TECHNICAL MANUAL

OPERATOR'S MANUAL

FOR

TRANSMISSION TEST SET, AN/USM-485

(NSN 6625-01-205-6492) (EIC: N/A)

HEADQUARTERS, DEPARTMENT OF THE ARMY
1 JUNE 1987

5 **SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK:**

1 **DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL.**

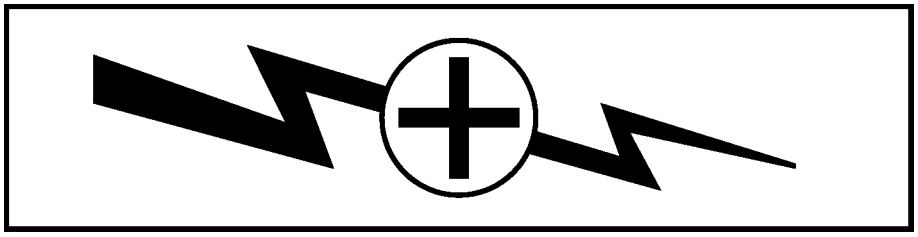
2 **IF POSSIBLE, TURN OFF THE ELECTRICAL POWER.**

3 **IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL.**

4 **SEND FOR HELP AS SOON AS POSSIBLE.**

5 **AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION.**

WARNING



HIGH VOLTAGE

is used in the operation of this equipment.

DEATH ON CONTACT

may result if personnel fail to observe safety precautions.

Never work on electronic equipment unless there is another person nearby who is familiar with the operation and hazards of the equipment and who is competent in administering first aid. When technicians are aided by operators, they must warn them about dangerous areas.

Be careful not to contact high-voltage connections of 115-volt ac input when installing or operating this equipment.

Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.

WARNING

Do not be misled by the terms "LOW VOLTAGE." Potentials as low as 50 volts can cause death under certain conditions.

For First Aid, refer to FM 4-25.11.

CHANGE
No. 1

Headquarters
Department of the Army
Washington, D.C., 2 May 2008

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HAZARDOUS MATERIAL INFORMATION – This document has been reviewed for the presence of solvents containing hazardous materials as defined by the EPCRA 302 and 313 lists by the Engineering, Environment, and Logistics Oversight Office. As of the base document, dated 1 June 1987, all references to solvents containing hazardous materials have been removed from this document by substitution with non-hazardous or less-hazardous materials where possible.

OZONE DEPLETING CHEMICAL INFORMATION – This document has been reviewed for the presence of Class I ozone depleting chemicals by the Engineering, Environment, and Logistics Oversight Office. As of the base document, dated 1 June 1987, all references to Class I ozone depleting chemicals have been removed from this document by substitution with chemicals that do not cause atmospheric ozone depletion.

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iii and 1-0	iii and iv

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By Order of the Secretary of the Army

GEORGE W. CASEY, JR.
General, United States Army
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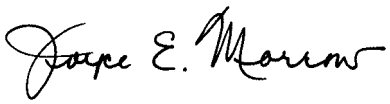

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B Blank	1	5-2 Blank	0
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vi Blank	1	A-2 Blank	0
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1-3 through 1-5	0	B-2	1
1-6 Blank	0	C-1	1
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TECHNICAL MANUAL
NO. 11-6625-3186-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 1 June 1987

OPERATOR'S MANUAL FOR TRANSMISSION TEST SET, AN/USM-485 (NSN 6625-01-205-6492) (EIC: N/A)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), located in the back of this manual, directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also send in your comments electronically to our E-mail address: 2028@redstone.army.mil or by fax, 256-842-6546/DSN 788-6541. For the World Wide Web use: https://amcom2028.redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hard copy 2028.

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This manual is an authentication of the manufacturer's commercial literature which, through usage, has been found to cover the data required to operate this equipment.

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