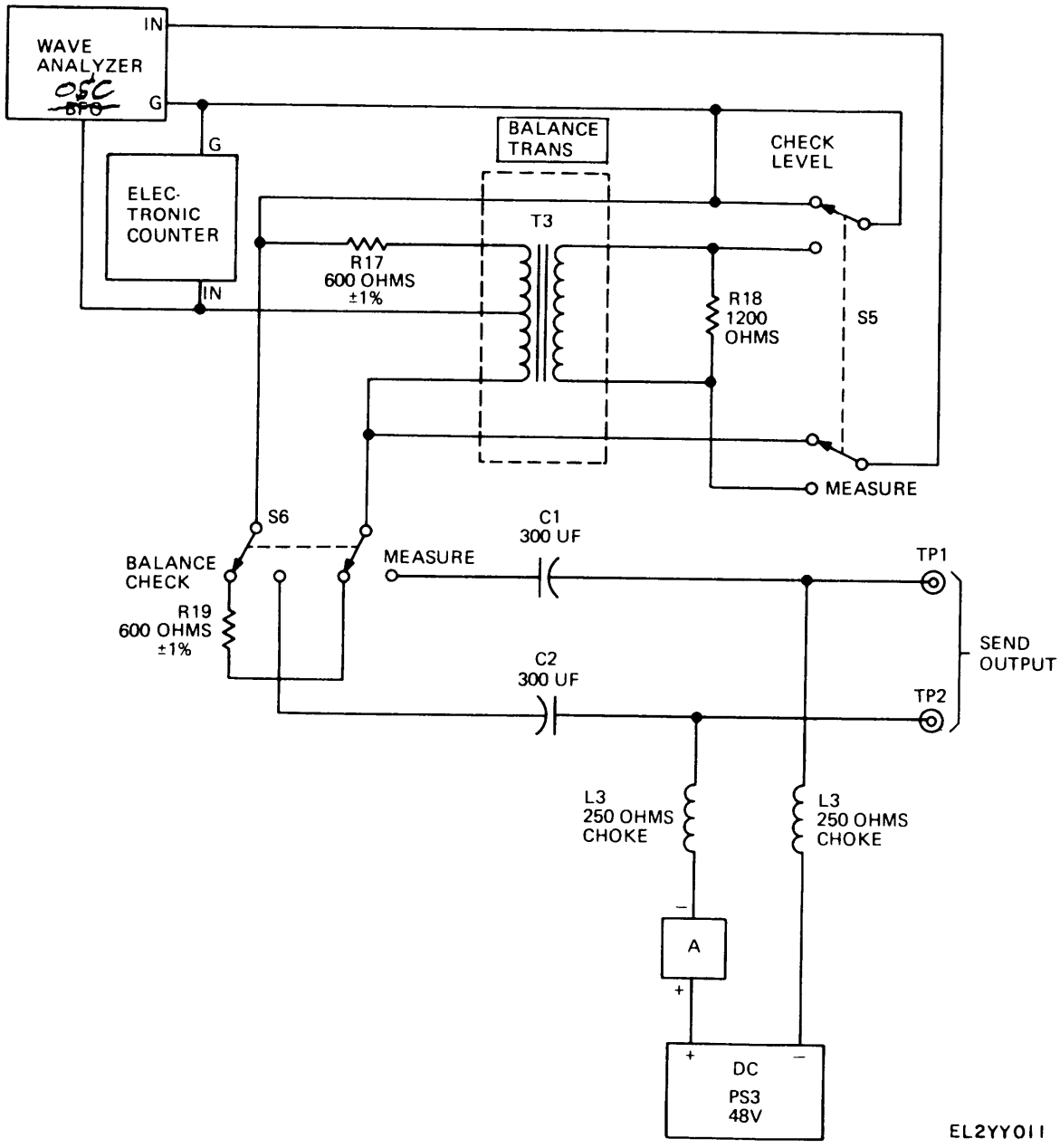

Figure 4-9. Return loss (2-wire) test setup.

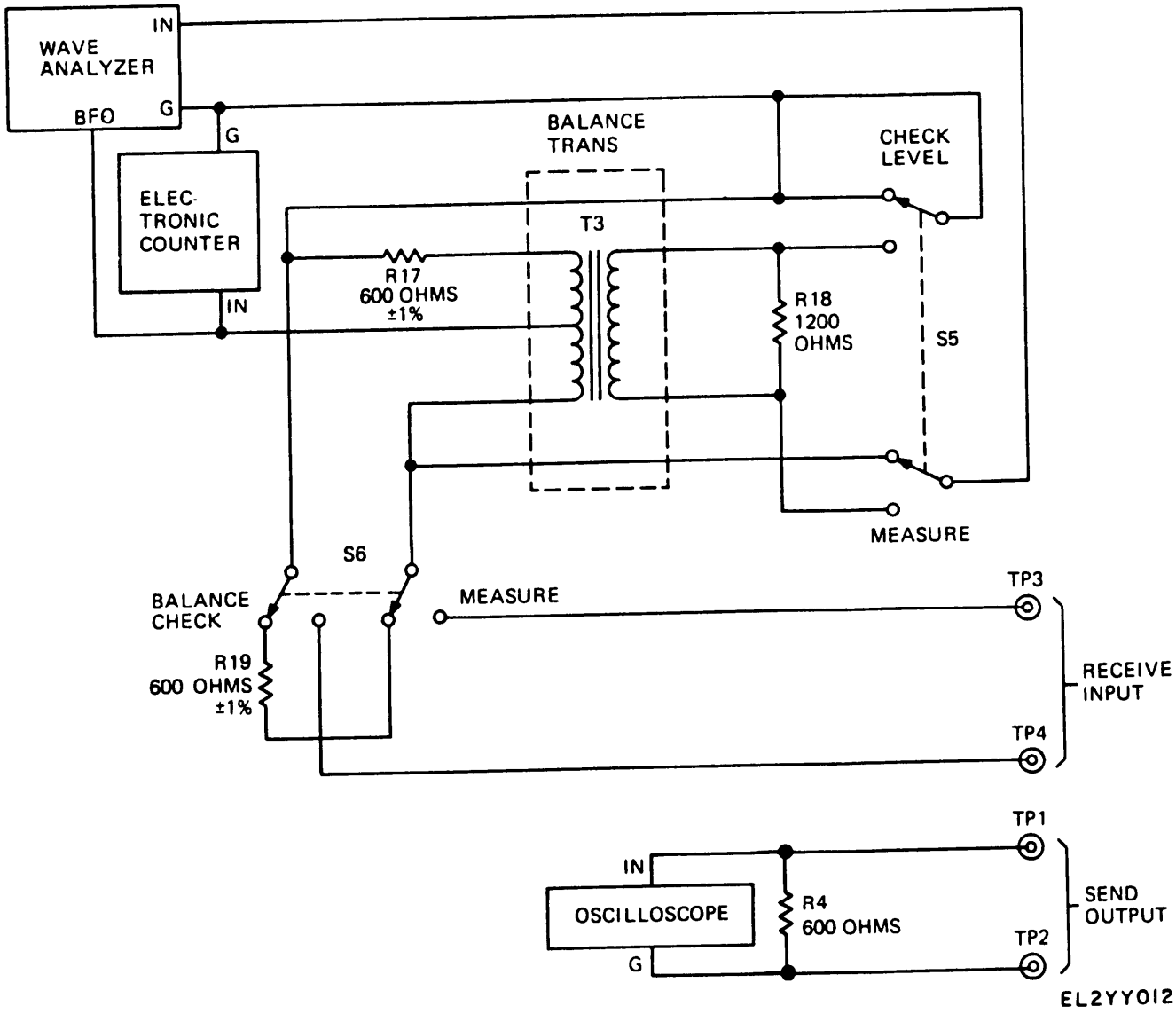

Figure 4-10. Return loss (4-wire) test setup.

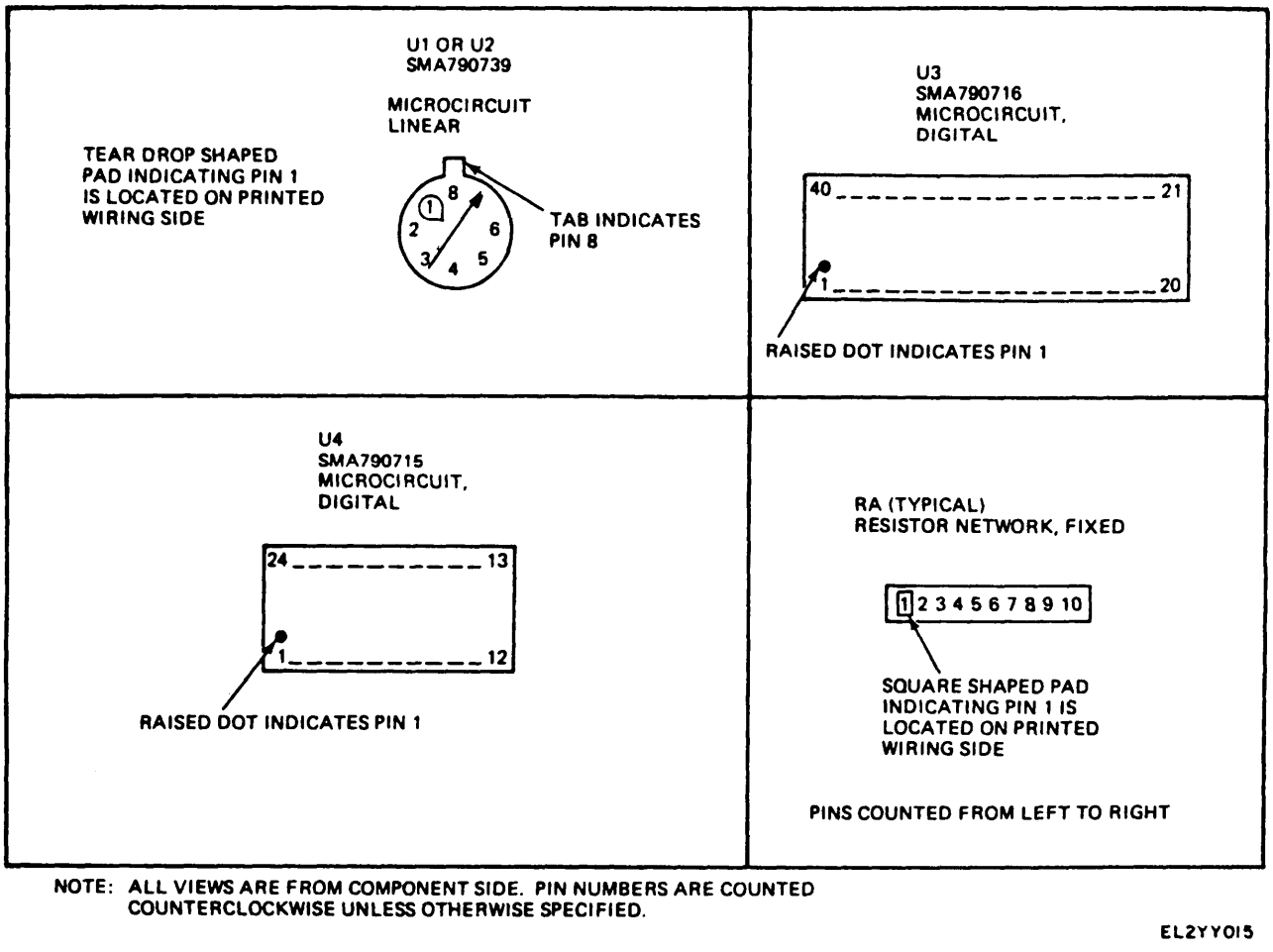

Figure 4-11. Microcircuit pin location for Telephone Set TA-838/TT

Table 4-3. Circuit Card Performance Test

Step No.	Control settings: Test equipment	Control settings: Test fixture	Test procedure	Performance standard
1		*a.* Set S2 (Hookswitch) to "On-Hook" position.	*Seize Signal*	
	b. Turn on PS-1 and adjust for 4.4 vdc as indicated on digital voltmeter.	*c.* Set S1 (Mode Switch) to "4W-AC/LB" position.	*d.* Connect test equipment as shown in figure 4-3.	
	e. Set TSW-1 to position 2, and TSW-2 to position 1. *f.* Set interrupter for STEADY 570HZ operation. *g.* Adjust oscillator and decade attenuator for 555 Hz and 49 mv (-24 dBm) as observed on EC-1 and VTVM-1.	*h.* Set S2 to "Off-Hook" position.		*h.* VTVM-2 indicates -4 dBm, +2, -3 dB; electronic counter EC-2 indicates 2250 Hz ± 29.3 Hz.
2			*Seize Sidetone* *a.* Perform Step 1*a* through *h*.	
	b. Tune wave analyzer for a peak at approximately 2250 Hz.			*b.* Wave analyzer indicates 0.38 mv or less.
3			*Release Signal* *a.* Perform Step 1*a* through *h*.	
	b. Connect oscilloscope across TP1 and TP2.	*c.* Set S2 (Hookswitch) to "On-Hook" position.		*c.* VTVM-2 indicates -4 dBm, +2, -3 dB; electronic counter. EC-2 indicates 2600 Hz ± 33.8 Hz.

NOTE

Step 3*c* must be completed before Release Signal time-out occurs. If time-out occurs before readings can be taken, set S2 to off-hook then on-hook as required to complete readings.

	e. Stop seize by momentarily setting TSW-1 to position 1.	*d.* Set S2 to "Off-Hook" position. *f.* Set S2 to "On-Hook" position.		*f.* Release Signal appears on scope for 3 seconds minimum, 10 seconds maximum.
4			*Extension Control Circuit* *a.* Perform Step 1*a* through *g*.	

Table 4-3. Circuit Card Performance Test—Continued

Step No.	Control settings: Test equipment	Control settings: Test fixture	Test procedure	Performance standard
	b. Connect oscilloscope between TP 1 and TP2.		*b.* Connect 470-ohm resistor R1 between PS-1 (+) and TP1.	
		c. Set S2 to "Off-Hook" position.		*c.* Seize Signal is not present on oscilloscope.
		d. Set S2 to "On-Hook" position.		*d.* Release Signal is not present on oscilloscope.
			e. Remove 470-ohm resistor R1 from TP1.	
		f. Set S2 to "Off-Hook" position.		*f.* Seize Signal is present on oscilloscope.
	g. Momentarily set TSW-1 to position 1.			*g.* Seize Signal is no longer present on oscilloscope.
5			*DTMF Signals* *a.* Perform Step 1*a* through *h*. *b.* Remove wave analyzer from TP 5 and TP6 and replace with VTVM-3. Connect wave analyzer meter input leads across TP1 and TP2. Remove electronic counter EC-2, and connect to wave analyzer OUTPUT connector.	
	c. Momentarily set TSW-1.			
	e. Tune wave analyzer for a peak at ≈ 697 Hz.	*d.* Depress and hold Digit 1.		*e.* Wave analyzer indicates -7 dBm, +2, -3 dB; electronic counter EC-2 indicates 697 Hz ± 9.06 Hz; VTVM-2 indicates -4 dBm; +2, -3 dB; VTVM-3 indicates 2.15 to 6.85 mv.
	g. Tune wave analyzer for a peak at ≈ 770 Hz.	*f.* Depress and hold Digit 4.		*g.* Wave analyzer indicates -7 dBm +2, -3 dB; electronic counter EC-2 indicates 770 Hz ± 10.1 Hz; VTVM-2 indicates -4 dBm, +2, -3 dB.
	i. Tune wave analyzer for a peak at ≈ 852 Hz.	*h.* Depress and hold Digit 7.		*i.* Wave analyzer indicates -7 dBm, +2, -3 dB; electronic counter EC-2 indicates 852 Hz ± 11.1 Hz; VTVM-2 indicates -4 dBm, +2, -3 dB.
	k. Tune wave analyzer for a peak at ≈ 941 Hz.	*j.* Depress and hold Digit R.		*k.* Wave analyzer indicates -7 dBm, +2, -3 dB; electronic counter EC-2 indicates 941 Hz ± 12.2 Hz; VTVM-2 indicates -4 dBm, +2, -3 dB.

Table 4-3. Circuit Card Performance Test—Continued

Step No.	Control settings: Test Equipment	Control settings: Test fixture	Test Procedure	Performance standard
		l. Depress and hold Digit 1.		
	m. Tune wave analyzer for a peak at ≈1209 Hz.			*m.* Wave analyzer indicates -7 dBm, +2, -3 dB; electronic counter EC-2 indicates 1209 Hz ± 15.7 Hz; VTVM-2 indicates -4 dBm, +2, -3 dB.
		n. Depress and hold Digit 2.		
	o. Tune wave analyzer for a peak at ≈1336 Hz.			*o.* Wave analyzer indicates -7 dBm, +2, -3 dB; electronic counter EC-2 indicates 1336 Hz ± 17.4 Hz; VTVM-2 indicates -4 dBm, +2, -3 dB.
		p. Depress and hold Digit 3.		
	q. Tune wave analyzer for a peak at ≈1477 Hz.			*q.* Wave analyzer indicates -7 dBm, +2, -3 dB; electronic counter EC-2 indicates 1477 Hz ± 19.2 Hz; VTVM-2 indicates -4 dBm, +2, -3 dB.
		r. Depress and hold Digit FO.		
	s. Tune wave analyzer for a peak at ≈1633 Hz.			*s.* Wave analyzer indicates -7 dBm, +2, -3 dB; electronic counter EC-2 indicates 1633 Hz ± 21.2 Hz; VTVM-2 indicates -4 dBm, +2, -3 dB.
6			*Receive Circuit Loss* *a.* Perform Step 1*a.* through *h.*, momentarily reset switch TSW-1. *b.* Remove wave analyzer from TP 5 and TP 6 and replace with VTVM-3.	
	c. Set interrupter to STEADY 570 HZ position. Set TSW-1 to position 2. Adjust oscillator for 1000 Hz at -4 dBm as read on EC-1 and VTVM-1. Set TSW-1 to position 1.			*c.* VTVM-3 indicates 173 mv minimum.
7			*Incoming Ring Detector* *a.* Repeat Step 1*a* through *h.*	
		b. Set S2 to "On-Hook" position.		
	c. Set decade attenuator for 50 dB of attenuation. Set interrupter to INTERRUPTED position, and TSW-1 to position 1. Slowly decrease attenuation until a clear audible ring is heard from ringer. Set interrupter to STEADY 570 HZ position.			*c.* VTVM-1 indicates between 29 and 103 mv.
			d. Repeat Step 7*b* and *c* with oscillator set at 585 Hz.	*d.* VTVM-1 indicates between 29 and 103 mv.

Table 4-3. Circuit Card Performance Test—Continued

Step No.	Control settings: Test equipment	Control settings: Test fixture	Test procedure	Performance Standard
	e. Set interrupter to STEADY 570 HZ position. Set TSW-1 to position 2, and TSW-2 to position 2. Adjust oscillator for 500 Hz and 104 mv as indicated on VTVM-1 and EC-1. Set interrupter to "Interrupted" position. Set TSW-1 to position 1. Slowly increase oscillator frequency until audible ring is present.			*e.* Electronic counter EC-1 indicates between 525 and 555 Hz.
	f. Increase oscillator frequency until audible ring is no longer present. Then slowly decrease oscillator frequency until audible ring is present.			*f.* Electronic counter EC-1 indicates between 585 and 615 Hz.
	g. Set interrupter to STEADY 570 HZ position. Set TSW-1 to position 2. Adjust oscillator for 200 Hz and 20.7 mv as indicated on VTVM-1 and EC-1. Set interrupter to "Interrupted" position. Set TSW-1 to position 1. Slowly adjust oscillator frequency from 200 Hz to 3500 Hz.			*g.* Audible and visual ring are not present (DS2 off).
8			*Point-to-Point Operation*	
		a. Set S1 (Mode Switch) to "Point-to-Point" position. Set S2 to "On-Hook" position.		
	b. Turn on PS-1 and adjust for 5.6 vdc as indicated on digital voltmeter.			
			c. Connect test equipment as shown in figure 4-3, except replace the wave analyzer with VTVM-3.	
	d. Connect oscilloscope to TP1 and TP2. Set interupter to STEADY 570 HZ position. Set TSW-1 to position 2, and TSW-2 to position 1. Adjust oscillator for 570 Hz at 194 mv (-12 dBm) as indicated on electronic counter EC-1 and VTVM-1.			
		e. Set S2 to "Off-Hook" position.		*e.* VTVM-2 indicates -4 dBm, +2, -3 dB; electronic counter EC-2 indicates 570 Hz ± 11.4 Hz.

Table 4-3. Circuit Card Performance Test—Continued

Step No	Control settings: Test equipment	Control settings: Test fixture	Test procedure	Performance standard
	NOTE Above ring signal will last for 2 seconds. If all readings are not obtained, set S2 to "On-Hook", then "Off-Hook" as necessary to complete readings.			
		f. Set S2 to "On-Hook" position.		*f.* 2600 Hz Release Signal is not present on osciloscope.
		g. Set S2 to "Off-Hook" position.	*g.* Measure ring duration.	*g.* Release Signal present on oscilloscope for 2 + 1 seconds.
		h. Key one of the digits.		*h.* VTVM -2 indicates -4 dBm, +2, -3 dB; VTVM -3 indicates 2.15 to 6.85 mv
9			*Send Output*	
		a. Set S2 (Hookswitch) to "On-Hook" position.		
	b. Turn on PS-1 and adjust for 5.6 vdc.	*c.* Set S1 (Mode Switch) to "4W-AC/LB" position.		
			d. Connect test equipment as shown in figure 4-3. Perform Step 1*e* through *g*. Connect oscilloscope between TP1 and TP2 and VTVM-3 between TP5 and TP6.	
		e. Set S2 to "Off-Hook" position.		*e.* Seize Signal appears on oscilloscope.
	f. Momentarily set TSW-1 to position 1.			*f.* Seize Signal is no longer present on oscilloscope.
			g. Disconnect all test equipment from terminals TP3 and TP4, and reconnect to TP7 and TP8, respectively.	
	h. Set TSW-1 to position 1. Adjust oscillator for a 5.8 mv, 1000 Hz output as indicated on EC-1 and VTVM-1.			
			i. Set potentiometer R35 on card under test fully clockwise.	*i.* VTVM-2 indicates -3 dBm or greater.
			j. Set potentionmeter R35 on card under test fully counterclockwise.	*j.* VTVM-2 indicates -8 dBm or less.
			k. Adjust R35 for a -6 dBm indication on VTVM-2.	
			l. Adjust oscillator for an indication of -4 dBm on VTVM-2.	*l.* VTVM-3 indicates between 38.5 and 61.5 mv.
	m. Adjust PS-1 to 4.4 vdc.			
	n. While observing oscilloscope, slowing increase oscillator output level until clipping just starts.			*n.* Oscilloscope indicates 1.75 volts peak-to-peak or greater.

Table 4-3. Circuit Card Performance Test—Continued

Step No	Control settings: Test equipment	Control settings: Test fixture	Test procedure	Performance standard
	p. Adjust PS-1 to 6.4 vdc.		*o.* Repeat Step *n* above with PS-1 set to 5 vdc.	*o.* Oscilloscope indicates 1.95 volts peak-to-peak or greater.
	q. While observing oscilloscope, increase oscillator output until absolute limiting occurs. (Absolute limiting is reached when the clipped square wave is at maximum pulse width.)			*q.* Oscilloscope indicates 4.0 volts peak-to-peak or less.
	r. Adjust oscillator for a 0-dBm indication on VTVM-2.			
			s. Remove test equipment connected to TP1 and TP2. Connect distortion analyzer in its place. Measure distortion.	*s.* Distortion analyzer indicates 5% or less.
10			*AC/DC Common Battery*	
			a. Connect test equipment as shown in figure 4-4.	
		b. Set S2 (Hookswitch) to "On-Hook" and S1 (mode switch) to "4W-AC/CB".		
	c. Turn off PS-1 on test fixture and set S4 to position 1. Set interrupter to STEADY 570 HZ position. TSW-1 to position 2, and TSW-2 to position 1. Adjust oscillaotr for 570 ± 10 Hz on electronic counter, -4 dBm on VTVM.			
	d. Turn on PS-2.			*d.* Ammeter (A) indicates 4 ma or less; DVM indicates between 4.4 and 6.4 vdc.
	e. Set S4 to position 2.			*e.* Ammeter (A) indicates 4 ma or less; DVM indicates between 4.4 and 6.4 vdc.
		f. Set S2 to "Off-Hook".		*f.* Ammeter (A) indicates 10 ma or less; DVM indicates between 4.4 and 6.4 vdc.
	g. Set S4 to position 1.			*g.* Ammeter (A) indicates 10 ma or less; DVM indicates between 4.4 and 6.4 vdc.
		h. Set S2 to "On-Hook" and S1 to "4W-DC/CB".		*h.* Ammeter (A) indicates 4 ma or less; DVM indicates between 4.4 and 6.4 vdc.
	i. Set S4 to position 2.			*i.* Ammeter (A) indicates 4 ma or less; DVM indicates between 4.4 and 6.4 vdc.

Table 4-3. Circuit Card Performance Test—Continued

Step No.	Control settings: Test equipment	Control settings: Test fixture	Test procedure	Performance standard
		j. Set S2 to "Off-Hook".		*j.* Ammeter (A) indicates between 10.5 and 22 ma; DVM indicates between 4.4 and 6.4 vdc.
	k. Set S4 to position 1.			*k* Ammeter (A) indicates between 10.5 and 22 ma; DVM indicates between 4.4 and 6.4 vdc.
		l. Set S2 to "On-Hook".		
	m. Set interrupter to INTERRUPTED and TSW-1 to position 1 to apply modulated ring.			*m.* Audible and visual rings are present; ammeter (A) indicates approximately 5.5 ma. maximum.
	n. Set interrupter to STEADY 570 HZ to remove modulated ring.			*n.* Audible and visual rings are no longer present.
		o. Set S1 to "4W-DC/LB".		
	p. Turn on PS-1.	*q.* Set S2 to "Off-hook".		*q.* Ammeter (A) indicates between 9 and 22 ma.
11			*2-Wire Operation* *a.* Connect test equipment as shown in figure 4-5.	
	b. Insure that PS-1 and PS-2 are turned off.	*c.* Set S2 to "On-Hook" and S1 to "2W-DC/CB".		
	d. Turn on oscillator and, with low output, adjust for 20 Hz as indicated on electronic counter. Remove counter from test setup. Adjust oscillator output level for 60 vdc as indicated on VTVM-1.			*d.* Audible ring is present and VTVM-2 indicates 95 mv or less.
			e. Disconnect test equipment and reconnect as shown in figure 4-6.	
	f. Turn on PS-3.	*g.* Set S2 to "Off-Hook".		
	h. Adjust oscillator for an output of -4 dBm at 1000 Hz as indicated on VTVM-1 and electronic counter.			*h.* VTVM-2 indicates 164 mv or greater.
			i. Disconnect test equipment and reconnect as shown in figure 4-7.	
		j. Set S2 to "On-Hook" and S1 to "2W-DC/LB".		
	k. Turn on and adjust PS-1 for an output of 5.6 vdc. Turn on and adjust PS-3 for an output of 48 vdc.			
		l. Set S2 to "Off-Hook".		

Table 4-3. Circuit Card Performance Test—Continued

Step No.	Control settings: Test equipment	Control settings: Test fixture	Test procedure	Performance standard
	m. Adjust oscillator for an output of 5.8 mv, 1000 Hz as indicated on VTVM-1 and electronic counter.			*m.* VTVM-2 indicates -6 dBm ± 2 dB.
			n. Disconnect oscillator.	
		o. Key any digit on the test fixture.		*o.* VTVM-2 indicates -4 dBm, +2, -3 dB.
			p. Reconnect oscillator.	
	q. Turn off PS-1.	*q.* Set S2 to "On-Hook" and S1 to "2W-DC/CB". Then set S2 to "Off-Hook".		
	r. Adjust oscillator for a -4 dBm output indication at VTVM-2.			*r.* VTVM-3 indicates between 34.9 and 69.3 mv.
			s. Disconnect test equipment and reconnect as shown in figure 4-8.	
	t. Turn on and adjust PS-3 for an output of 48 vdc.	*t.* Set S2 to "On-Hook", set S1 to "2W-DC/LB", then reset S2 to "Off-Hook".		*t.* Ammeter (A) indicates 30 ma or greater.
	v. Turn off PS-3.	*u.* Set S2 to "On-Hook".		
		w. Set S1 to "2W-DC/CB."		
			x. Connect test equipment as shown in figure 4-9.	
	y. Turn on PS-3 and adjust for an output of 48 vdc.	*y.* Set S2 to "Off-Hook".		
	z. Set S5 to "Check Level", S6 to "Balance Check" and adjust wave analyzer for a -4 dBm output at 300 Hz.			
	aa. Set S5 and S6 to "Measure".			*aa.* Wave analyzer indicates -16 dBm or less.
			ab. Repeat steps *z* and *aa* above with the wave analyzer at 1000 Hz.	*ab.* Wave analyzer indicates -23 dBm or less.
			ac. Repeat steps *z* and *aa* above with the wave analyzer at 3500 Hz.	*ac.* Wave analyzer indicates -18 dBm or less.
		ad. Set S2 to "On-Hook".		
	ae. Turn off PS-3.			
			af. Connect test equipment as shown in figure 4-10.	
		ag. Set S1 to "4W-AC/LB".		
	ah. Turn on PS-1 and adjust to 5.6 vdc.	*ai.* Set S2 to "Off-Hook".		*ai.* Observe seize signal is present on scope.
	aj. Set S5 to "Check Level", S6 to "Balance Check" and adjust wave analyzer for a -4 dBm output at 570 Hz.			

Table 4-3. Circuit Card Performance Test—Continued

Step No	Control settings: Test equipment	Control settings: Test fixture	Test procedure	Performance standard
	ak. Set S5 and S6 to "Measure" position. *al.* Set S5 to "Check Level" and S6 to "Balance Check". Set wave analyzer to 300 Hz at -4 dBm. *am.* Set S5 and S6 to "Measure" position.		*an.* Repeat steps *al* and *am* above at 1000 Hz. *ao.* Repeat steps *al* and *am* above at 3500 Hz. *ap.* Interchange the test connections to TP1 and TP2 with those to TP3 and TP4. Repeat steps *al* through *ao* above.	*ak.* Seize signal ceases. *am.* Wave analyzer indicates -18 dB or less. *an.* Wave analyzer indicates -24 dB or less. *ao.* Wave analyzer indicates -18 dB or less. *ap.* Wave analyzer indicates -18 dB or less.

4-13. Circuit Card Troubleshooting for Telephone Set TA-838/TT

After verification of a malfunction by performance of the tests given in table 4-3, perform the appropriate fault isolation procedure in table 4-4 (identified by the same step number as the step of table 4-3 in which failure was noted). Upon isolation of the malfunction to a small group of components, use standard techniques to determine the individual faulty component. Paragraph 4-14 provides procedures for removal of components for testing. Several of the standard troubleshooting procedures are given in paragraph 4-15. These procedures are not recommended for troubleshooting as a general rule, but sometimes it is difficult to isolate troubles to a particular component. In such cases, it may be necessary to remove the suspected component and test it. DO NOT remove components for testing without some indication that the particular component is at fault.

NOTE

To make measurements on the printed circuit board, removal of the conformal coating at the point of measurement is required. This may be accomplished by scraping the area well with a sharp knife.

Table 4-4. Circuit Card Troubleshooting for Telephone Set TA-838/TT

Step No.	Procedure	Required results	Correction action if results are	
			Correct	Incorrect
1	With the card connected and stimulated as described in step 1 (Seize Signal) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. With a dc voltmeter, measure the voltage between pins 18 and 36 of test connector J1.	+4.4 vdc ±10%	Go to step 1*b*.	Replace VR2, C2, C3, C12 or C25. (Standard methods of testing can determine which component has malfunctioned.)
	NOTE Pin 36 will be the low (Return) point for all measurements unless otherwise specified.			
	b. With the dc voltmeter, measure the voltage at pin 12 of U3.	0 ±0.1 vdc	Go to step 1*e*.	Go to step 1*c*.
	c. Measure the dc voltage at the base of transistor Q4.	Less than 0.75 vdc but more than 0.4 vdc	Replace Q4.	Go to step 1*d*.
	d. Measure the dc voltage at the junction of CR 2 and CR5.	4.0 vdc ± 10%	Replace C6 or RA5.	Replace CR2 or CR5.
	e. Measure the dc voltages at terminals 6, 7, 9 and 10 of U3.	4.4. vdc ±10%	Go to step 1*f*.	Replace RA10.
	f. Measure the dc voltage at pin 34 of U3.	0 ±0.1 vdc	Go to step 1*g*.	Replace U3.
	g. With an oscilloscope, observe waveform at pin 18 of U3.	295 kHz	Go to step 1*h*.	Replace Y1, C28, C29, R102, R103, or U3.
	h. Measure the dc voltage at the emitter of Q3.	≈2.25 vdc ±10%	Go to step 1*m*.	Go to step 1*i*.
	i. Measure the dc voltage at pin 28 of U3.	4.4 vdc ±10%	Go to step 1*j*.	Replace U3.
	j. Measure the dc voltage at the junction of CR1 and RA14 pin 5.	4.0 vdc ±10%	Go to step 1*k*.	Replace CR1 or RA14.
	k. Measure the dc voltage at the collector of Q1.	2.7 vdc ±10%	Go to step 1*l*	Replace VR1, Q1 or Q2.
	l. Measure the dc voltage at the collector of Q3.	4.4 vdc ±10%	Replace Q3 or C5.	Replace RA14.
	m. With a frequency counter, measure the signal at pin 4 of RA17.	2234.8 Hz ±10%	To to step 1*n*.	Replace U4 or RA17.
	n. Measure the dc voltage at the collector of Q11.	0 ±0.1 vdc	Go to step 1*o*.	Go to step 1*p*.
	o. Measure the ac voltage at the junction of C15 and C18.	68.5 ±2 mv	Replace C15 or RA3.	Replace C18 or RA6.
	p. Measure the dc voltage at pin 26 of U3.	0 ±0.1 vdc	Replace Q11 or RA2.	Replace U3.
	q. With frequency counter, measure the signal at pin 1 of A1.	2234.8 Hz ±10%	Replace T1.	Replace A1.

Table 4-4. Circuit Card Troubleshooting for Telephone Set TA-838/TT — Continued

Step No.	Procedure	Required results	Corrective action if results are: Correct	Corrective action if results are: Incorrect
2	With the card connected and stimulated as described in step 2 (Seize Sidetone) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. With frequency counter, measure the signal at the junction of RA4 pin 3, RA1 pin 8, and C26.	2234.8 Hz ±10%	Go to step 2*b*.	Replace T1.
	b. Measure the dc voltage at the collector of Q6.	0 ±0.1 vdc	Go to step 2*e*.	Go to step 2*c*.
	c. Measure the dc voltage at the base of Q6.	0 ±1 vdc	Replace Q6, RA4, RA1, C26.	Go to step 2*d*.
	d. Measure the dc voltage at pin 25 of U3.	0 ±1 vdc	Replace RA2.	Replace U3.
	e. Measure the dc voltage at pin 8 of U1.	4.4 vdc ±10%	Go to step 2*f*.	Replace RA9 or U3.
	f. Measure the dc voltage at pin 3 of U1.	2.25 vdc± 10%	Go to step 2*g*.	Replace RA4, RA9, CR7, CR6, CR3, CR4, C9 or U1.
	g. Measure the ac voltage at pin 6 of U1.	Less than 0.38 mvac	Replace C1	Replace U1, RA9, C11 or L1.
3	With the card connected and stimulated as described in step 3 (Release Signal) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. Measure the dc voltage at the base of Q5.	0 ±0.1 vdc	Go to step 3*b*.	Replace RA5 or C7.
	b. Measure the dc voltage at the collector of Q5.	4.4 vdc ±10%	Go to step 3*c*.	Replace Q5 or RA10.
	c. During Release signal measure the dc voltage at pin 35 of U3.	0 ±0.1 vdc	Replace U4 or RA17.	Replace U3.
4	With the card connected and stimulated as described in steps 4*a* thru 4*c* (Extension Control) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. Measure the dc voltage at the + side of C6.	+2.25 vdc ±10%	Go to step 4*b*.	Replace RA5 or CR5.
	b. Measure the dc voltage at the base of Q4.	+0.67 vdc ±10%	Go to step 4*c*.	Replace RA5 or C6.
	c. Measure the dc voltage at pin 12 of U3.	0 ±0.1 vdc	Replace U3.	Replace Q4.
5	With card and test equipment connected as described in step 5 (DTMF Signals) of the Circuit Card Test Procedure, (table 4-3), perform the following:			
	a. Turn off PS-1 and remove card from test fixture. Using multimeter, check continuity between the following pins: *From* — *To* U3-34 — U4-23 U3-35 — U4-22 U3-36 — U4-02 U3-21 — U4-13 U3-31 — U4-01 J1-40 — U3-17 J1-42 — U3-13 J1-42 — U4-20 J1-23 — U3-14 J1-23 — U4-21 J1-41 — U3-15 J1-22 — U3-16 J1-28 — U4-03 J1-47 — U4-04 J1-46 — U4-05	Continuity	Go to step 5*b*.	Repair printed wiring track.
	b. Reconnect the card, turn on PS-1, and stimulate the card as described in step 5 of table 4-3.	None		

Table 4-4. Circuit Card Troubleshooting for Telephone Set TA-838/TT — Continued

Step No.	Procedure	Required results	Corrective action if results are: Correct	Corrective action if results are: Incorrect
	c. Using oscilloscope, check for proper U3 and U4 pin voltages as indicated in table 4-4.2 for no digits pressed.	See table 4-4A.	Go to step 5*d*.	Replace RA11, RA1, U4, U3 in sequence until trouble is corrected.
	d. Depress and hold Digit 1, using wave analyzer, measure the frequency and voltage at the following junction points: (1) C14 and C16 for low frequency (2) C15 and C18 for high frequency	(1) 70 mvac ±10% at 697 Hz ±5% (2) 80 mvac ±10% at 1209 Hz ±5%	Go to step 5*f*.	If either or both readings are incorrect, go to step 5*e*.
	e. With Digit 1 depressed, check for proper U3 and U4 pin voltages as indicated in table 4-4.2 for Digit 1.	See table 4-4A.	Replace RA13 or RA17 for low or high frequency failure, respectively.	Replace U4. If trouble is not corrected, replace U3.
	f. Perform step 5*d*(1) and (2) using Digit 5.	(1) 70 mvac ±10% at 770 Hz ±5% (2) 80 mvac ±10% at 1336 Hz ±5%	Go to step 5*g*.	Perform step 5*e* except use Digit 5.
	g. Perform step 5*d*(1) and (2) using Digit 9.	(1) 70 mvac ±10% at 852 Hz±5% (2) 80 mvac ±10% at 1477 Hz±5%	Go to step 5*h*.	Perform step 5*e* except use Digit 9.
	h. Perform step 5*d*(1) and (2) using Digit P.	(1) 70 mvac± 10% at 941 Hz ±5% (2) 80 mvac ±10% at 1633 Hz ±5%	Go to step 5*i*.	Perform step 5*e* except use Digit P.
	i. With wave analyzer connected to Send Output (TP1 and TP2), depress Digit 1 and tune wave analyzer for 697 Hz. Observe level.	-7 dBm at 697 Hz	Go to step 5*j*.	Go to step 5*k*.
	j. Tune wave analyzer for 1209 Hz and observe level.	-7 dBm at 1209 Hz	DTMF circuit functioning properly. Repeat test procedure in table 4-3, step 5.	Go to step 5*k*.
	k. Using oscilloscope, check signal at pin 1 of A1.	697/1209 Hz	Replace T1.	Go to step 5*l*
	l. Check signal at pin 3 of A1.	697/1209 Hz	Replace A1.	Replace RA3.
6	With the card connected and stimulated as described in step 6 (Receive Circuit Loss) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. Measure the audio signal across C4.	-4.95 dBm± 1dB.	Go to step 6*b*.	Replace T2 or C4.
	b. Measure the dc voltage at the + side of C9.	+2.25 vdc ±5%	Go to step 6*c*.	If voltage is high, replace RA4. If voltage is low, replace RA9 or C9.
	c. Measure the ac voltage at pin 6 of U1.	Greater than 173 mvac	Replace C1.	Replace U1 or RA9.
7	With the card connected and stimulated as described in step 7 (Ring Detector) of the Circuit Card Test Procedure (table 4-3), perform the following: (If ring signal is correct but LED indicator remains off, go to step 7*m*.)			
	a. Observe signal at pin 1 of U3 with oscilloscope.	0 to 4.4v square wave	Go to step 7*e*.	Go to step 7*b*.
	b. Measure the dc voltage at pin 8 of U2.	3.5 vdc ±5%	Go to step 7*c*.	Replace RA4.
	c. Measure the dc voltage at pin 3 of U2.	2.25 vdc ±10%	Go to step 7*d*.	Replace RA4.
	d. Measure the dc voltage at pin 2 of U2.	2.25 vdc ±10%	Replace U2 or C8.	Replace RA9.
	e. Using oscilloscope, observe signal at pin 32 of U3.	4.4v ±10% square wave	Go to step 7*f*.	Replace U3.
	f. Observe signal at pin 33 of U3.	0 to 4.4v Square Wave	Go to step 7*g*.	Replace U3.
	g. Observe signal at the base of Q24.	0.6V ±5% Square Wave	Go to step 7*h*.	Replace Q20, RA7, or CR14.

Table 4-4. Circuit Card Troubleshooting for Telephone Set TA-838/TT — Continued

Step No.	Procedure	Required results	Corrective action if results are: Correct	Corrective action if results are: Incorrect
	h. Observe signal at the collector of Q24.	3.5V ±5% Square Wave	Go to step 7*i*.	Replace Q24 or CR17.
	i. Observe signal at the collector of Q22.	0 to 4.4V Square Wave	Go to step 7*j*.	Replace Q22 or RA8.
	j. Observe the signal at the base of Q25.	3.5 ±5% Square Wave	Go to step 7*k*.	Replace Q21 or RA8.
	k. Using oscilloscope, observe amplitude of the square wave at the collector of Q25.	0 ±0.5 vdc low level; 4.4 vdc ±10% high level	Go to step 7*l*.	If high level is incorrect, replace Q25. If low level is incorrect, replace Q18 or RA7.
	l. Observe signal at pin 7 of J1.	4.0V ±5% peak-to-peak	Replace Q19, Q26 or RA8.	Replace CR12 or C24.
	m. Observe signal at the base of Q23.	+4.0V ±5% Square Wave	Replace Q23 or RA8.	Replace CR13, CR15, CR16 or RA8.
8	With the card connected and stimulated as described in step 8 (Point to Point Operation) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. Measure the dc voltage at pin 8 of U3.	5.6 vdc ±10%	Go to step 8*b*.	Replace RA10.
	b. While sending 570 Hz measure the dc voltage at pin 36 of U3.	0 ±0.1 vdc	Replace U4.	Replace U3.
9	With the card connected and stimulated as described in steps 9*a*-9*h* (Send Output) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. Measure the dc voltage at pin 30 of U3.	0 ±0.1 vdc	Go to step 9*b*.	Replace U3.
	b. With an oscilloscope, observe a 1000 Hz signal at the collector of Q9.	Signal present	Go to step 9*c*.	Replace R10, C13 or Q9.
	c. Measure the dc voltage at the collector of Q10.	0 ±0.1 vdc	Go to step 9*d*.	Go to step 9*f*.
	d. With oscilloscope, observe 1000 Hz signal at R35, pin 1.	Signal present.	Go to step 9*e*.	Replace R34.
	e. Turn off PS-1. Using multimeter, measure resistance across R35.	1K to 20K	Replace A1.	Replace R35.
	f. Turn on PS-1 and measure the dc voltage at the base of Q10.	0.66 ± 0.1 vdc	Replace Q10 or L2.	Go to step 9*g*.
	g. Measure the dc voltage at the base of Q8.	1.29 ± 0.1 vdc	Replace Q8 or RA6.	Go to step 9*h*.
	h. Measure the dc voltage at pin 29 of U3.	5.6 vdc± 10%	Replace RA2.	Replace U3.
10	With the card connected and stimulated as described in steps 10*a* thru 10*e* except when off-hook (AC/DC Common Battery) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. Measure the dc voltage across C22.	+22 vdc ±10%	Go to step 10*b*.	Replace VR4 or C22.
	b. Measure the dc voltage at the + side of VR-3.	+4.7 vdc± 5%	Go to step 10*c*.	Replace VR3, C19 or CR9.
	c. Measure the dc voltage at the emitter of Q12.	+0.5 vdc ±10%	Go to step 10*d*.	Replace CR9, RA12 or C19.
	d. Measure the dc voltage at the collector of Q12.	-17.3 vdc ±10%	Go to step 10*e*.	Replace Q12 or RA12.
	e. Measure the dc voltage at the base of Q13.	-0.07 vdc± 10%	Go to step 10*f*.	Replace RA12, C20 or C23.
	f. Measure the dc voltage at the base of Q16.	-17.3 vdc± 10%	Go to step 10*g*.	Replace Q13 or RA15.
	g. Measure the dc voltage at the base of Q17.	-18.7 vdc± 10%	Go to step 10*h*.	Replace Q16, RA15 or C21.
	h. Measure the dc voltage at the collector of Q16.	-17.9 vdc± 10%	Go to step 10*i*.	Replace RA15 or C21.
	i. Measure the dc voltage at the collector of Q17.	0 ± 0.25 vdc- ±10%	Go to step 10*j*.	Replace Q17, CR8 or L3.
	j. Set S1 to 4W-DC/CB and go off-hook.		Go to step 10*k*.	

Table 4-4. Circuit Card Troubleshooting for Telephone Set TA-838/TT — Continued

Step No	Procedure	Required results	Corrective action if results are: Correct	Corrective action if results are: Incorrect
	k. Measure the dc voltage at the emitter of Q14.	0.81 vdc ±10%	Go to step 10*l*.	Replace RA12.
	l. Measure the dc voltage at the base Q14.	+0.19 vdc ±10%	Go to step 10*m*.	Replace RA15, C17, or R45.
	m. Measure the dc voltage at the collector of Q15.	+12.7 vdc ±10%	Go to step 10*n*.	Replace Q14 or Q15.
	n. Measure the dc voltage at the base of Q15.	-12.0 vdc±10%	Go to step 10*o*.	Replace RA15.
	o. Measure the dc voltage at the junction of CR10 and CR11.	-13.4 vdc±10%	Replace CR11.	Replace CR10.
11	With the card connected and stimulated as described in steps 11*e*. thru 11*h*. (2-Wire Operation) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. Measure the dc voltage at the junction of CR18 and CR19.	-0.72 vdc±10%	Go to step 11*b*.	Replace C27, CR18 or CR19.
	b. Measure the dc voltage at the junction of CR20 and CR21.	+13 vdc ±10%	Go to step 11*c*.	Replace CR20 or CR21.
	c. Measure the dc voltage at the + side of C31.	+12.4 vdc ±10%	Go to step 11*d*.	Replace C31, C32 or VR6.
	d. Measure the dc voltage at the base of Q27.	+6.3 vdc ±10%	Go to step 11*e*.	Replace CR23, Q27, or VR5.
	e. Measure the dc voltage at the base of Q29.	+0.75 vdc ±10%	Go to step 12.	Replace Q29, RA16, CR23 or VR5.
12	With card connected and stimulated as described in steps 11*a* thru 11*d* (2-Wire Operation) of the Circuit Card Test Procedure (table 4-3), perform the following:			
	a. Measure the ac voltage at the junction of R105 and C30.	47.5 vac ±10%	Go to step 12*b*.	Replace R104 or R105.
	b. Measure the ac voltage at the junction of C30 and CR26.	42.5 vac ±10%	Go to step 12*c*.	Replace C30 or RA16.
	c. With an oscilloscope, observe the waveshape at the junction of CR24 and CR25.	+1.2V high level; -0.6V low level	Go to step 12*d*.	If waveshape is not present, replace R114. If high level is incorrect, replace CR22 or CR25. If low level is incorrect, replace CR24.
	d. Measure the acvoltage at the junction of CR26 and pin 8 of RA16.	+20.0 vac ±10%	Go to step 12*e*.	Replace CR26.
	e. Measure the dc voltage at the + side of C33.	+1.6 vac ±10%	Go to step 12*f*.	Replace RA16 or C33.
	f. Measure the dc voltage at the base of Q30.	+0.6 vdc ±10%	Go to step 12*g*.	Replace CR27, CR28 or RA16.
	g. Measure the dc voltage at the collector of Q30.	0 ±0.1 vdc	Go to step 12*h*.	Replace Q30.
	h. With an oscilloscope, observe the waveshape at the collector of Q28.	0 to +5.6V square wave	Replace U3.	Replace RA16, Q28 or RA11.

4-13.1 Circuit Card Troubleshooting for Telephone Set TA-838A/TT

After verification of a malfunction by performance of the test given in table 4-3, perform the appropriate fault isolation procedure in table 4-4.1. Upon isolation of the malfunction to a small group of components, use standard techniques to determine the individual faulty component. Paragraph 4-14 provides procedures for component removal. Several of the standard troubleshooting procedures are given in paragraph 4-15. Do not remove components for testing without some indication that the particular component is at fault.

Table 4-4.1 Circuit Card Troubleshooting for Telephone Set TA-838A/TT

Note 1. All measurements below to be taken between J2/9 (Ground) and the identified test points.
Note 2. Corrective actions must be performed one at a time in the order presented. After each action, the procedure must be repeated. When the required result is achieved, no further action is required.

Step	Procedure	Required results	Correction action if results are	
			Correct	Incorrect
1.	SEIZE SIGNAL Go off-hook and set PS1 to 4.4v. Perform the following:			
	a. With a DC voltmeter, measure the voltage between J2/3 and J2/9.	+4.4v±10%	Go to step 1b.	Disconnect J1, clean connector pins and reconnect it, or replace C46.
	b. With a DC voltmeter, measure J2/20.	+3.6v±10	Go to step 1. d	Go to step 1.c
	c. With a DC voltmeter, measure J1/33.	0v+0.2v	Replace U10	Clean connector J1.
	d. With a scope, observe J2/23	Square wave 0-3.6v 2250Hz	Go to step 1e.	Replace U8, U6, U7, U4, Q7, Q6, Q8 or U1.
	e. With a scope, observe J2/8.	Square wave 0-3.6v 2250Hz	Go to step 1f.	Replace U9. U12 or U5.
	f. With a DC voltmeter, measure J2/7.	0v+0.2v	Go to step 1g.	Replace U3 or Q12.
	g. With a scope, observe J2/19.	Sine wave 2250Hz 1.3v PP ± 10%	Go to step 1h.	Replace U17 or its surrounding components.
	h. With a scope, observe J2/6. Expect some ringing in the observed sine wave.	Sine wave 2250Hz 1.8vpp±10%	Replace R18, C33 or R7.	Replace the send amplifier.
2.	SEIZE SIDE TONE Go off-hook and set PS1 to 4.4v. Perform the following:			
	With a DC voltmeter, measure J2/5.	+4.4v±10%	Replace L1, C22, C23 or the receive amplifier.	Replace U3, Q11 or RA4.
3.	RELEASE SIGNAL Go on-hook and set PS1 to 4.4v. Perform the following:			
	a. With a DC voltmeter, measure J2/20.	0v+0.2v	Go to step 3c.	Go to step 3b.
	b. With a DC voltmeter, measure J1/33.	3.6v±10%	Repalce U10.	Clean J1 or replace C3.
	c. With a scope on J2/23 go on-hook, then off-hook and observe square wave during approximately first six seconds.	Square wave 0-3.6v 2600Hz.	Replace U17.	Replace U1.
4.	EXTENSION CONTROL Go on-hook and set PS1 to 4.4v. Perform the following:			
	a. With a DC voltmeter, measure J2/1.	3.6v±10%	Replace U1.	Go to step 4b.
	b. Go off-hook and with a DC voltmeter measure J1/5.	+2.0v Min.	Replace Q7, RA1 or D2.	Clean J1.
5.	DTMF SIGNALS Set MODE SELECT switch to PT-PT. Go off-hook and set PS1 to 4.4v. Perform the following:			
	a. With a scope, observe J2/22 while pushing any key on keyset.	Dual tone signal.	Go to step 5b.	Replace U15 or U16.
	b. With a DC voltmeter, measure J2/7.	0v±0.2v	Replace C29, R20 or RA2.	Replace U3, Q12, or RA1.

Table 4-4.1 Circuit Card Troubleshooting for Telephone Set TA-838A/TT-Continued

Step	Procedure	Required results	Correction action if results are: Correct	Correction action if results are: Incorrect
6.	RECEIVE CIRCUIT LOSS Set MODE SELECT switch to PT-PT. Go off-hook and set PS1 to 4.4v. Apply 0.5v RMS at 1000 Hz to receive inputs TP3 and TP4. Perform the following:			
	a. With a DC voltmeter, measure J2/5.	0v+0.2v	Go to step 6b.	Replace Q11, RA4 or U3.
	b. With a scope, observe J1/10.	Sine wave 1000Hz 1.5 vpp±40%	Replace C21, L1, C22, C23 or receive amplifier.	Replace C20 or T2.
7.	RING DETECTOR Set MODE SELECT switch to PT-PT. Go off-hook and set PS1 to 4.4v. Apply 1.0v RMS at 570Hz to receive inputs TP3 and TP4. Set RING VOLUME control midway. Perform the following:			
	a. Listen for audible ring.	Audible ring.	Go to step 7d.	Go to 7b.
	b. With a scope, observe J2/12.	Square wave 570Hz.	Go to step 7c.	Replace U20, RA6 or receive amplifier.
	c. With a scope, observe J2/15.	Square wave 570Hz.	Replace U9, U12, Q10, U11, Q1, Q2, Q3 or Q4.	Replace U22, its surrounding components, U2 or U14.
	d. Set input to minimum. Gradually increase voltage until an audible ring is produced. With an AC millivolt meter, measure the input level.	Ring occurs at 29 to 103 mv.		Replace U20, RA6 or receive amplifier.
	e. Set input to 150mv at 700Hz. Gradually reduce frequency until an audible ring is produced. With a counter, measure the input frequency.	Ring occurs at 585 to 615Hz.		Replace crystal CY1, C1 or U1.
	f. Set input to 150mv at 500Hz. Gradually increase frequency until an audible ring is produced. With a counter, measure the input frequency.	Ring occurs at 525 to 555Hz.		Replace crystal CY1, C1 or U1.
8.	POINT TO POINT OPERATION Set MODE SELECT switch to PT-PT. Go on-hook and set PS1 to 4.4v. Perform the following:			
	a. With scope connected to J2/17 go on-hook then off-hook. Observe sine wave on scope during first two seconds.	Sinewave 570Hz 1.0vpp±10%	Replace C31 or R22.	Go to step 8b.
	b. With scope connected to J2/11 go on-hook then off-hook. Observe square wave on scope during first two seconds.	Square wave 570Hz.	Replace U18 or its surrounding components.	Go to step 8c.
	c. With scope connected to J2/23 go on-hook the off-hook. Observe square wave on scope during first two seconds.	Square wave 570Hz.	Replace U9, U12 or U5.	Replace U4.
9.	SEND OUTPUT Set MODE SELECT switch to PT-PT. Go off-hook and set PS1 to 4.4v. Perform the following:			
	With a DC voltmeter, measure J2/7.	0v+0.2v	Replace R18, C33 or send amplifier.	Replace Q12, RA2 or U3.
10.	AC, DC/CB Set MODE SELECT swtich to 4W/DC/CB. Connect 24VDC power supply, positive to one XMT terminal and negative to one RCV terminal. Go off-hook and perform the following:			
	a. Measure DC voltage from J1/15 to J1/54.	+22v±10%	Go to step 10b.	Replace VR5 or C40.
	b. Measure DC voltage from J1/16 to J1/36.	+5.1v±10%	Go to step 10c.	Replace VR6, Q19, C41, Q18, Q20, Q21 or RA10.

Table 4-4.1 Circuit Card Troubleshooting for Telephone Set TA-838A/TT-Continued

Step	Procedure	Required results	Correction action if results are	
			Correct	Incorrect
11.	2 WIRE RING Set MODE SELECT switch to 2W/DC/LB. Set PS1 to 4.4v. Apply 90v RMS at 20Hz to XMT terminals TP1 and TP2. Set RING VOLUME control midway and go on-hook. Perform the following:			
	With a scope, observe J2/15.	Square wave 20Hz.	Replace U1.	Replace U21, U2 or RA5.
12.	2 WIRE RECEIVE CIRCUIT LOSS Set MODE SELECT switch to 2W/DC/LB. Set PS1 to 4.4v. Apply 0.5v RMS at 1000Hz to XMT terminals TP1 and TP2. Go off-hook. Perform the following:			
	With an AC voltmeter measure J1/34.	5.0mv RMS ± 20%.	Replace C24, recieve amplifier, L2, C22 or C23.	Replace RA13, C35 or T1.

Table 4-4.2. DTMF Circuit Component Voltage Levels

	Digit pressed				
Test point	None	1	5	9	P
U3-13	1	0	1	1	1
U3-14	1	1	0	1	1
U3-15	1	1	1	0	1
U3-16	1	1	1	1	0
U3-17	1	0	1	1	1
U3-31	0	0	0	0	0
U3-34	1	1	1	1	0
U3-35	1	1	1	0	1
U3-36	1	0	1	1	1
U4-2	1	0	1	1	1
U4-3	1	1	0	1	1
U4-4	1	1	1	0	1
U4-5	1	1	1	1	0
U4-20	1	0	1	1	1
U4-21	1	1	0	1	1
U4-22	1	1	1	0	1
U4-23	1	1	1	1	0

Note: 1 = +4.4 vdc ± 10%, 0 = 0 ± 0.1 vdc

Table 4-5. Required Test Equipment

Description	Qty	Test setup designation
Multimeter ME-30( )/U	3	VTVM-1, -2, -3
Counter, Electronic, Digital Readout AN/USM-207A	2	EC-1, -2
Power Supply, PP-351/U	1	PS-1
		PS-2, -3
Oscilloscope AN/USM-281	1	S
Test Set TS-402	1	DA
Generator, Signal TX-421	1	OSC
Analyzer, Spectrum TS-723A	1	WA
Interrupter, Ringing, Telephone KY-834/U.	1	
Multimeter, AN/USM-223-Used as ammeter.	1	A
Digital Voltmeter, AN/GSM-64.	1	DVM
Transformer (1:1) SM-D-751237, North Electric Co.	2	T1, T2
Balance Transformer, C-161.	1	T3
Light Emitting Diode SM-C-790693, North Electric Co.	1	DS2
Keyset SM-D-790799, North Electric Co.	1	
Ringer SM-A-790701, North Electric Co.	1	
Mode Switch SM-A-790680, North Electric Co.	1	S1
Toggle Switch 6PDT ("Hookswitch")	1	S2
Connector (54 Pin) SM-C-790736, North Electric Co.	1	J1
Resistor, 470-ohm ½ W, 5%	1	R1
Resistor, ,600 ohm ¼ W, 1%	5	R4, 5, 11, 17, 19
Resistor, 150-ohm ¼ W, 1%	2	R2, 3
Resistor, 1K-ohm ¼ W, 5%	4	R7, 8, 9, 10
Resistor, 10-ohm 1W, 1%	1	R12
Resistor, 275-ohm ½ W, 1%	2	R13, 14
Resistor, 475-ohm ½ W, 1%	2	R15, 16
Resistor, 1200-ohm ¼ W, 5%	1	R18
Resistor, 270-ohm ½ W, 1%	1	R20
Resistor, 2700-ohm ¼ W, 1%	1	R21
Choke, 9H @ 1KHz	2	L1, 2
Capacitor, 300-uf, 60-V, Polarized	2	C1, 2
AC Isolation Plugs	As required	
Capacitor, 2.2 uf, 200V, Non-Polarized	1	C4

4-14. Removal of Circuit Card Components

The tools and equipment required when performing removal or replacement procedures on Telephone Set TA-838/TT are listed in the maintenance allocation chart, To remove components from circuit card A1, perform steps *a* through *f* below,

a. Insert the printed circuit board in the vise so that the component side is facing downward,

b. Remove the conformal coating from the component to release the component from the board.

c. With small iron and solder sucker or solder wick, carefully and quickly unsolder the component leads, one at a time.

d. With sharp knife, carefully lift any leads that are bent over on the board. Use the small iron, if necessary, to heat the lead and lift at the same time.

CAUTION

Be careful not to lift any of the printed traces from the board.

e. Check to see that all leads of the component are straight up whereby they can slide easily through the holes in the printed circuit board.

CAUTION

When using the resoldering tip, it is recommended not to have it any hotter than necessary. Do not leave it idling for a long time prior to use. Do not apply heat with tip any longer than necessary as the printed circuit board can be very easily burned.

f. For integrated circuits, use a resoldering tip, heat all leads at the same time, and with draw the integrated circuit from below.

NOTE

Integrated circuit boards should come out easily, leaving printed traces intact with holes open ready to receive the new integrated circuit.

4-15. Testing of Components (out-of-Circuit)

a. Checking Transistors and Capacitors. Check transistors with Transistor Test Set TS-1836C/U which has a highly limited current capability. Observe proper polarity for NPN to avoid error in measurement. For good transistors, the forward transistor resistance is low (from 1 to 100 ohms) but never ZERO; backward resistance is always much higher than the forward resistance, (well above 10,000 ohms). Resistance between transistor collector and emitter, in either direction, varies with temperature; variation is greater for the forward direction resistance. Do not assume trouble is eliminated when only one part is replaced. This is especially true when one transistor fails, causing other transistors to fail. Replacing only one transistor and turning power on, before checking for additional defective components, could damage the replaced component.

NOTE

When soldering semi-conductor devices, hold the lead being soldered with a pair of pliers placed between the device and the solder joint to provide an effective heat-sink. Refer to TB SIG-222 for additional information. When checking capacitors, the leakage resistance obtained from a simple resistance check is not always an indication of a faulty capacitor. Only a dead short is a true indication of a shorted capacitor.

b. Rectifiers. Open rectifiers produce low output supply voltage with a significant increase in ripple amplitude, while shorted units usually cause a power line fuse to blow.

c. Diodes. Diodes should be tested in both directions. A high resistance reading should be obtained in one direction and a low resistance reading in the the other. If this is not obtained the diode is bad.

d. Integrated Circuits. The ultimate test of an integrated circuit is in its performance in its circuit application with input and output signals within operational parameters. Out-of-circuit testing of integrated circuits is not applicable.

4-16. Replacement of Circuit Card Components

The replacement of components onto the printed circuit board are to be performed in accordance with TB SIG-222 requirements. After the component has been installed, the area must be conformal-coated. Conathane CE-1155 polyurethane coating may be applied in either the spray, dip, or brush techniques, and cured at either room or elevated temperatures.

4-17. Post Repair Inspection

The following inspection should be performed after repairs have been made to the printed circuit board or the telephone set:

a. Become familiar with all inspection information pertaining to the material to be inspected.

b. Soldered connections should be checked as follows:

(1) *Acceptable connections:* Clean, shiny, rouded, smooth and approximate outline of the window and terminal. Clearance between connection and other parts greater than 1/16 inch,

(2) *Unacceptable connections:* Charring, burning, or other damage from heat. Splattering of flu or solder. Excess solder (greater than 50 percent of

the wire thickness). Cold solder joint (rough, chalky, lusterless, uneven). Disturbed connection (movement of lead or terminal while hot, causing insufficient bonding). Rosin connection (flux separating lead from terminal). Solder ground (grounding or shorting because of excess solder). Sharp point on solder connection. Scars, holes, or depressions, perhaps containing oxide or impurities.

c. Perform mechanical examinations as follows:

NOTE

In the following procedures, care should be exercised to avoid bending the lead to the point of separation. A faulty connection can generally be determined in three or four movements.

(1) *Method 1.* Apply pressure sideways with a soldering aide at the point of connection. If there is any movement of the wire relative to the terminal, the joint shall be considered faulty.

(2) *Method 2.* Connect a low-range ohmmeter across the soldered connection. If the reading is intermittent while moving the wire, the connection shall be considered faulty.

d. Check components for values, tolerances, polarities, sizes and compliance with specifications and standards. Check the following:

(1) Lead length is at least 3/16 inch from component to solder joint.

(2) Terminals have no more than 3 wires per terminal.

(3) Minimum conductor width is 0.025.

(4) Conductors contain no exterior corners with angles less than 90°.

(5) Components weighing more than 1/2 ounce (e.g., capacitor A2C1) are supported with bracket or clamp.

(6) Components having conductive exteriors crossing near any conductor are properly insulated,

(7) Replacement or removal is possible without disturbing any other component.

(8) Nicked wires caused by stripping.

(9) All plated holes or eyelets have only one lead connected and are filled with solder.

(10) Workmanship components, board, and chassis are free of all foreign materials.

(11) Flexible conductors have enough slack for at least two replacements of any mechanical termination.

(12) Wire insulation is closer than 1/8 inch from solder connection.

e. Check the printed circuit board for processing defects as follows:

(1) Loose circuitry (any portion of the printed wiring that is not firmly attached to the boards).

(2) Broken circuitry (any break in the printed wiring).

(3) Loose hardware (any terminal, stud, eyelet, etc that is loose under light finger pressure).

(4) Damaged circuitry (crushed terminal shanks or eyelets are rollover; any damaged or missing circuitry).

(5) Delamination or blistering between circuitry or in close proximity to circuitry.

(6) Excessive rollover penetration (rollover penetration that causes damage to base lamination).

(7) Cracked eyelets.

f. Sign off accepted printed circuit board on the shop card and inspection report, and return to stock.

g. Perform a final assembly examination as follows:

(1) Check that screws and bolts in tapped parts, other than nuts, engage for a distance at least equal to the diameter of the screw or bolt.

(2) All parts should be assembled in the proper sequence with no missing, inoperative, defective, bent, broken, or otherwise damaged parts which could cause malfunction or become inoperative or unsafe for service.

(3) All threaded parts or devices should be of the proper type, class, and size with no crossed threads, or burred or mutilated heads. All screws in tapped parts should engage for a distance at least equal to the diameter of the screw. There should be no evidence of loose lockwashers or warpage or distortion of mating parts.

(4) Screws secured by nuts or other retaining devices, which permit projection beyond the retaining device, shall be of such length to permit a minimum projection of 1 1/2 threads and a maximum of 1/8 inch plus 1 1/2 threads for screws up to and including 1 inch and 1/4 inch plus 1 1/2 threads for screws over 1 inch.

(5) Parts provided with pigtail leads (resistors, capacitors, etc) shall be secured between solder-type terminals on part mounting boards with the marking on the component visible. The clearance between the soldered connection and the body of the part shall not be less than 3/16 inch.

(6) All surfaces of the equipment should be free of corrosion.

(7) All hardware finishes should be of the proper color and should extend evenly throughout the finished area with no debris, burrs, blisters, gouge marks, checks, pits, or residuals of corrosive processing agents.

(8) Sign off accepted fabricated parts on the shop card and inspection report, and return to stock.

APPENDIX A
REFERENCES

AFR 66-1	Maintenance Management
AFR 900-4	Air Force Suggestion Program
	Reporting of Transportation Discrepancies in Shipments
AR 735-11-2/ AFR 400-54/MCO 4430.3F	Reporting of Item and Packaging Discrepancies
DA PAM 310-1	Consolidated Index of Army Publications and Blank Forms.
DA PAM 738-750	The Army Maintenance Management System (TAMMS).
FM 21-11	Artificial Respiration
TB SIG-222	Solder and Soldering.
TM 750-244-2	Procedures for Destruction of Electronics Material to Prevent Enemy Use.
TM 11-5805-650-20P	Organization Maintenance Repair Parts and Special Tools List for Telephone Set TA-838/TT and Telephone Set TA-838A/TT (NSN 5805-00-234-8676 and 5805-01-125-5976).
TM 11-5805-650-34P	Direct Support and General Support Maintenance Repair Parts and Special Tools List for Telephone Set TA-838/TT and Telephone Set TA-838A/TT (NSN 5805-00-234-8676 and 5805-01-125-5976).
TM 11-6625-539-14-3	Operator, Organizational, Direct Support, and General Support Maintenance Manual, Including Repair Parts and Special Tools List; Test Set, Transistor TS-1836C/U (NSN 6625-00-159-2253).
TM 40-90-1	Administrative Storage.
TO 00-5-1	Air Force Technical Order System.

APPENDIX B

DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE REPAIR PARTS AND SPECIAL TOOLS LIST

Section I. INTRODUCTION

B-1. Scope.

This appendix lists repair parts required for the performance of direct support and general support maintenance of the TA438/TT.

B-2. General.

This Repair Parts and Special Tools List is divided into the following sections:

a. Section II—Repair Parts List. A list of repair parts authorized for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending numerical sequence, with parts in each group listed in figure and item number sequence.

*b. Section III-Special Tools List. Not applica*ble.

c. Section IV—National Stock Number and Part Number Index. A list, in National item identification number (NIIN) sequence, of all National stock numbers (NSN) appearing in the listing, followed by a list in alphanumeric sequence of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance.

B-3. Explanation of Columns

The following provides an explanation of columns found in the tabular listings:

a. Illustration. This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* The number used to identify each item called out in the illustration.

b. Source, Maintenance, and Recoverability Codes (SMR).

(1) *Source code.* Source codes are assigned to support items to indicate the manner of acquiring support items for maintenance, repair, or overhaul of end items. Source codes are entered in the first and second position of the Uniform SMR Code format as follows:

Code	Definition
PA	— Item procured and stocked for anticipated or known usage.
PB	— Item procured and stocked for insurance purpose because essentiality dictates that a minimum quantity be available in the supply systems.
XA	— Item is not procured or stocked because the requirements for the item will result in the replacement of the next higher assembly.
XB	— Item is not procured or stocked. If not available through salvage, requisition.
XD	— A support item that is not stocked. When required, item will be procured through normal supply channels.

NOTE

Cannibalization or salvage may be used as a source of supply for any items source-coded above, except those coded XA, XD, and aircraft support items as restricted by AR 700-42.

(2) *Maintenance code.* Maintenance codes are assigned to indicate the levels of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the Uniform SMR Code format as follows:

(a) The maintenance code entered in the third position will indicate the lowest maintenance level authorized to remove, replace, and use the support item. The maintenance code entered in the third position will indicate one of the following levels of maintenance:

Code	*Definition*
O	— Support item is removed, replaced, used at the organizational level.
F	— Support item is removed, replaced, used at the direct support level.
H	— Support item is removed, replaced, used at the general support level.

(b) The maintenance code entered in the fourth position indicates whether the item is to be repaired and identifies the lowest maintenance level with the capability to perform complete re-

pair (i.e., all authorized maintenance functions). This position will contain one of the following maintenance codes:

Code — *Definition*

F -- The lowest maintenance level capable of complete repair of the support item is the direct support level.

D — The lowest maintenance level capable of complete repair of the support item is the depot level, performed by depot, mobile depot, or specialized repair activity.

L — Repair restricted to designated specialized repair activity.

Z — Nonreparable. No repair is authorized.

(3) Recoverability code. Recoverability codes are assigned to support items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the Uniform Code format as follows:

Recoverability Code — Definition

Z— Nonreparable item. When unserviceable, condemn and dispose at the level indicated in position 3.

F — Reparable item. When uneconomically reparable, condemn and dispose at the direct support level.

H -- Reparable item. When unecomically reparable, condemn and dispose at the general support level.

D — Reparable item. When beyond lower level repair capability, return to depot. Coondemnation and dis-

e. National Stock Number. This column indicates the National stock number assigned to the item and will be used for requisitioning purposes.

d. Part Number. Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of' the item by means of its engineering drawings, specifications standards, and inspection requirements, to identify an item or range of items.

NOTE

When a stock-numbered item is requisitioned, the repairpart received may have a different part number than the part being replaced.

e. Federal Supply Code for Manufacturer *(FSCM).* The FSCM is a 5-digit numeric code listed in SB 708-12 which is used to identify the manufacturer, distributor, or Government agency, etc.

f. Description. This column indicates the Federal item name and, if required, a minimum description to identify the item. When the part to be used differs between serial numbers of the same model, the effective serial numbers are shown as the last line of the description.

g. Unit of Measure (U/M). Indicates the standard of the basic quantity of the listed item as used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in., pr, etc). When the unit of measure differs from the unit of issue, the lowest unit of issue that will satisfy the required units of measure will be requisitioned,

h. Quantity Incorporated in Unit. Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group. A "V" appearing in this column in lieu of a quantity indicates that definite quantity cannot be indicated (e.g., shims, spacers, etc).

B-4. Special Information

(Not applicable)

B-5. How to Locate Repair Parts

a. When Nationa stock number or part number is unknown:

(1) *First.* Using the table of contents, determine the functional group. This is necessary since illustrations are prepared for functional groups, and listings are divided into the same groups,

(2) *Second.* Find the illustration covering the functional group to which the repair part belong-s.

(3) *Third.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(4) *Fourth.* Using the Repair Parts Listing, find the figure and item number noted on the illustration.

b. When National stock number or part number is known:

(1) *First.* Using the Index of National Stock Numbers and Part Nummbers, find the pertinent National stock number or part number. This index is in ascending NSN sequence, followed by a list of part numbers in ascending alphanumeric sequence, cross-referenced to the illustration figure number and item number.

(2) *Second.* After finding the figure and item number, locate the figure and item number in the repair parts list.

B-6. Abbreviations

(Not applicable)

(Next printed page is B–5.)

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP OO: TELEPHONE SET TA-838/TT		
B-1	1	PAOZZ	5340-01-014-9442	SMB790810	80063	BRACKET, SPRING RETAINER	EA	1
B-1	2	PAOZZ	5305-00-054-6652	MS51957-28	96906	SCREW, MACHINE	EA	2
B-1	3	PAOZZ	5310-00-929-6395	MS35338-136	96906	WASHER LOCK	EA	2
B-1	4	PAOZZ	5305-00-722-5998	MS15795-805	96906	WASHER, FLAT	EA	2
B-1	5	PAOZZ	5340-01-015-1258	SMC790718	80063	STRAP, TIEDOWN	EA	1
B-1	6	PAOZZ	5305-01-016-2297	SMB790719	80063	SCREW, SHOULDER	EA	1
B-1	7	PAOZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK	EA	1
B-1	8	XDOZZ		SMB790688	80063	RETAINER, LOOP	EA	2
B-1	9	PAOZZ	5305-00-054-6667	MS51957-42	96906	SCREW, MACHINE	EA	2
B-1	10	PAOZZ	5305-00-054-6669	MS51957-44	96906	SCREW, MACHINE	EA	2
B-1	11	PAOZZ	5310-00-880-5978	MS15795-807	96906	WASHER, FLAT	EA	4
B-1	12	PAOZZ	5340-01-015-1254	SMC790702	80063	SLING, CARRYING	EA	1
B-1	13	PAOZZ	5360-01-017-9236	SMC790713	80063	SPRING, DOUBLE TORSION	EA	1
B-1	14	XDOZZ		SMB790703	80063	LOOP, STRAP FASTENER	EA	1
B-1	15	PAFFF	5965-01-060-6943	SMD790665	80063	HANDSET ASSEMBLY	EA	1
B-1	16	PAFZZ	5305-00-958-2918	MS24693C26	96906	SCREW MACHINE	EA	2
B-1	17	XBFZZ		SMB790807	80063	BRACKET, DOUBLE	EA	2

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
						GROUP 01 - BASE ASSEMBLY	EA	1
B-2	1	PBFZZ	5305-01-019-1011	SMB790720	80063	SCREW, EXTERNALLY RELIEVED	EA	10
B-2	2	PAFZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK	EA	10
B-2	3	PAFZZ	5310-00-880-5978	MS15795-807	96906	WASHER, FLAT	EA	10
B-2	4	PBFZZ	5330-00-079-4578	MS9068-006	96906	PACKING, PREFORMED	EA	10
B-2	5	PAFZZ	5330-01-015-1237	SMC790674	80063	GASKET	EA	1
B-2	6	XBFZZ		SMD790673	80063	BASE, TELEPHONE	EA	1
B-2	7	PAFLD	5805-01-016-6974	SMD790711	80063	CIRCUIT CARD ASSEMBLY	EA	1
B-2	8	PAFZZ	5305-00-054-6652	MS51957-28	96906	SCREW, MACHINE	EA	8
B-2	9	PAHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK	EA	8
B-2	10	PAHZZ	5310-00-880-5976	MS15795-806	96906	WASHER, FLAT	EA	8
						GROUP 0101 - CIRCUIT CARD ASSEMBLY		
B-3	1	PAHZZ	5961-00-951-8757	JAN2N2222A	81349	TRANSISTOR	EA	16
B-3	2	PAHZZ	5961-00-814-9532	JAN2N2484	81349	TRANSISTOR	EA	3
B-3	3	PAHZZ		SMA790803	80063	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-3	4	PAHZZ		SMB790806	80063	PAD, MOUNTING	EA	1
B-3	5	PAHZZ		SMA790768	80063	SEMICONDUCTOR DEVICE, DIODE	EA	4
B-3	6	PAHZZ		SMA798766	80063	TRANSISTOR	EA	1
B-3	7	PAHZZ	5961-00-938-1135	JAN1N4148	81349	SEMICONDUCTOR DEVICE, DIODE	EA	20
B-3	8	PAHZZ		SMA790746	80063	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-3	9	PAHZZ		SMA790767	80063	TRANSISTOR	EA	1
B-3	10	XBHZZ		SMB790801	80063	HEAT SINK, ELECTRICAL	EA	1
B-3	11	PAHZZ	5961-00-925-3777	JAN2N2907A	81349	TRANSISTOR	EA	6
B-3	12	PAHZZ		SMA790763	80063	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-3	13	PAHZZ	5961-00-842-6181	JAN1N3018B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-3	14	PAHZZ	5961-00-951-8757	JAN2N2222A	81349	TRANSISTOR	EA	3
B-3	15	PAHZZ	5961-00-929-3086	SMB751244	80063	PAD, MOUNTING	EA	29
B-3	16	PAHZZ	5961-00-850-9438	JAN1N3033B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-3	17	PAHZZ	5961-00-702-3435	JAN1N3600	81349	SEMICONDUCTOR DEVICE, DIODE	EA	2
B-3	18	PAHZZ		SMA790745	80063	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-3	19	PAHZZ	5961-00-107-4740	JAN1N5288	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-3	20	PAHZZ	5950-00-325-6110	MS75101-3	96906	COIL, RADIOFREQUENCY	EA	1
B-3	21	PAHZZ	5910-00-113-5499	M39014-02-1391	81349	CAPACITOR, FIXED	EA	8
B-3	22	PAHZZ	5905-01-014-6499	SMA790712-3	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	23	PAHZZ	5910-01-003-8290	M39014-02-1389	81349	CAPACITOR, FIXED	EA	1
B-3	24	PAHZZ	5905-01-014-4526	SMA790712-6	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	25	PAHZZ	5910-00-018-2911	CM07FD103F03	81349	CAPACITOR, FIXED	EA	2

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-3	26	PAHZZ	5962-01-016-6970	SMA790715	80063	MICROCIRCUIT, DIGITAL	EA	1
B-3	27	PAHZZ		SMA790712-13	80063	RESISTOR NETWORK, FIXED	EA	2
B-3	28	PAHZZ	5905-00-499-6755	RJ50CP203	81349	RESISTOR, VARIABLE	EA	1
B-3	29	PAHZZ		RNR60K1052FM	81349	RESISTOR, FIXED	EA	1
B-3	30	PAHZZ	5905-01-014-6479	SMA790712-1	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	31	PAHZZ	5905-00-572-7920	RLR05C102JM	81349	RESISTOR, FIXED	EA	1
B-3	32	PAHZZ	5805-01-016-6936	SMD790744	80063	AMPLIFIER, AUDIO	EA	1
B-3	33	PAHZZ	5905-01-014-6498	SMA790712-2	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	34	PAHZZ	5961-00-410-3900	JAN1N3330B	81349	SEMICONDUCTOR DEVICE, DIODE	EA	1
B-3	35	PAHZZ	5310-00-582-5677	MS15795-810	96906	WASHER, FLAT	EA	2
B-3	36	PAHZZ		M39014-02-1383	81349	CAPACITOR, FIXED	EA	2
B-3	37	PAHZZ	5905-01-014-4530	SMA790712-16	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	38	PAHZZ	5910-00-007-3974	M39003-01-2271	81349	CAPACITOR, FIXED	EA	1
B-3	39	PAHZZ	5910-00-306-5980	M39006-09-6178	81349	CAPACITOR, FIXED	EA	1
B-3	40	PAHZZ		SMA790712-14	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	41	PAHZZ	5905-01-014-6501	SMA790712-5	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	42	PAHZZ		M39003-01-2466	81349	CAPACITOR, FIXED	EA	1
B-3	43	PAHZZ	5910-00-495-0042	M39003-01-2357	81349	CAPACITOR, FIXED	EA	2
B-3	44	PAHZZ	5905-01-014-4527	SMA790712-7	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	45	PAHZZ	5905-01-016-9578	SMA790712-8	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	46	PAHZZ	5950-01-016-6941	SMC790726	80063	TRANSFORMER, AUDIO-INPUT	EA	1
B-3	47	PAHZZ	5910-00-984-7588	CM05FD101J03	81349	CAPACITOR, FIXED	EA	2
B-3	48	PAHZZ	5962-01-016-6806	SMA790739	80063	MICROCIRCUIT, LINEAR	EA	2
B-3	49	PAHZZ	5910-00-154-0547	M39003-01-2313	81349	CAPACITOR, FIXED	EA	1
B-3	50	PAHZZ	5905-01-014-6500	SMA790712-4	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	51	PAHZZ	5905-00-106-3668	RCR07G220JS	81349	RESISTOR, FIXED	EA	1
B-3	52	PAHZZ	5905-01-014-4528	SMA790712-9	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	53	PAHZZ	5910-00-010-8160	M39003-01-3132	81349	CAPACITOR, FIXED	EA	1
B-3	54	PAHZZ	5910-00-954-5497	CM05FD201J03	81349	CAPACITOR, FIXED	EA	1
B-3	55	PAHZZ	5910-00-113-5689	M39003-01-2296	81349	CAPACITOR, FIXED	EA	1
B-3	56	PAHZZ	5950-01-017-7310	MS75101-12	96906	COIL, RADIOFREQUENCY	EA	1
B-3	57	PAHZZ		M39014-02-1399	81349	CAPACITOR, FIXED	EA	1
B-3	58	PAHZZ	5962-01-016-6969	SMA790716	80063	MICROCIRCUIT, DIGITAL	EA	1
B-3	59	PAHZZ	5955-01-016-6920	SMA790714	80063	CRYSTAL UNIT, QUARTZ	EA	1
B-3	60	PAHZZ	5905-00-577-1995	RLR05C622JM	81349	RESISTOR, FIXED	EA	1
B-3	61	PAHZZ	5905-00-465-0333	RCR07G565JS	81349	RESISTOR, FIXED	EA	1
B-3	62	PAHZZ		SMA790712-11	80063	RESISTOR NETWORK, FIXED	EA	1
B-3	63	PAHZZ	5910-00-223-0472	CM05ED820J03	81349	CAPACITOR, FIXED	EA	1

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION	USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-3	64	PAHZZ	5910-00-051-4612	CM05ED220J03	81349	CAPACITOR, FIXED		EA	1
B-3	65	PAHZZ		RWR71S6811FM	81349	RESISTOR, FIXED		EA	1
B-3	66	PAHZZ		RLR20C102JM	81349	RESISTOR, FIXED		EA	1
B-3	67	PAHZZ	5905-00-914-9256	RLR20C103JM	81349	RESISTOR, FIXED		EA	1
B-3	68	PAHZZ	5905-01-014-4529	SMA790712-10	80063	RESISTOR NETWORK, FIXED		EA	1
B-3	69	PBHLH	5935-01-016-9621	SMC790734	80063	CONNECTOR, RECEPTACLE		EA	1
B-3	70	PBHZZ	5320-00-850-2272	MS16535-157	96906	RIVET, TUBULAR		EA	2
B-3	71	PAHZZ	5950-01-016-6805	SMC790728	80063	INDUCTOR, SINGLE FREQUENCY		EA	1
B-3	72	PAHZZ	5910-00-611-3263	M39006-09-607C	81349	CAPACITOR, FIXED		EA	1
B-3	73	PAHZZ	5910-00-965-9441	CM06FD102J03	81349	CAPACITOR, FIXED		EA	2
B-3	74	PAHZZ	5905-00-128-6237	RCR07G3R3JS	81349	RESISTOR, FIXED		EA	1
B-3	75	PAHZZ		SMA790712-15	80063	RESISTOR NETWORK, FIXED		EA	1
B-3	76	PAHZZ		M39003-03-0187	81349	CAPACITOR, FIXED		EA	1
B-3	77	PAHZZ		M39022--01-1149	81349	CAPACITOR, FIXED		EA	1
B-3	78	PAHZZ	5950-01-016-6942	SMC790727	80063	TRANSFORMER, AUDIO-OUTPUT		EA	1
B-3	79	PAHZZ		SMA790712-12	80063	RESISTOR NETWORK, FIXED		EA	1
B-3	80	PAHZZ	5910-00-227-6378	CM05FD111J03	81349	CAPACITOR, FIXED		EA	1
B-3	81	PAHZZ		SMB751245	80063	PAD, MOUNTING		EA	54
						GROUP:02 -HANDSET ASSEMBLY			
B-4	1	XBFZZ	5805-01-014-9595	SMD790668	80063	CAP, RECEIVER, HANDSET		EA	1
B-4	2	PAFZZ	5965-00-549-0220	TA235PT	80058	EARPHONE ELEMENT		EA	1
B-4	3	XBFZZ		SMD790667	80063	CAP, TRANSMITTER, HANDSET		EA	1
B-4	4	XAFZZ		SMB790742	80063	RETAINING RING		EA	1
B-4	5	PAFZZ	5965-01-177-9138	SMA790705	80063	MICROPHONE, DYNAMIC		EA	1
B-4	6	PAFZZ	5330-01-015-1241	SMB751253	80063	GASKET, RUBBER		EA	1
B-4	7	PAFZZ	5965-01-628-8436	SMC790732	80063	ADAPTER		EA	1
B-4	8	PAFZZ	5330-01-015-1240	SMC790687-3	80063	GASKET, LOUDSPEAKER		EA	1
B-4	9	XAFZZ		SMD790666	80063	HANDLE, HANDSET		EA	1
B-4	10	PAFZZ	5995-01-014-9442	SMC790738	80063	CORD ASSEMBLY		EA	1
B-4	11	PAFZZ	5340-00-956-4436	SMB751281-2	80063	CLAMP, LOOP		EA	2
B-4	12	PAFZZ	5905-00-054-5649	MS51957-15	96906	SCREW, MACHINE		EA	2
B-4	13	PAFZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK		EA	2
B-4	14	PAFZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT		EA	2
B-4	15	XBFZZ		SMC790809	80063	COVER		EA	1
B-4	16	PAFZZ	5305-00-225-6400	MS24693C3	96906	SCREW, MACHINE		EA	2
						GROUP: 03 -SHELL ASSEMBLY			
B-5	1	PAHDD	5940-01-016-9595	SMC790770	81349	TERMINAL BOARD ASSEMBLY		EA	1
B-5	2	PAHZZ	5305-00-054-6650	MS51957-26	96906	SCREW, MACHINE		EA	2
B-5	3	PAHZZ	5310-00-929-6395	MS35338-136	96906	WASHER, LOCK		EA	8

(1) ILLUSTRATION (A) FIG NO.	(B) ITEM NO.	(2) SMR CODE	(3) NATIONAL STOCK NUMBER	(4) PART NUMBER	(5) FSCM	(6) DESCRIPTION USABLE ON CODE	(7) UNIT OF MEAS	(8) QTY INC IN UNIT
B-5	4	PAFZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT	EA	8
B-5	5	PAFZZ	5910-00-315-3449	M39022-01-1161	81349	CAPACITOR, FIXED	EA	1
B-5	6	PAHZZ		SM-D-790799	80063	SWITCH, PUSH, TELEPHONE	EA	1
B-5	7	PAHZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN, HEX	EA	6
B-5	8	PAFZZ	5930-01-016-6930	SMD790752	80063	SWITCH, PUSH	EA	1
B-5	9	XBFZZ		SMD790676	80063	HORN, LOUDSPEAKER	EA	1
B-5	10	XAFZZ		SMC790682	80063	GRILL, METAL	EA	1
B-5	11	PAFZZ	5330-01-015-1238	SMC790684	80063	GASKET, HORN	EA	1
B-5	12	PAFZZ	5305-00-546-6669	MS51957-44	96906	SCREW, MACHINE	EA	8
B-5	13	PAFZZ	5310-00-933-8119	MS35338-137	96906	WASHER, LOCK	EA	8
B-5	14	PAFZZ	5310-00-880-5978	MS15795-807	96906	WASHER, FLAT	EA	8
B-5	16	XBFZZ		SMC790686	80063	BRACKET, LOUDSPEAKER	EA	1
B-5	16	PAFZZ	5330-01-014-9446	SMC790687-1	80063	GASKET, LOUDSPEAKER	EA	1
B-5	17	PAFZZ	5965-01-016-6913	SMA790701	80063	EARPHONE ELEMENT	EA	1
B-5	18	PBFZZ	5330-01-015-1239	SMC790687-2	80063	GASKET, LOUDSPEAKER	EA	1
B-5	19	PAFZZ		MS24655-221	96906	SWITCH, TOGGLE	EA	1
B-5	20	PAFZZ	5310-01-016-9347	SMB790707	80063	WASHER, FLAT	EA	1
B-5	21	PBFZZ	5355-00-057-7794	MS91528-0C1B	96906	KNOB, CONTROL	EA	1
B-5	22	PAFZZ	5905-01-017-8657	RV6SAYSA253A	81349	RESISTOR, VARIABLE	EA	1
B-5	23	PBHZZ	6210-01-015-1226	SMC790693	80063	LIGHT, INDICATOR	EA	1
B-5	24	PAHZZ	5310-01-015-1245	SMB790760	80063	WASHER, RUBBER	EA	1
B-5	25	PAHZZ	5310-00-945-0528	MS9321-11	96906	WASHER, FLAT	EA	1
B-5	26	PAHZZ	5310-00-087-2855	MS25082B5	96906	NUT, PLAIN, HEX	EA	1
B-5	27	PAHZZ	5930-01-019-8949	SMA790680	80063	SWITCH, ROTARY	EA	1
B-5	28	PAFZZ	5905-01-015-1232	SMB790683	80063	SCREW, EXTERNALLY RELIEVED	EA	1
B-5	29	XBHZZ	5805-01-164-0840	SMD790675	80063	COVER, BATTERY	EA	1
B-5	30	PAFZZ	5330-01-019-1022	SMC790689	80063	GASKET, COVER	EA	1
B-5	31	PAFZZ	5999-01-027-4859	SMC790678	80063	CONTACT, ELECTRICAL	EA	2
B-5	32	PAFZZ	5310-00-595-6211	MS15795-803	96906	WASHER, FLAT	EA	4
B-5	33	PAFZZ	5310-00-933-8118	MS35338-135	96906	WASHER, LOCK	EA	4
B-5	34	PAFZZ	5305-00-054-5648	MS51957-14	96906	SCREW, MACHINE	EA	2
B-5	35	XBHZZ		SMB790685	80063	PIN, STRAIGHT	EA	1
B-5	36	PBFZZ	5940-00-681-9771	257B5	81349	BOARD, TERMINAL	EA	1
B-5	37	PAFZZ	5305-00-054-5651	MS51957-17	96906	SCREW, MACHINE	EA	2
B-5	38	PAFZZ	5940-00-937-5237	PB08NA01	81349	POST, BINDING BLK	EA	2
B-5	39	PAFZZ	5940-00-926-8162	PB08NA02	81349	POST, BINDING RED	EA	2
B-5	40	PAFZZ	5310-00-934-9765	MS35650-304	96906	NUT, PLAIN HEX	EA	4
B-5	41	PAFZZ	5310-00-543-5933	MS35333-73	96906	WASHER, LOCK	EA	4
B-5	42	PAFZZ	5310-00-934-9761	MS35649-264	96906	NUT, PLAIN HEX	EA	4
B-5	43	PAFZZ	5310-00-616-3555	MS35333-71	96906	WASHER, LOCK	EA	2
B-5	44	PAFZZ	5310-00-722-5998	MS15795-805	96906	WASHER, FLAT	EA	4
B-5	45	PAFZZ	5330-01-019-1023	SMC790704	80063	GASKET, CONTACT ASSEMBLY	EA	1
B-5	46	PAFZZ	5999-01-016-6949	SMC790699	80063	CONTACT ASSEMBLY	EA	1

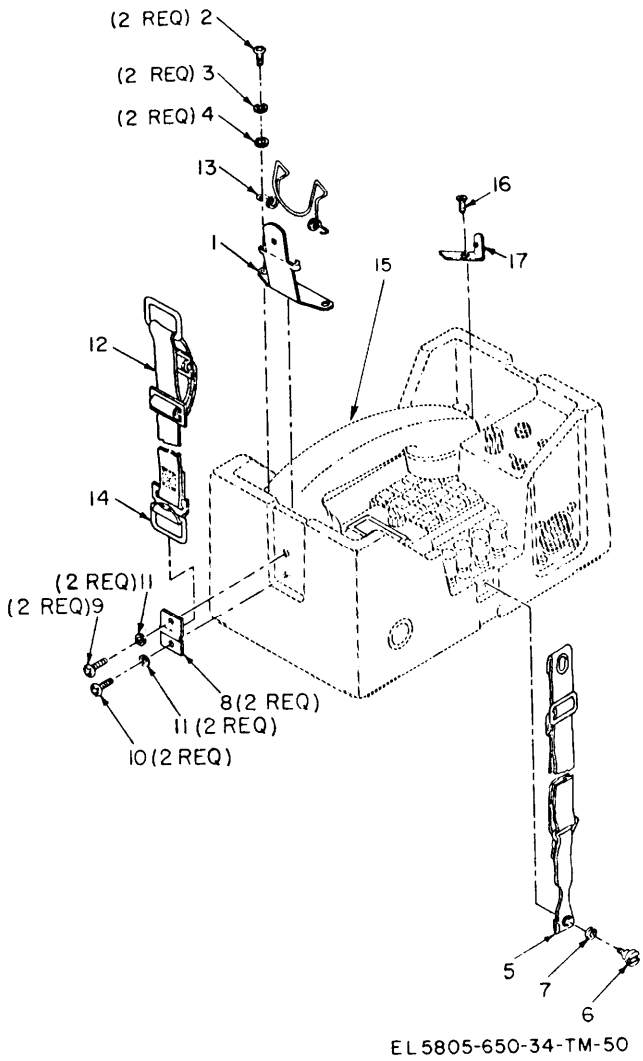

Figure B-1. Telephone Set TA-838/TT.

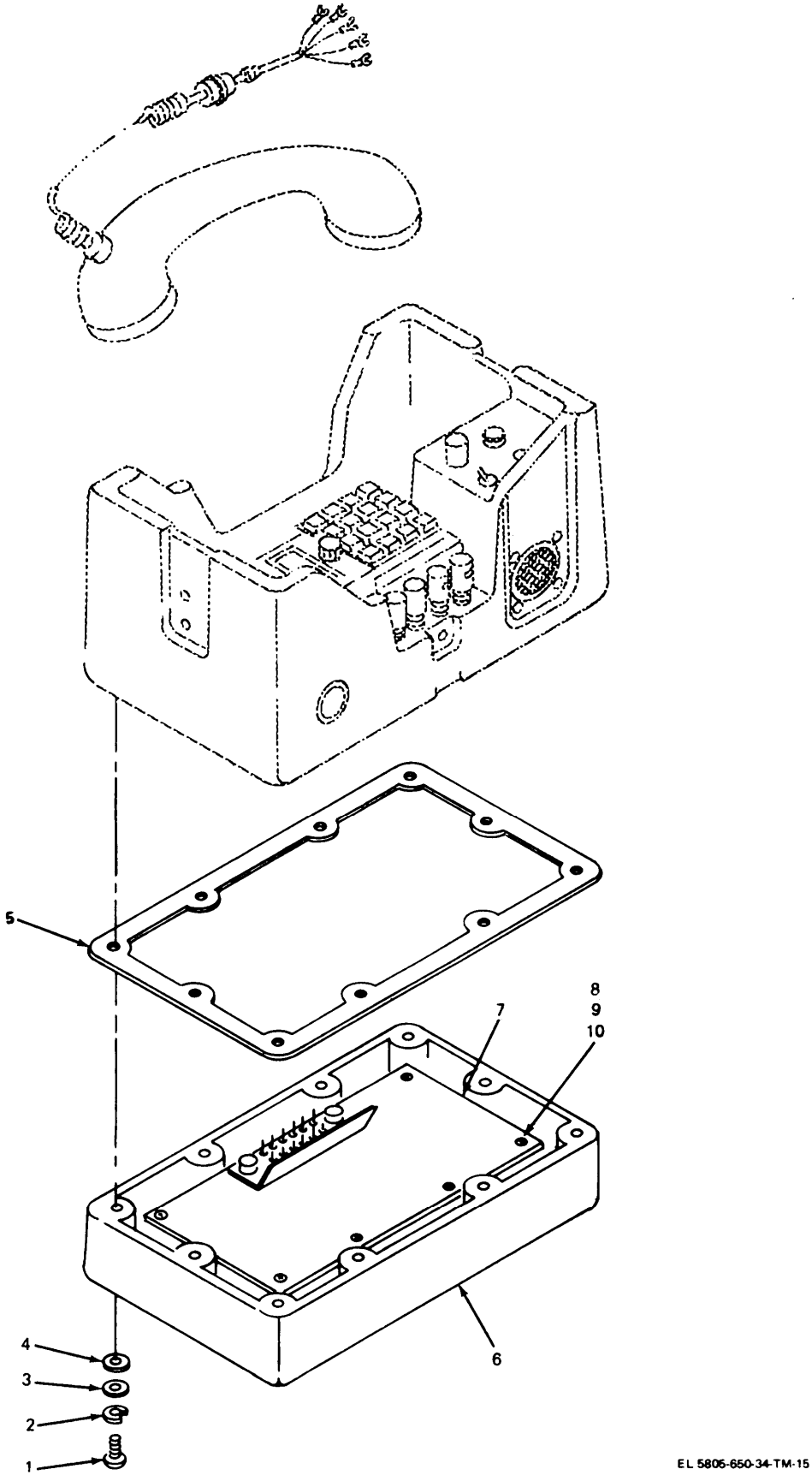

Figure B-2. Base assembly.

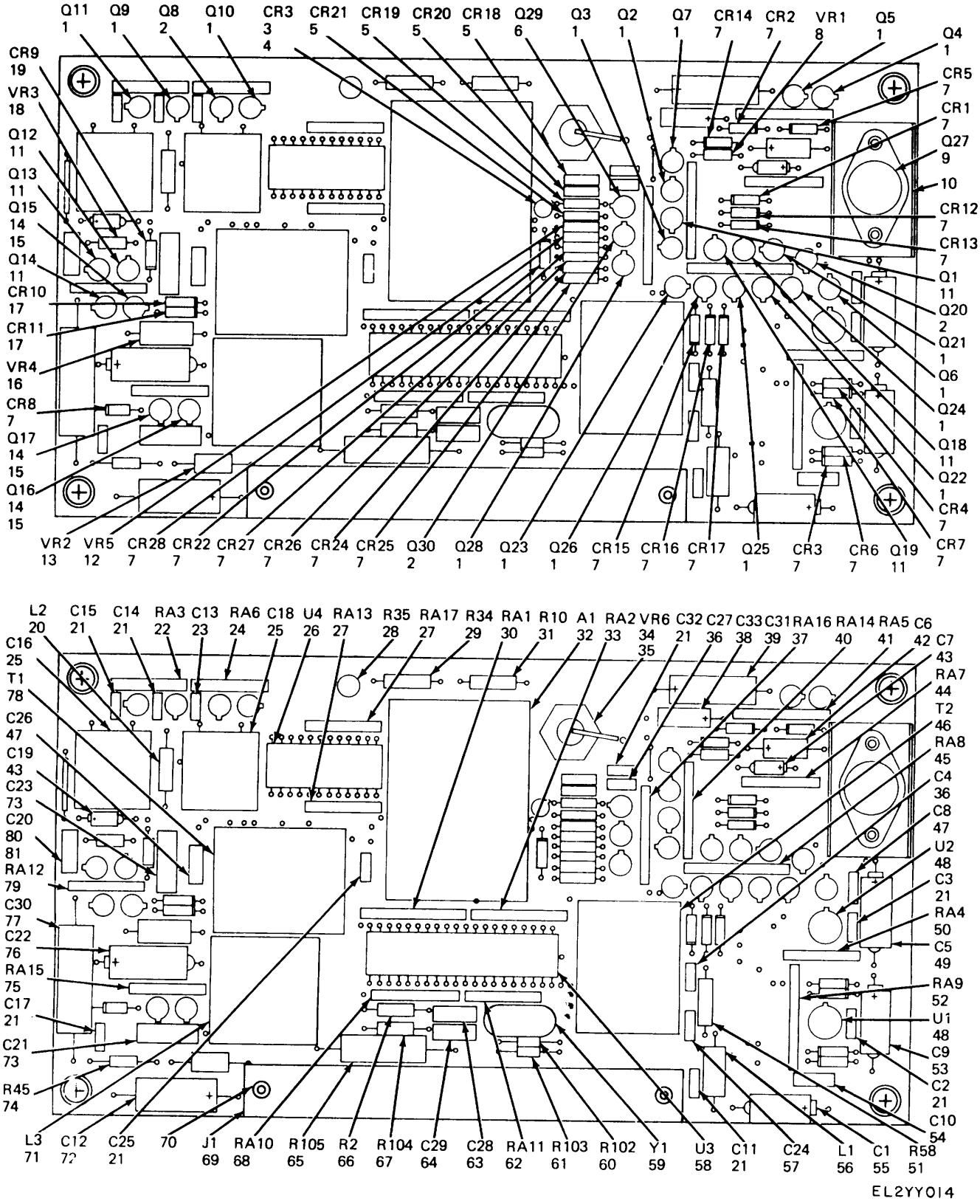

Figure B-3. Circuit card assembly.

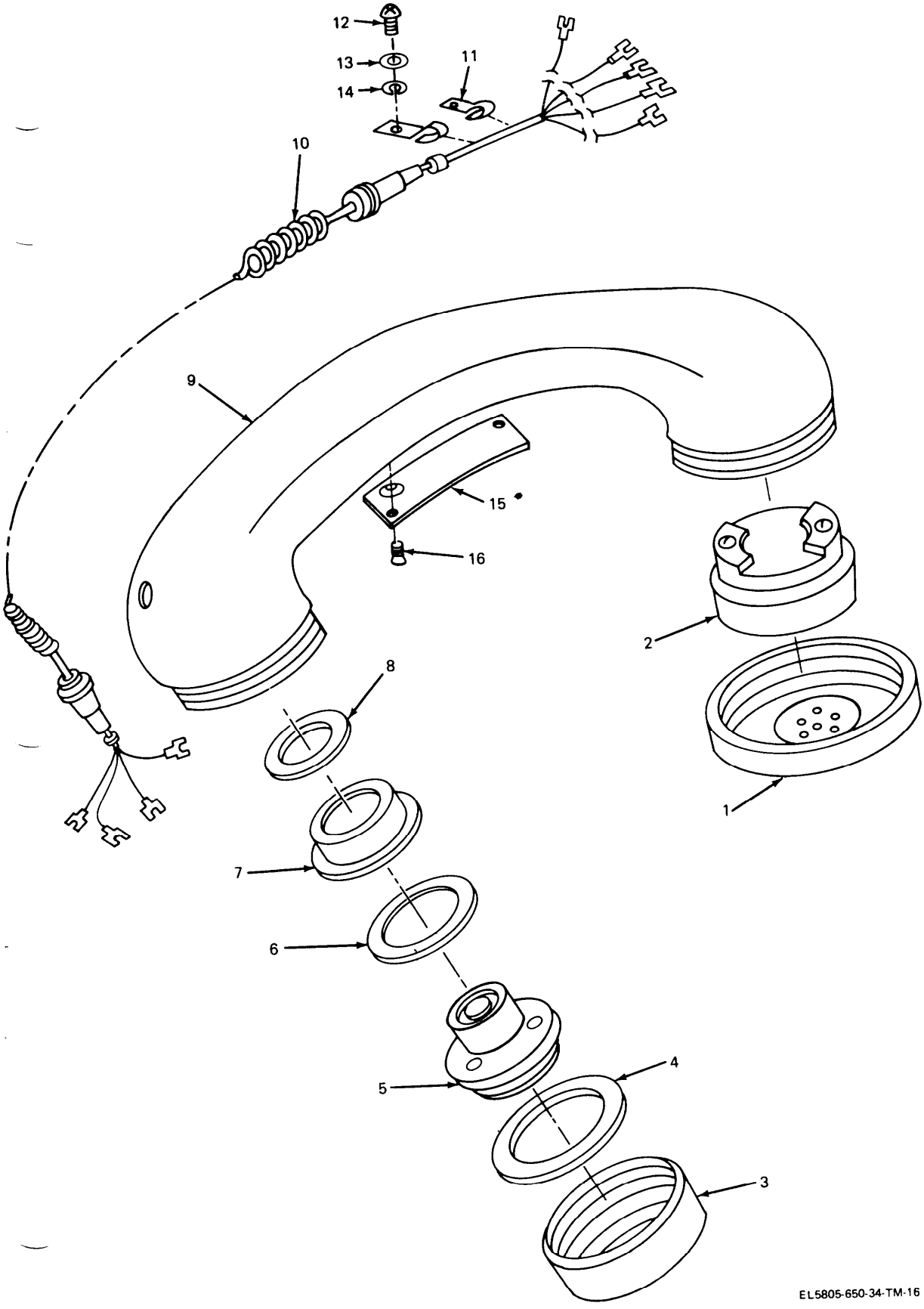

Figure B-4. Handset assembly.

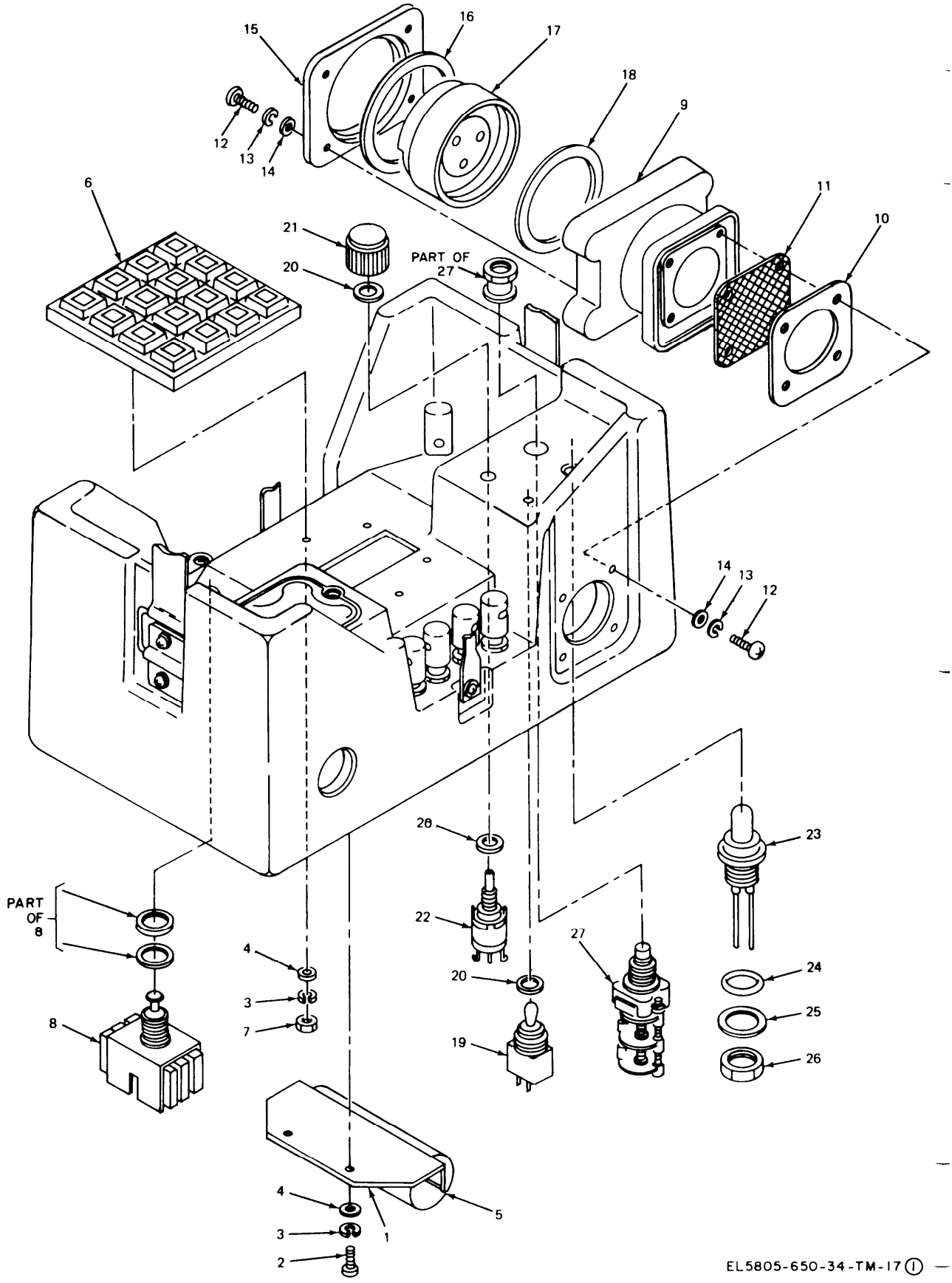

Figure B-5 ① . Shell assembly (sheet 1 of 2).

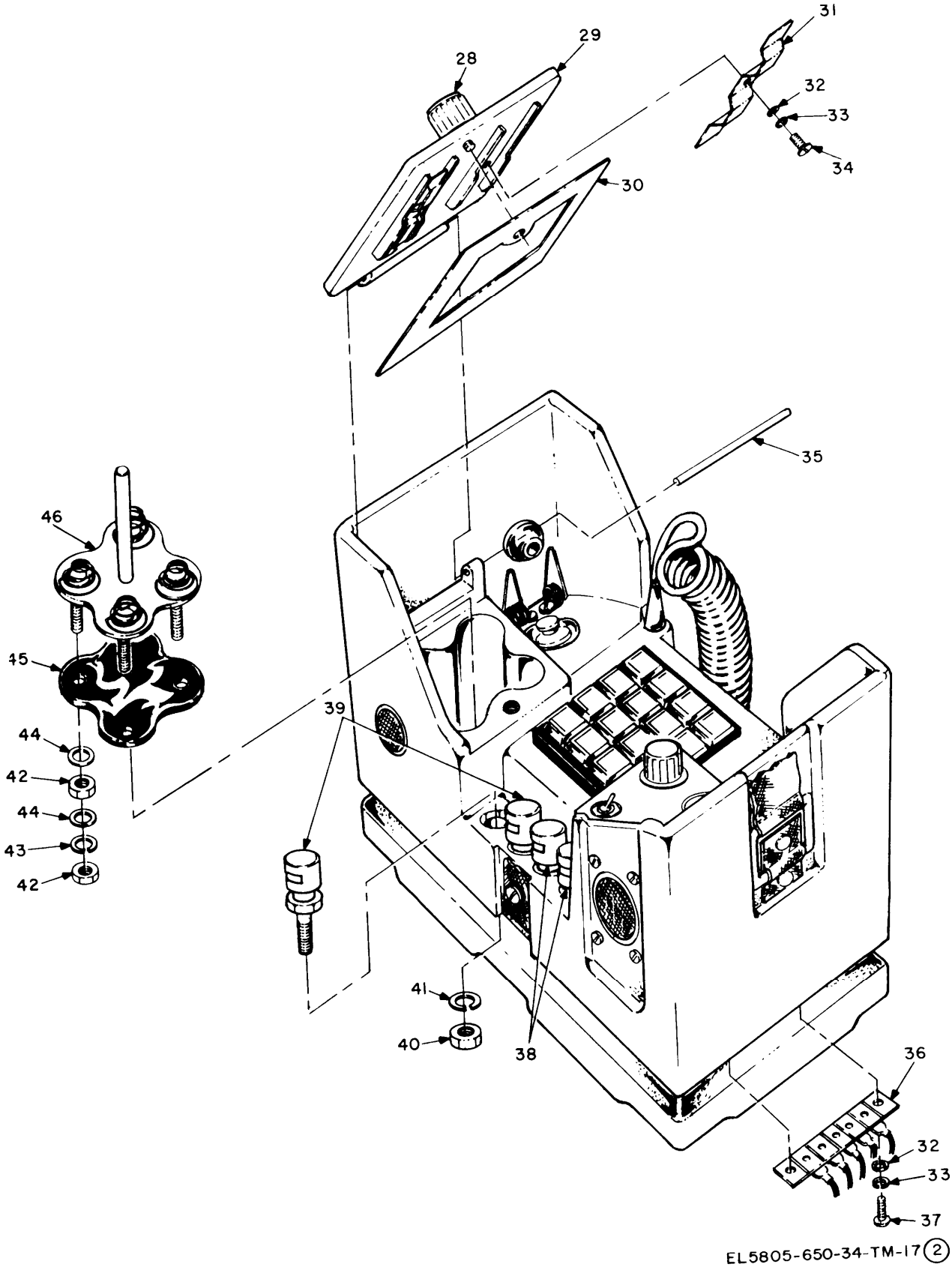

Figure B-5 ② . Shell assembly (sheet 2 of 2).

SECTION IV. FEDERAL STOCK NUMBER AND PART NUMBER INDEX (CONTINUED)

STOCK NUMBER	FIG. NO.	ITEM NO.	STOCK NUMBER	FIG. NO.	ITEM NO.
5305-00-054-5648	B-5	34	5910-00-954-5497	B-3	54
5305-00-054-5651	B-5	37	5910-00-965-9441	B-3	73
5305-00-054-6650	B-5	2	5910-00-984-7588	B-3	47
5305-00-054-6652	B-1	2	5940-00-681-9771	B-5	36
5305-00-054-6652	B-2	8	5940-00-926-8162	B-5	39
5305-00-054-6667	B-1	9	5940-00-937-5237	B-5	38
5305-00-054-6669	B-1	10	5950-00-325-6110	B-3	20
5305-00-057-7794	B-5	21	5961-00-107-4740	B-3	19
5305-00-958-2918	B-1	16	5961-00-410-3900	B-3	34
5305-00-225-6400	B-4	16	5961-00-702-3435	B-3	17
5305-00-546-6669	B-5	12	5961-00-814-9532	B-3	2
5305-00-722-5998	B-1	4	5961-00-842-0181	B-3	13
5310-00-087-2855	B-5	26	5961-00-850-9438	B-3	16
5310-00-543-5933	B-5	41	5961-00-925-3777	B-3	11
5310-00-582-5677	B-3	35	5961-00-929-3086	B-3	15
5310-00-595-6211	B-4	14	5961-00-938-1135	B-3	7
5310-00-595-6211	B-5	4	5961-00-951-8757	B-3	1
5310-00-595-6211	B-5	32	5961-00-951-8757	B-3	14
5310-00-616-3555	B-5	43	5965-00-549-0220	B-4	2
5310-00-722-5998	B-5	44	5305-01-016-2297	B-1	6
5310-00-880-5976	B-2	10	5305-01-019-1011	B-2	1
5310-00-880-5978	B-1	11	5310-01-015-1245	B-5	24
5310-00-880-5978	B-2	3	5310-01-016-9347	B-5	20
5310-00-880-5978	B-5	14	5330-01-014-9446	B-5	16
5310-00-929-6395	B-1	3	5330-01-015-1237	B-2	5
5310-00-929-6395	B-2	9	5330-01-015-1238	B-5	11
5310-00-929-6395	B-5	3	5330-01-015-1239	B-5	18
5310-00-933-8118	B-1	7	5330-01-015-1240	B-4	8
5310-00-933-8118	B-4	13	5330-01-015-1241	B-4	6
5310-00-933-8118	B-5	33	5330-01-019-1023	B-5	45
5310-00-933-8119	B-2	2	5340-01-014-9442	B-1	1
5310-00-933-8119	B-5	13	5340-01-015-1254	B-1	12
5310-00-934-9761	B-5	7	5340-01-015-1258	B-1	5
5310-00-934-9761	B-5	42	5360-01-017-9236	B-1	13
5310-00-934-9765	B-5	40	5805-01-014-9595	B-4	1
5310-00-945-0528	B-5	25	5805-01-016-6936	B-3	32
5320-00-850-2272	B-3	70	5805-01-016-6974	B-2	7
5330-00-079-4578	B-2	4	5905-01-014-4526	B-3	24
5340-00-956-4436	B-4	11	5905-01-014-4527	B-3	44
5905-00-054-5649	B-4	12	5905-01-014-4528	B-3	52
5905-00-106-3668	B-3	51	5905-01-014-4529	B-3	68
5905-00-128-6237	B-3	74	5905-01-014-4530	B-3	37
5905-00-465-0333	B-3	61	5905-01-014-6479	B-3	30
5905-00-499-6755	B-3	28	5905-01-014-6498	B-3	33
5905-00-572-7920	B-3	31	5905-01-014-6499	B-3	22
5905-00-577-1995	B-3	60	5905-01-014-6500	B-3	50
5905-00-914-9256	B-3	67	5905-01-014-6501	B-3	41
5910-00-007-3974	B-3	38	5905-01-015-1232	B-5	28
5910-00-010-8160	B-3	53	5905-01-016-9578	B-3	45
5910-00-018-2911	B-3	25	5905-01-017-8657	B-5	22
5910-00-051-4612	B-3	64	5930-01-016-6930	B-5	8
5910-00-113-5499	B-3	21	5930-01-019-8949	B-5	27
5910-00-113-5689	B-3	55	5935-01-016-9621	B-3	69
5910-00-154-0547	B-3	49	5940-01-016-9595	B-5	1
5910-00-223-0472	B-3	63	5950-01-016-6805	B-3	71
5910-00-227-6378	B-3	80	5950-01-016-6941	B-3	46
5910-00-306-5980	B-3	39	5950-01-016-6942	B-3	78
5910-00-315-3449	B-5	5	5950-01-017-7310	B-3	56
5910-00-495-0042	B-3	43	5955-01-016-6920	B-3	59
5910-00-611-3263	B-3	72	5962-01-016-6806	B-3	48

SECTION IV. FEDERAL STOCK NUMBER AND PART NUMBER INDEX (CONTINUED)

STOCK NUMBER	FIG. NO.	ITEM NO.	STOCK NUMBER	FIG. NO.	ITEM NO.
5962-01-016-6969	B-3	58			
5962-01-016-6970	B-3	26			
5965-01-016-6913	B-5	17			
5965-01-060-6943	B-1	15			
5999-01-016-6949	B-5	46			
6210-01-015-1226	B-5	23			

SECTION IV. FEDERAL STOCK NUMBER AND PART NUMBER INDEX (CONTINUED)

PART NUMBER	FSCM	FIG. NO.	ITEM NO.
CM05ED220J03	81349	B-3	64
CM05ED820J03	81349	B-3	63
CM05FD101J03	81349	B-3	47
CM05FD111J03	81349	B-3	80
CM05FD201J03	81349	B-3	54
CM06FD102J03	81349	B-3	73
CM07FD103F03	81349	B-3	25
JAN1N3018B	81349	B-3	13
JAN1N3033B	81349	B-3	16
JAN1N3330B	81349	B-3	34
JAN1N3600	81349	B-3	17
JAN1N4148	81349	B-3	7
JAN1N5288	81349	B-3	19
JAN2N2222A	81349	B-3	1
JAN2N2222A	81349	B-3	14
JAN2N2484	81349	B-3	2
JAN2N2907A	81349	B-3	11
MS15795-803	96906	B-4	14
MS15795-803	96906	B-5	4
MS15795-803	96906	B-5	32
MS15795-805	96906	B-5	44
MS15795-806	96906	B-1	3
MS15795-806	96906	B-2	10
MS15795-807	96906	B-1	11
MS15795-807	96906	B-2	3
MS15795-807	96906	B-5	14
MS15795-810	96906	B-3	35
MS16535-157	96906	B-3	70
MS24655-221	96906	B-5	19
MS24693C26	96906	B-1	16
MS24693C3	96906	B-4	16
MS25082B5	96906	B-5	26
MS35333-71	96906	B-5	43
MS35333-73	96906	B-5	41
MS35338-135	96906	B-1	7
MS35338-135	96906	B-4	13
MS35338-135	96906	B-5	33
MS35338-136	96906	B-1	4
MS35338-136	96906	B-2	9
MS35338-136	96906	B-5	3
MS35338-137	96906	B-2	2
MS35338-137	96906	B-5	13
MS35649-264	96906	B-5	7
MS35649-264	96906	B-5	42
MS35650-304	96906	B-5	40
MS51957-14	96906	B-5	34
MS51957-15	96906	B-4	12
MS51957-17	96906	B-5	37
MS51957-26	96906	B-5	2
MS51957-28	96906	B-1	2
MS51957-28	96906	B-2	8
MS51957-42	96906	B-1	9
MS51957-44	96906	B-1	10
MS51957-44	96906	B-5	12
MS75101-12	96906	B-3	56
MS75101-3	96906	B-3	20
MS9068-006	96906	B-2	4
MS91528-0C1B	96906	B-5	21
MS9321-11	96906	B-5	25
MS9022-01-1161	81349	B-5	5
M39003-01-2	81349	B-3	38
M39003-01-2	81349	B-3	55
M39003-01-2	81349	B-3	49
M39003-01-2	81349	B-3	43
M39003-01-2	81349	B-3	42
M39003-01-3	81349	B-3	53
M39003-03-0	81349	B-3	76
M39006-09-6	81349	B-3	72
M39006-09-6	81349	B-3	39
M39014-02-1	81349	B-3	36
M39014-02-1	81349	B-3	23
M39014-02-1	81349	B-3	21
M39014-02-1	81349	B-3	57
M39022-01-1	81349	B-3	77
PB08NA01	81349	B-5	38
PB08NA02	81349	B-5	39
RCR07G220JS	81349	B-3	51
RCR07G3R3JS	81349	B-3	74
RCR07G565JS	81349	B-3	61
RJ50CP203	81349	B-3	28
RLR05C102JM	81349	B-3	31
RLR05C622JM	81349	B-3	60
RLR20C102JM	81349	B-3	66
RLR20C103JM	81349	B-3	67
RNR60K1052FI	81349	B-3	29
RV6SAYSA253A	81349	B-5	22
RWR71S6811FI	81349	B-3	65
SMA790680	80063	B-5	27
SMA790701	80063	B-5	17
SMA790705	80063	B-4	5
SMA790712-1	80063	B-3	30
SMA790-712-:	80063	B-3	68
SMA790712-1	80063	B-3	62
SMA790712-1	80063	B-3	79
SMA790712-1	80063	B-3	27
SMA790712-1	80063	B-3	40
SMA790712-1	80063	B-3	75
SMA790712-1	80063	B-3	37
SMA790712-2	80063	B-3	33
SMA790712-3	80063	B-3	22
SMA790712-4	80063	B-3	50
SMA790712-5	80063	B-3	41
SMA790712-6	80063	B-3	24
SMA790712-7	80063	B-3	44
SMA790712-8	80063	B-3	45
SMA790712-9	80063	B-3	52
SMA790714	80063	B-3	59
SMA790715	80063	B-3	26
SMA790716	80063	B-3	58
SMA790739	80063	B-3	48
SMA790745	80063	B-3	18
SMA790746	80063	B-3	8
SMA790763	80063	B-3	12
SMA790767	80063	B-3	9
SMA790768	80063	B-3	5
SMA790803	80063	B-3	3
SMA798766	80063	B-3	6
SMB751244	80063	B-3	15
SMB751245	80063	B-3	81
SMB751253	80063	B-4	6

SECTION IV. FEDERAL STOCK NUMBER AND PART NUMBER INDEX (CONTINUED)

PART NUMBER	FSCM	FIG. NO.	ITEM NO.	PART NUMBER	FSCM	FIG. NO.	ITEM NO.
SMB751281-2	80063	B-4	11				
SMB790683	80063	B-5	28				
SMB790685	80063	B-5	35				
SMB790688	80063	B-1	8				
SMB790703	80063	B-1	14				
SMB790707	80063	B-5	20				
SMB790719	80063	B-1	6				
SMB790720	80063	B-2	1				
SMB790742	80063	B-4	4				
SMB790760	80063	B-5	24				
SMB790801	80063	B-3	10				
SMB790806	80063	B-3	4				
SMB790807	80063	B-1	17				
SMB790810	80063	B-1	1				
SMC790674	80063	B-2	5				
SMC790682	80063	B-5	10				
SMC790684	80063	B-5	11				
SMC790686	80063	B-5	15				
SMC790687-1	80063	B-5	16				
SMC790687-2	80063	B-5	18				
SMC790687-3	80063	B-4	8				
SMC790693	80063	B-5	23				
SMC790699	80063	B-5	46				
SMC790702	80063	B-1	12				
SMC790704	80063	B-5	45				
SMC790713	80063	B-1	13				
SMC790718	80063	B-1	5				
SMC790726	80063	B-3	46				
SMC790727	80063	B-3	78				
SMC790728	80063	B-3	71				
SMC790732	80063	B-4	7				
SMC790734	80063	B-3	69				
SMC790738	80063	B-4	10				
SMC790770	81349	B-5	1				
SMC790809	80063	B-4	15				
SMD790665	80063	B-1	15				
SMD790666	80063	B-4	9				
SMD790667	80063	B-4	3				
SMD790668	80063	B-4	1				
SMD790673	80063	B-2	6				
SMD790675	80063	B-5	29				
SMD790676	80063	B-5	9				
SMD790678	80063	B-5	31				
SMD790689	80063	B-5	30				
SMD790711	80063	B-2	7				
SMD790744	80063	B-3	32				
SMD790799	80063	B-5	6				
SMD790752	80063	B-5	8				
TA235PT	80058	B-4	2				
257B5	81349	B-5	36				

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
Commander
Stateside Army Depot
ATTN: AMSTA-US
Stateside, N.J. 07703

DATE 10 July 1975

PUBLICATION NUMBER	DATE	TITLE
TM 11-5840-340-12	23 Jan 74	Radar Set AN/[illegible]C-76

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.
2-25	2-28		
3-10	3-3		3-1
5-6	5-8		
		F03	

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

Recommend that the installation antenna alignment procedure be changed throughout to specify a 2° IFF antenna lag rather than 1°.

REASON: Experience has shown that with only a 1° lag, the antenna servo system is too sensitive to wind gusting in excess of [illegible] knots, and has a tendency to rapidly accelerate and decelerate as it hunts, causing strain to the drive train. Hunting is minimized by adjusting the lag to 2° without degradation of operation.

Item 5, Function column. Change "2 db" to "3db."

REASON: The adjustment procedure for the TRANS POWER FAULT indicator calls for a 3 db (500 watts) adjustment to light the TRANS POWER FAULT indicator.

Add new step f.1 to read, "Replace cover plate removed in step e.1, above."

REASON: To replace the cover plate.

Zone C 3. On J1-2, change "+24 VDC to "+5 VDC."

REASON: This is the output line of the 5 VDC power supply. + 24 VDC is the input voltage.

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:
SSG I. M. DeSpiritof 999-1776	SSG I. M. DeSpiritof

TEAR ALONG DOTTED LINE

DA FORM 1 AUG 74 2028-2 (TEST)

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

HISA 1686-75

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

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PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

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DEPARTMENT OF THE ARMY

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US Army Electronics Command
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BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.	

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER	SIGN HERE:

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US Army Electronics Command
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Fort Huachuca (10)
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LBAD (14)
SAAD (30)
TOAD (14)
SHAD (3)
SigFLDMS (1)
USAERDAA (1)
USAERDAW (1)
Units org under fol TOE: None

NG: None

USAR: None

For explanation of abbreviations used see, AR 310–50.

☆ U.S. GOVERNMENT PRINTING OFFICE : 1993 O - 342-421 (80655)

PLACEHOLDER

FIGURE# FO-1 thru FO-8

13 Foldouts

TABLE# _____

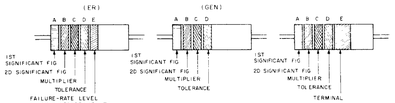
ILLUSTRATION # _____

DRAWING # _____

PAGE # _____

PLACEHOLDER

Figure 4-3. Foldout Placeholder Page (Front)



COLOR CODE MARKING FOR COMPOSITION TYPE RESISTORS

COLOR-CODE MARKING FOR FILM-TYPE RESISTORS

TABLE I

COLOR CODE FOR COMPOSITION TYPE AND FILM TYPE RESISTORS

BAND A		BAND B		BAND C		BAND D		BAND E	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)	COLOR	FAILURE RATE LEVEL	TERM
BLACK	0	BLACK	0	BLACK	1			BROWN	M=1.0	
BROWN	1	BROWN	1	BROWN	10			RED	P=0.1	
RED	2	RED	2	RED	100			ORANGE	R=0.01	
ORANGE	3	ORANGE	3	ORANGE	1,000			YELLOW	S=0.001	
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	±10 (COMP TYPE ONLY)	WHITE		SOLDERABLE
GREEN	5	GREEN	5	GREEN	100,000	GOLD	±5			
BLUE	6	BLUE	6	BLUE	1,000,000	RED	±2 (NOT APPLICABLE TO ESTABLISHED RELIABILITY)			
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7							
GRAY	8	GRAY	8	SILVER	0.01					
WHITE	9	WHITE	9	GOLD	0.1					

BAND A — THE FIRST SIGNIFICANT FIGURE OF THE RESISTANCE VALUE (BANDS A THRU D SHALL BE OF EQUAL WIDTH)

BAND B — THE SECOND SIGNIFICANT FIGURE OF THE RESISTANCE VALUE

BAND C — THE MULTIPLIER (THE MULTIPLIER IS THE FACTOR BY WHICH THE TWO SIGNIFICANT FIGURES ARE MULTIPLIED TO YIELD THE NOMINAL RESISTANCE VALUE.)

BAND D — THE RESISTANCE TOLERANCE

BAND E — WHEN USED ON COMPOSITION RESISTORS, BAND E INDICATES ESTABLISHED RELIABILITY FAILURE-RATE LEVEL (PERCENT FAILURE PER 1,000 HOURS). ON FILM RESISTORS, THIS BAND SHALL BE APPROXIMATELY 1½ TIMES THE WIDTH OF OTHER BANDS, AND INDICATES TYPE OF TERMINAL.

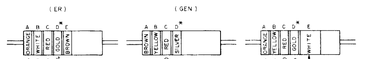
RESISTANCES IDENTIFIED BY NUMBERS AND LETTERS (THESE ARE NOT COLOR CODED)

SOME RESISTORS ARE IDENTIFIED BY THREE OR FOUR DIGIT ALPHA NUMERIC DESIGNATORS. THE LETTER R IS USED IN PLACE OF A DECIMAL POINT WHEN FRACTIONAL VALUES OF AN OHM ARE EXPRESSED. FOR EXAMPLE:

2R7 = 2.7 OHMS 10RO = 10.0 OHMS

FOR WIRE-WOUND-TYPE RESISTORS COLOR CODING IS NOT USED. IDENTIFICATION MARKING IS SPECIFIED IN EACH OF THE APPLICABLE SPECIFICATIONS.

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3,900 OHMS
RESISTANCE TOLERANCE ±5%
FAILURE RATE LEVEL M

NOMINAL RESISTANCE 1,400 OHMS
RESISTANCE TOLERANCE ±10%

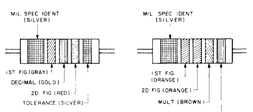
NOMINAL RESISTANCE 3,400 OHMS
RESISTANCE TOLERANCE ±5%
TERMINAL SOLDERABLE

COMPOSITION-TYPE RESISTORS

FILM-TYPE RESISTORS

* IF BAND D IS OMITTED, THE RESISTOR TOLERANCE IS ±20% AND THE RESISTOR IS NOT MIL-STD

A COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS



COLOR CODING FOR TUBULAR ENCAPSULATED RF CHOKES AT A, AN EXAMPLE OF THE CODING FOR AN 8.2 UH CHOKE IS GIVEN. AT B, THE COLOR BANDS FOR A 330 UH INDUCTOR ARE ILLUSTRATED

TABLE 2

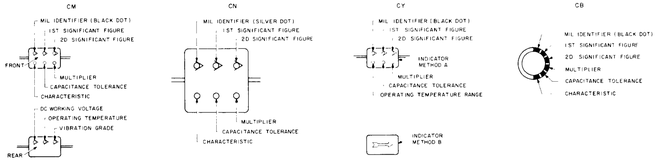
COLOR CODING FOR TUBULAR ENCAPSULATED RF CHOKES

COLOR	SIGNIFICANT FIGURE	MULTIPLIER	INDUCTANCE TOLERANCE (PERCENT)
BLACK	0	1	
BROWN	1	10	1
RED	2	100	2
ORANGE	3	1,000	3
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE			20
SILVER			10
GOLD	DECIMAL POINT		5

MULTIPLIER IS THE FACTOR BY WHICH THE TWO COLOR FIGURES ARE MULTIPLIED TO OBTAIN THE INDUCTANCE VALUE OF THE CHOKE COIL

B COLOR CODE MARKING FOR MILITARY STANDARD

CAPACITORS, FIXED, VARIOUS-DIELECTRICS, STYLES CM, CN, CY, AND CB



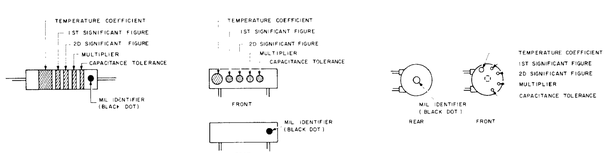


Figure FO-1. Military standard color code markings.

TABLE 3 — FOR USE WITH STYLES CM, CN, CY AND CB

COLOR	MIL ID	1ST SIG FIG	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE			CHARACTERISTIC			DC WORKING VOLTAGE	OPERATING AIR TEMP RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CB	CM	CX, CM	CM
BLACK	CM, CY, CN	0	0	1			±20%	±20%	A				-55°C to +70°C	10-55 HZ
BROWN		1	1	10					B	E	B			
RED		2	2	100	±2%		±2%	±2%	C				-55°C to +85°C	
ORANGE		3	3	1,000	±30%				D		D	300		
YELLOW		4	4	10,000					E				-55°C to +125°C	10-2,000 HZ
GREEN		5	5		±5%				F			500		
BLUE		6	6										-55°C to +150°C	
PURPLE (VIOLET)		7	7											
GRAY		8	8											
WHITE		9	9											
GOLD				0.1		±5%	±5%							
SILVER	CN			0.01	±10%	±10%	±10%	±10%						

TABLE 4 — TEMPERATURE COMPENSATING, STYLE CC

COLOR	TEMPERATURE COEFFICIENT*	1ST SIG FIG	2D SIG FIG	MULTIPLIER	CAPACITANCE TOLERANCE		MIL ID
					CAPACITANCES OVER 10 UUF	CAPACITANCES 10 UUF OR LESS	
BLACK	0	0	0	1		±2.0 UUF	CC
BROWN	-30	1	1	10	±1%		
RED	-80	2	2	100	±2%	±0.25 UUF	
ORANGE	-150	3	3	1,000			
YELLOW	-220	4	4				
GREEN	-330	5	5		±5%	±0.5 UUF	
BLUE	-470	6	6				
PURPLE (VIOLET)	-750	7	7				
GRAY		8	8	0.01*			
WHITE		9	9	0.1*	±10%		
GOLD	+100			0.1		±1.0 UUF	
SILVER				0.01			

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-250, MIL-C-11272B, AND MIL-C-10950C RESPECTIVELY

3 LETTERS INDICATE THE TEMPERATURE RANGE AND VOLTAGE-TEMPERATURE LIMITS DESIGNATED IN MIL-C-11015D

4 TEMPERATURE COEFFICIENT IN PARTS PER MILLION PER DEGREE CENTIGRADE

* OPTIONAL CODING WHERE METALLIC PIGMENTS ARE UNDESIRABLE

C COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

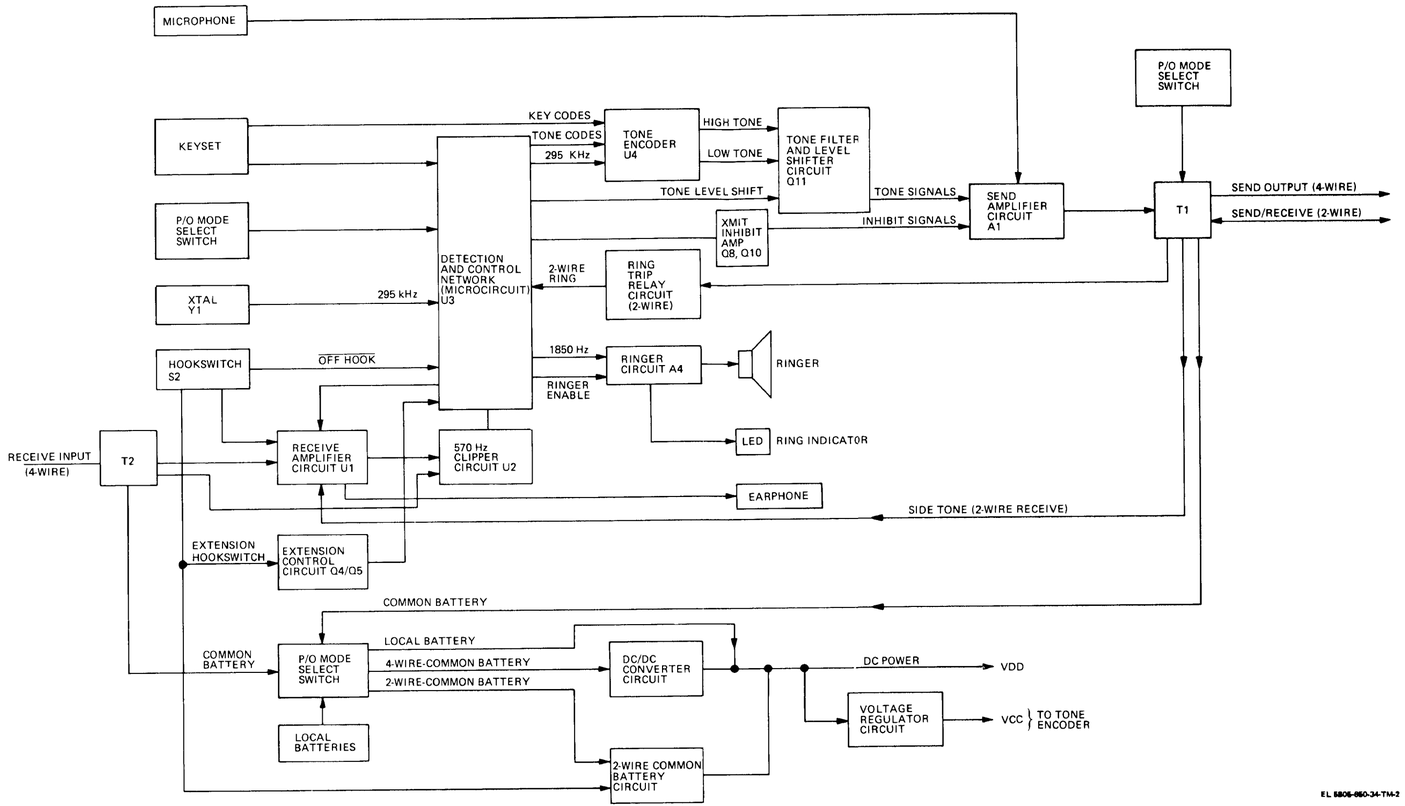


Figure FO-2. Telephone Set TA 838/TT, functional block diagram.

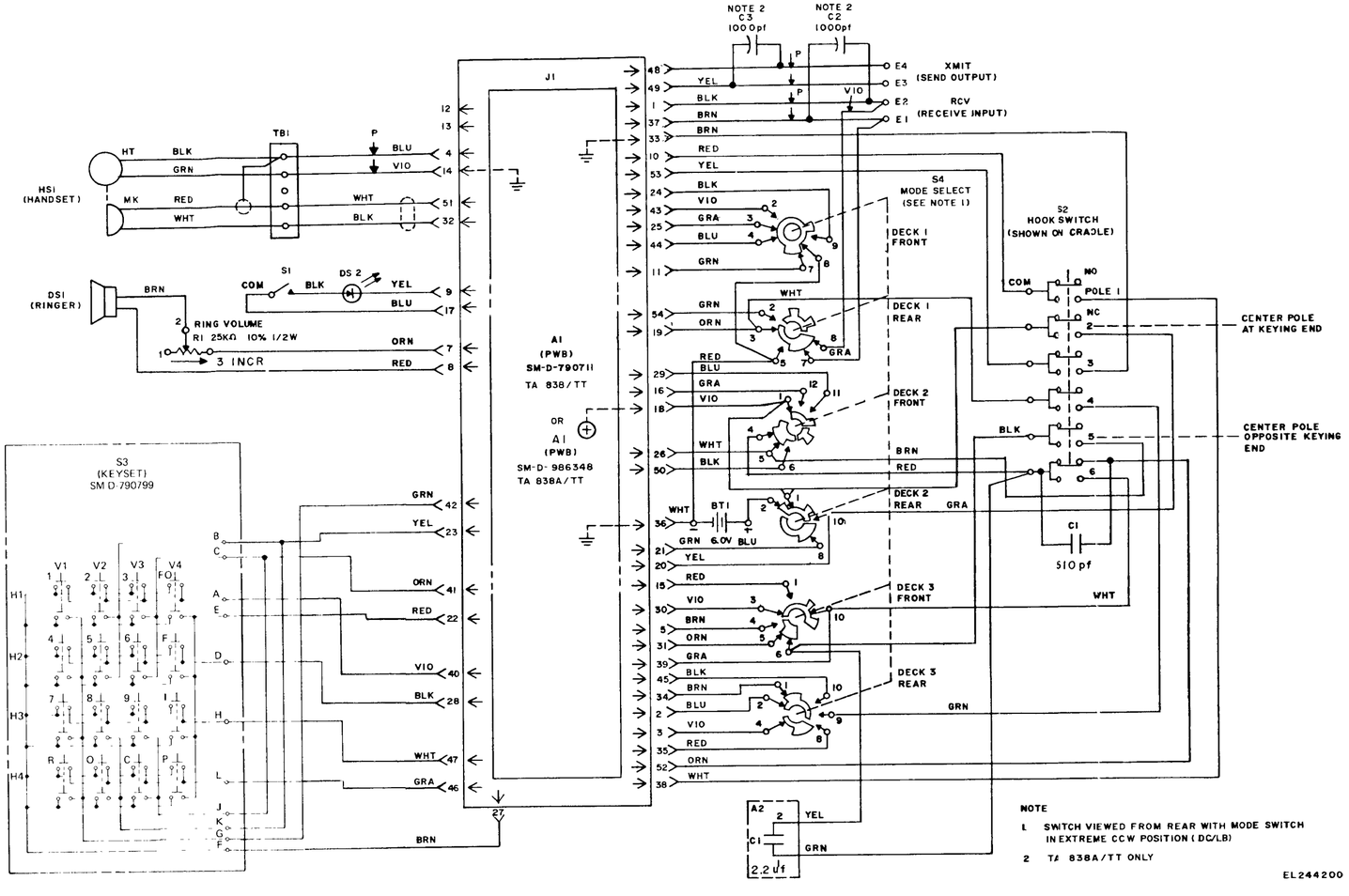


Figure FO-3. Telephone, Set TA 838/TT and TA-838A/TT Wiring Diagram.

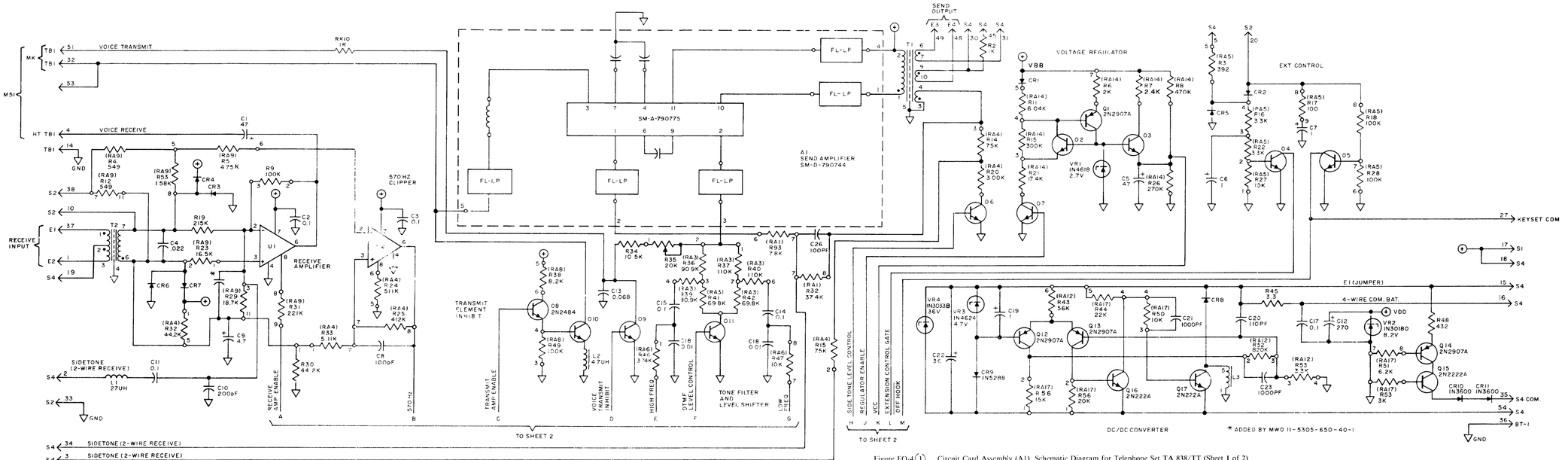
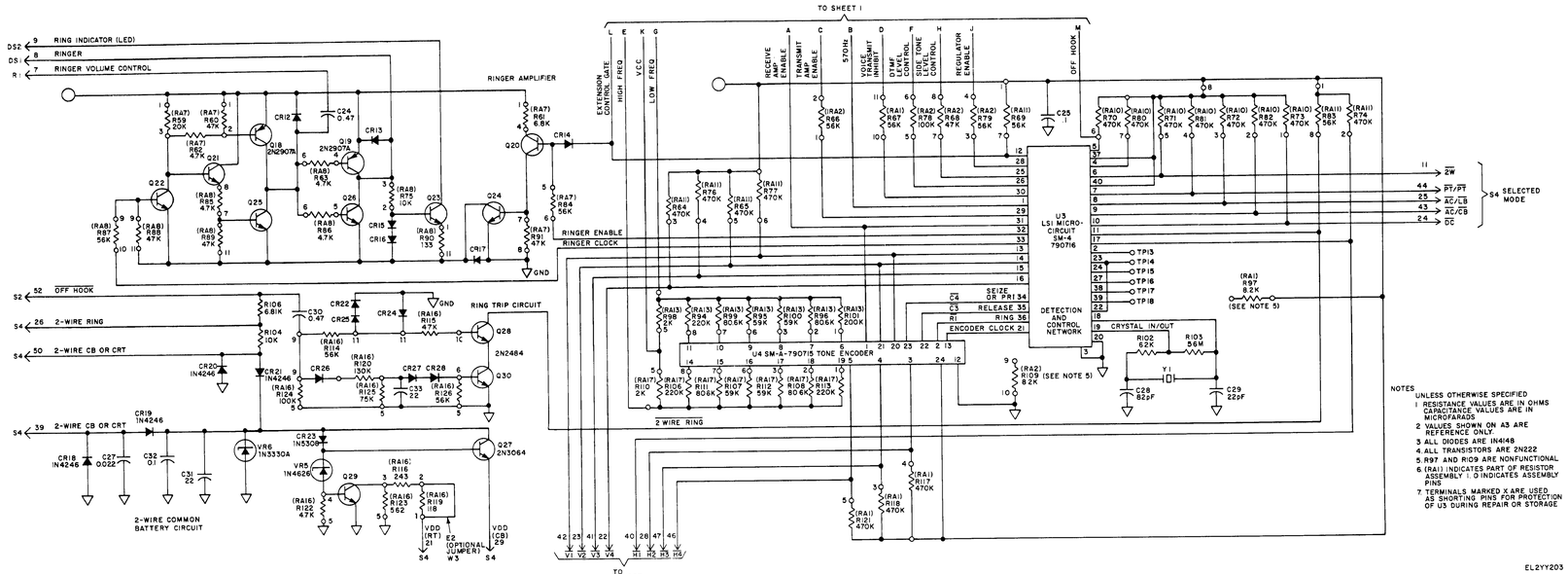


Figure FO-4 (1). Circuit Card Assembly (A1), Schematic Diagram for Telephone Set TA 838/TT (Sheet 1 of 2)



NOTES
UNLESS OTHERWISE SPECIFIED
1. RESISTANCE VALUES ARE IN OHMS CAPACITANCE VALUES ARE IN MICROFARADS
2. VALUES SHOWN ON A3 ARE REFERENCE ONLY.
3. ALL DIODES ARE IN4148
4. ALL TRANSISTORS ARE 2N222
5. R97 AND R109 ARE NONFUNCTIONAL
6. (RA1) INDICATES PART OF RESISTOR ASSEMBLY 1. 0 INDICATES ASSEMBLY PINS.
7. TERMINALS MARKED X ARE USED AS SHORTING PINS FOR PROTECTION OF U3 DURING REPAIR OR STORAGE

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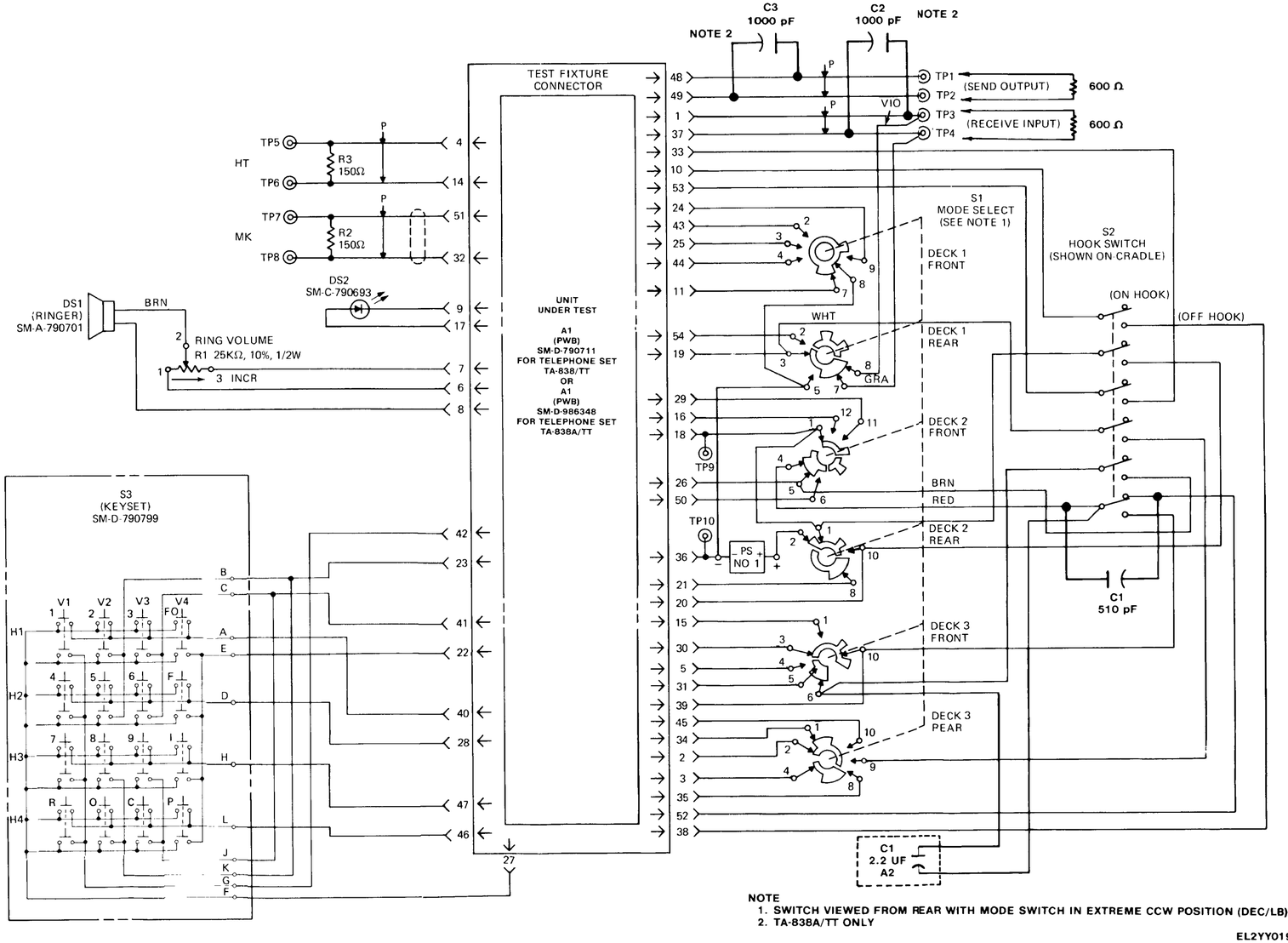
Figure FO-4 (2) Circuit Card Assembly (A) Schematic Diagram for Telephone Set TA-838/TT (Sheet 2 of 2)



NOTE
1. SWITCH VIEWED FROM REAR WITH MODE SWITCH IN EXTREME CCW POSITION (DEC/LB)
2. TA-838A/TT ONLY

EL2YY019

Figure FO-5 Circuit Card Assembly Test Setup Fixture Schematic Diagram for Telephone Set TA-838/TT and TA-838A/TT

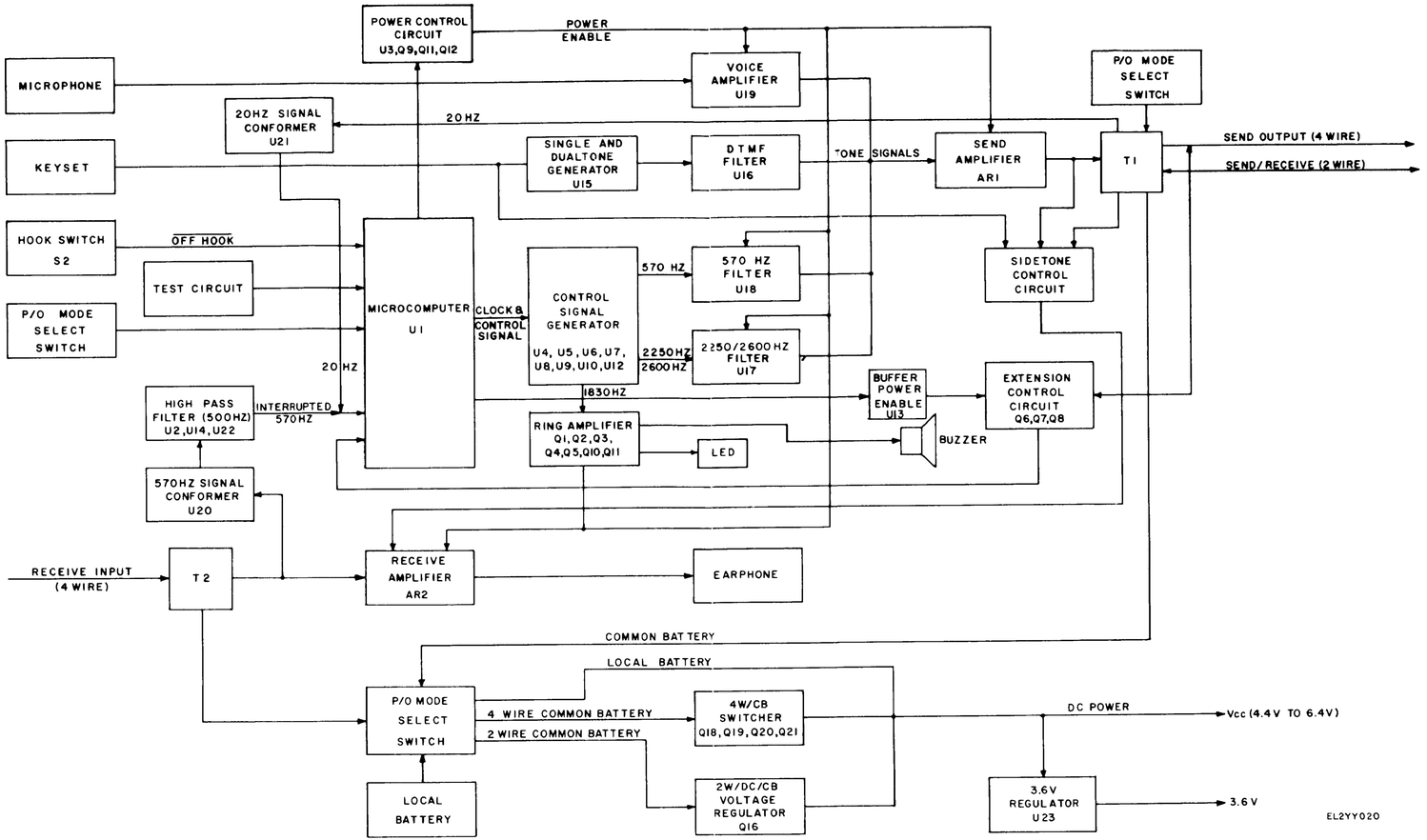


Figure FO-6. Telephone Set TA-838A/TT functional block diagram.

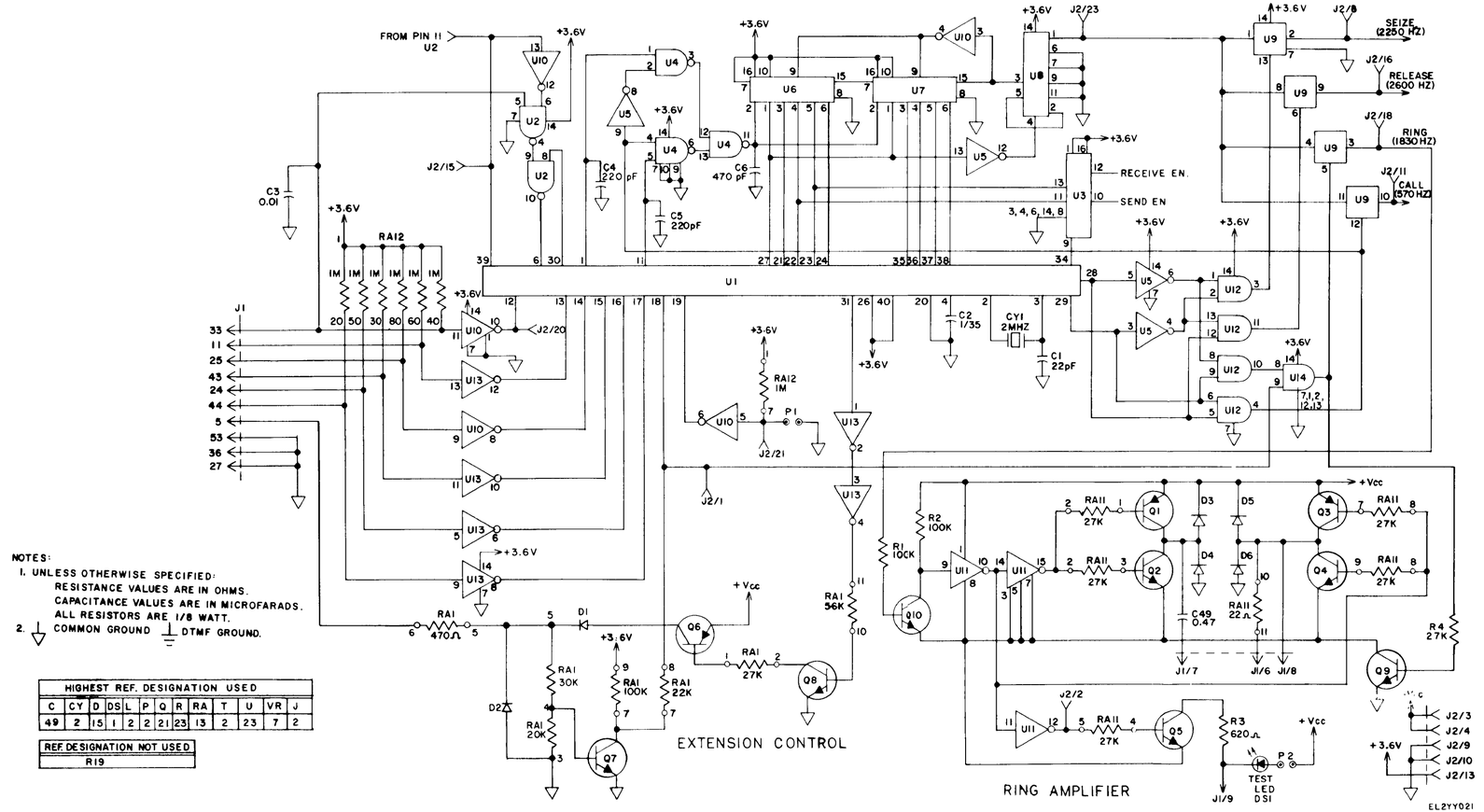


Figure FO-7 (1). Circuit Card Assembly (A1) schematic diagram for Telephone Set TA-838A/TT (sheet 1 of 3)

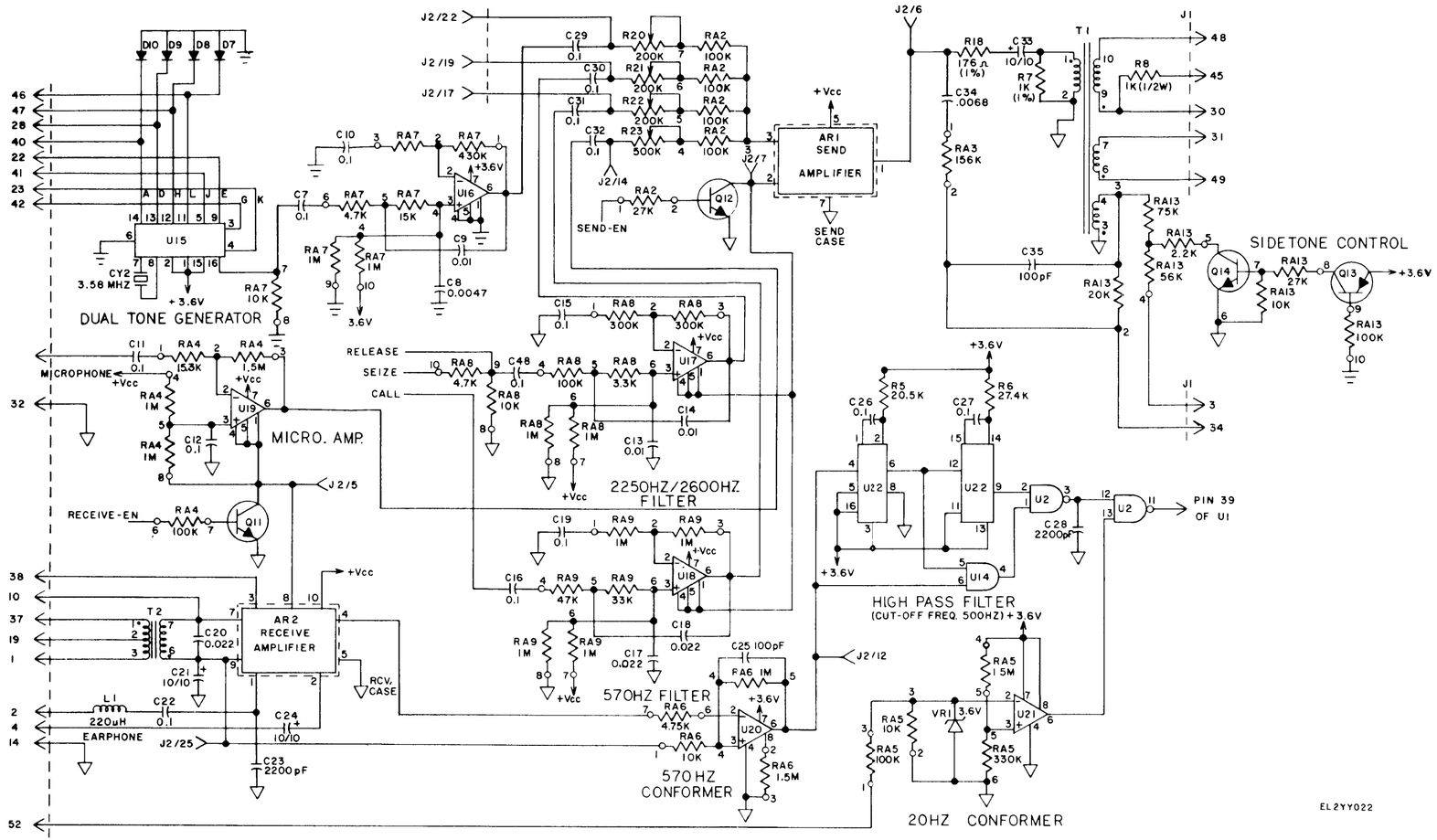


Figure FO-7 (2) Circuit Card Assembly (A1) Schematic Diagram for Telephone Set TA-838A/TT (sheet 2 or 3).

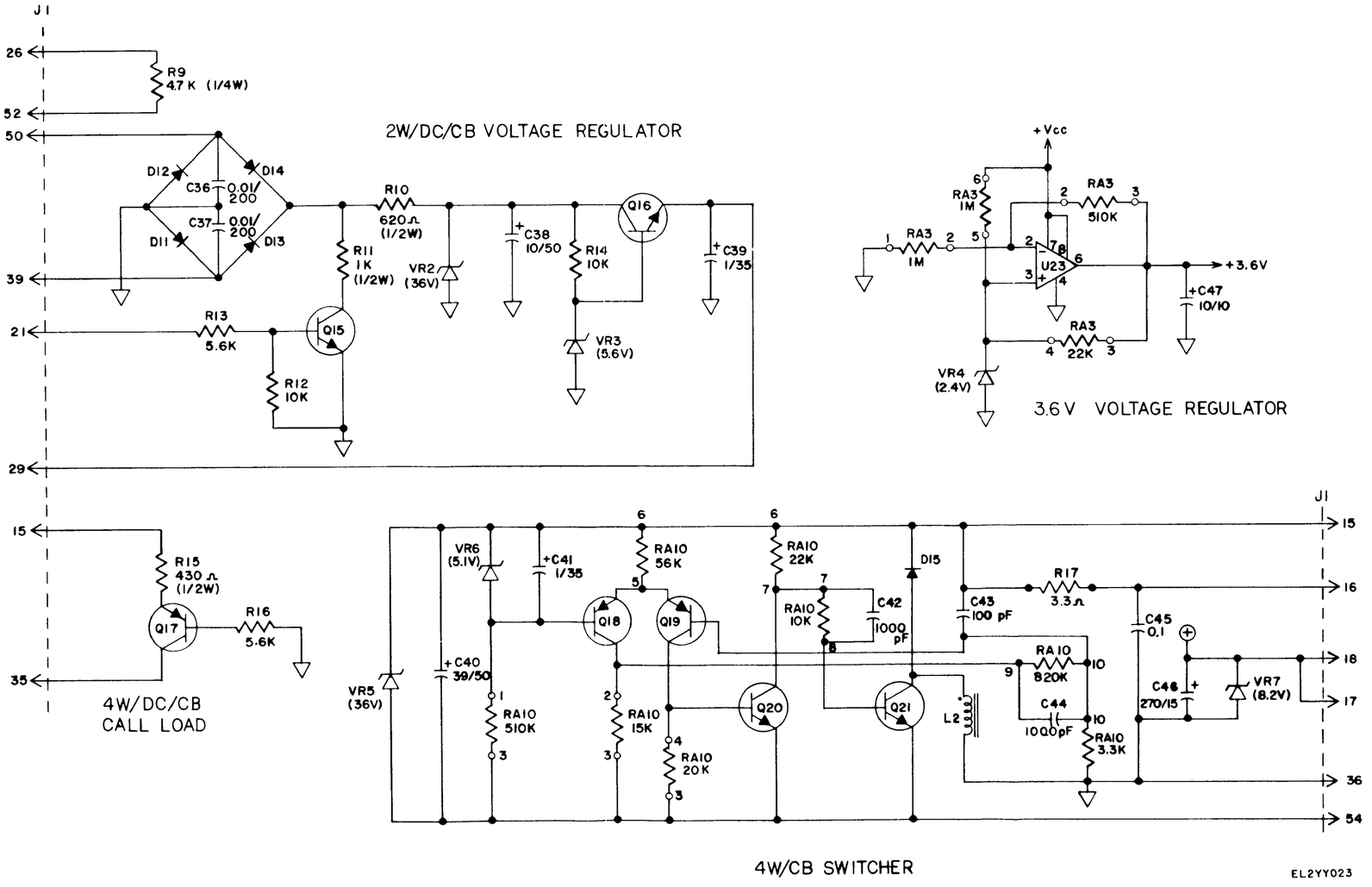


Figure FO-7 (3) Circuit Card Assembly (A1) Schematic Diagram for Telephone Set TA-838A/TT (sheet 3 of 3).

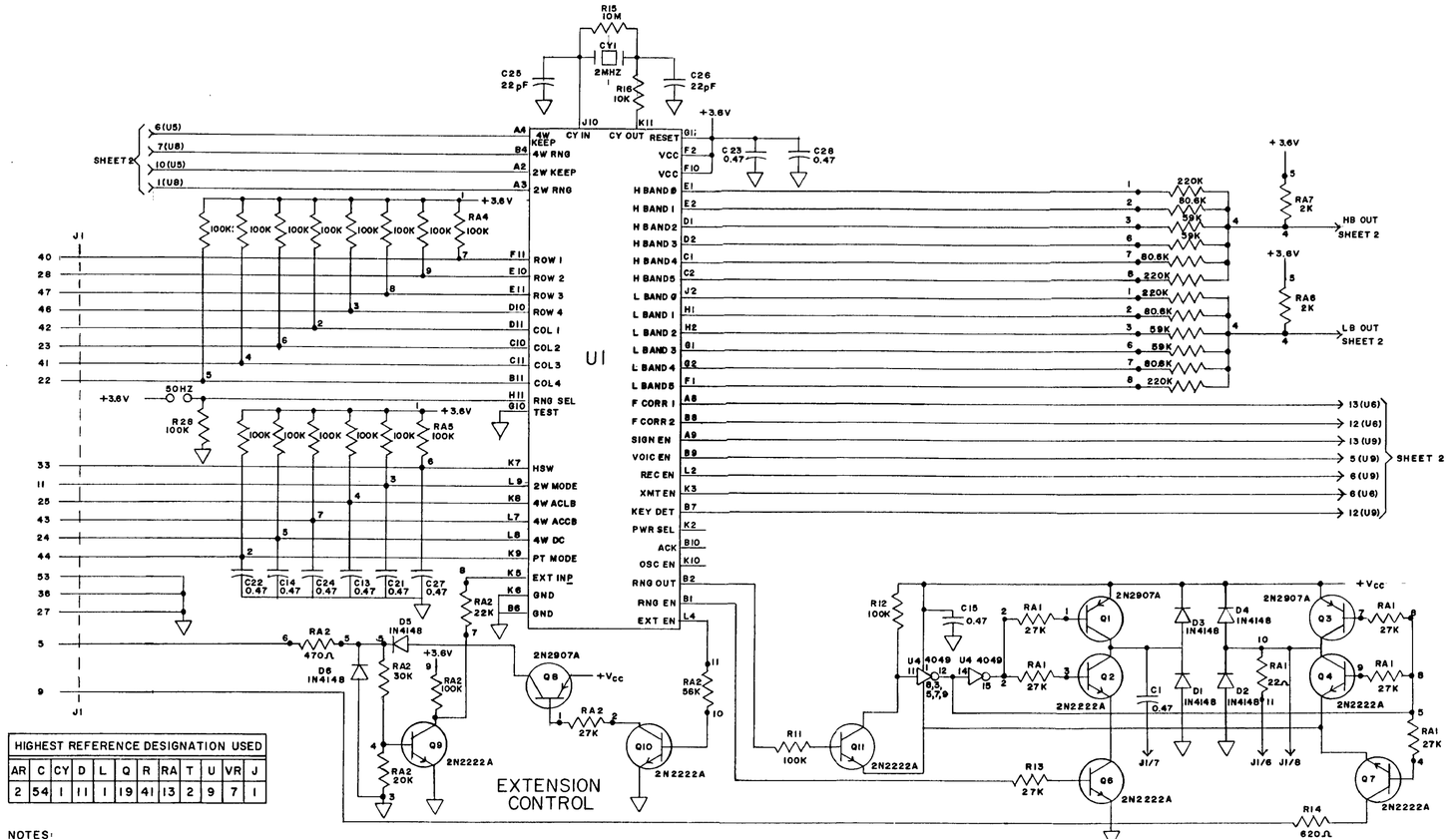


Figure FO-8 (1) Circuit Card Assembly (A1) (Part Number A3188334) schematic diagram for Telephone Set TA 838/TT and Set TA-838A/TT (sheet 1 of 3)

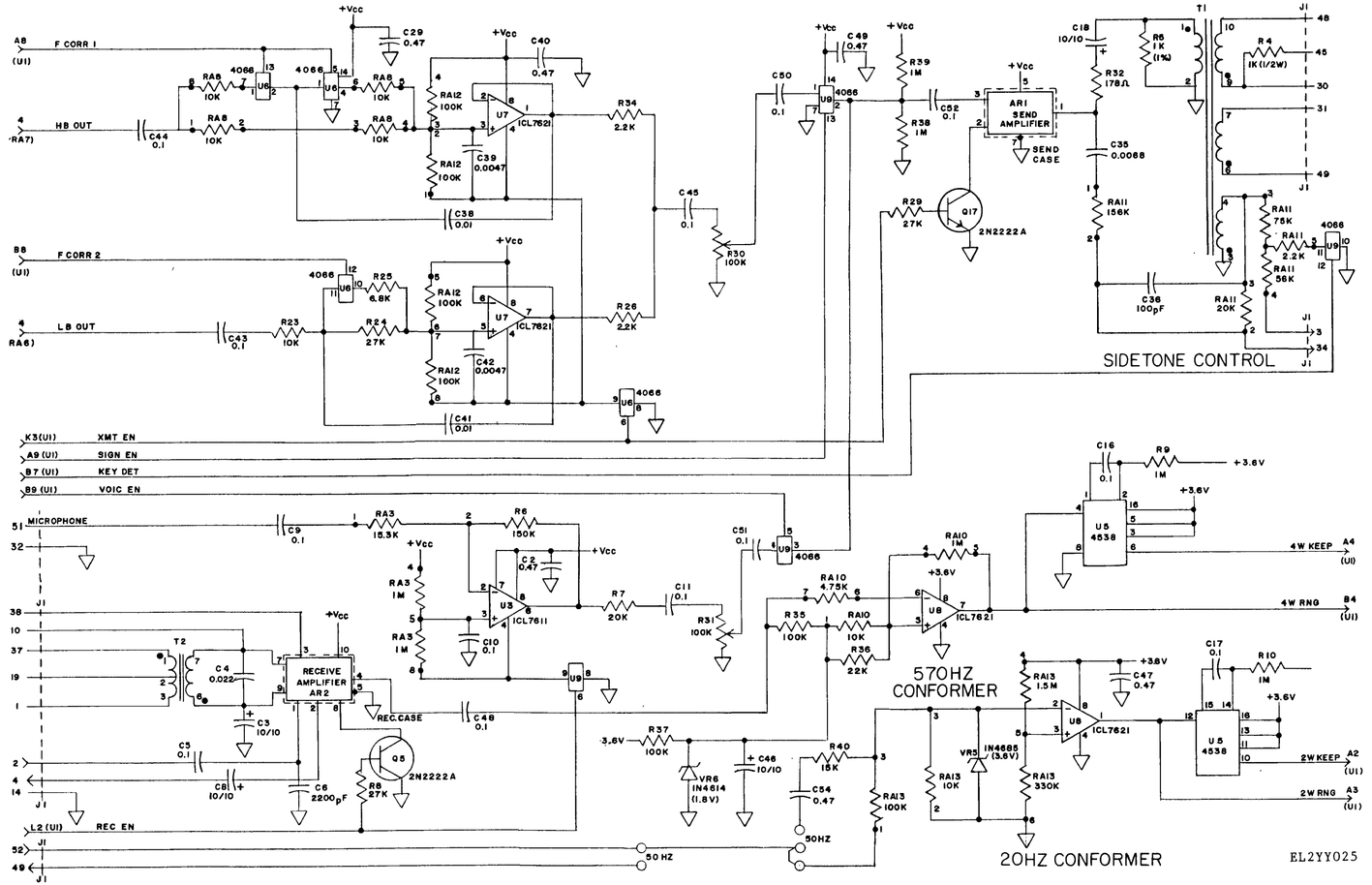


Figure FO-8 (2) Circuit Card Assembly (A1) (Part Number A3188334) schematic diagram for Telephone Set TA 838/TT and Set TA-838A/TT (sheet 2 of 3)

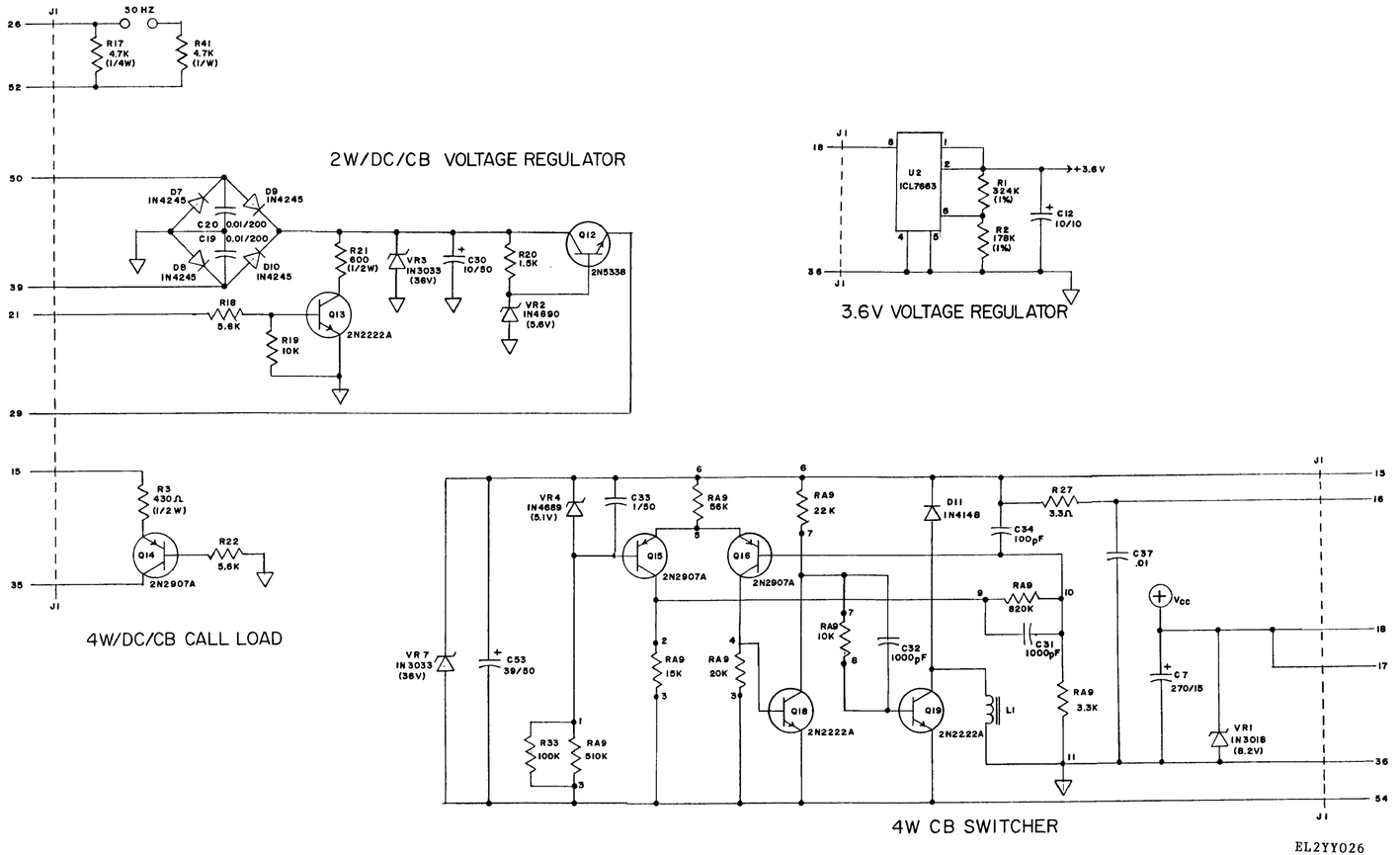


Figure FO-8 (2) Circuit Card Assembly (A1) (Part Number A3188334) schematic diagram for Telephone Set TA 838/TT and Set TA-838A/TT (sheet 3 of 3)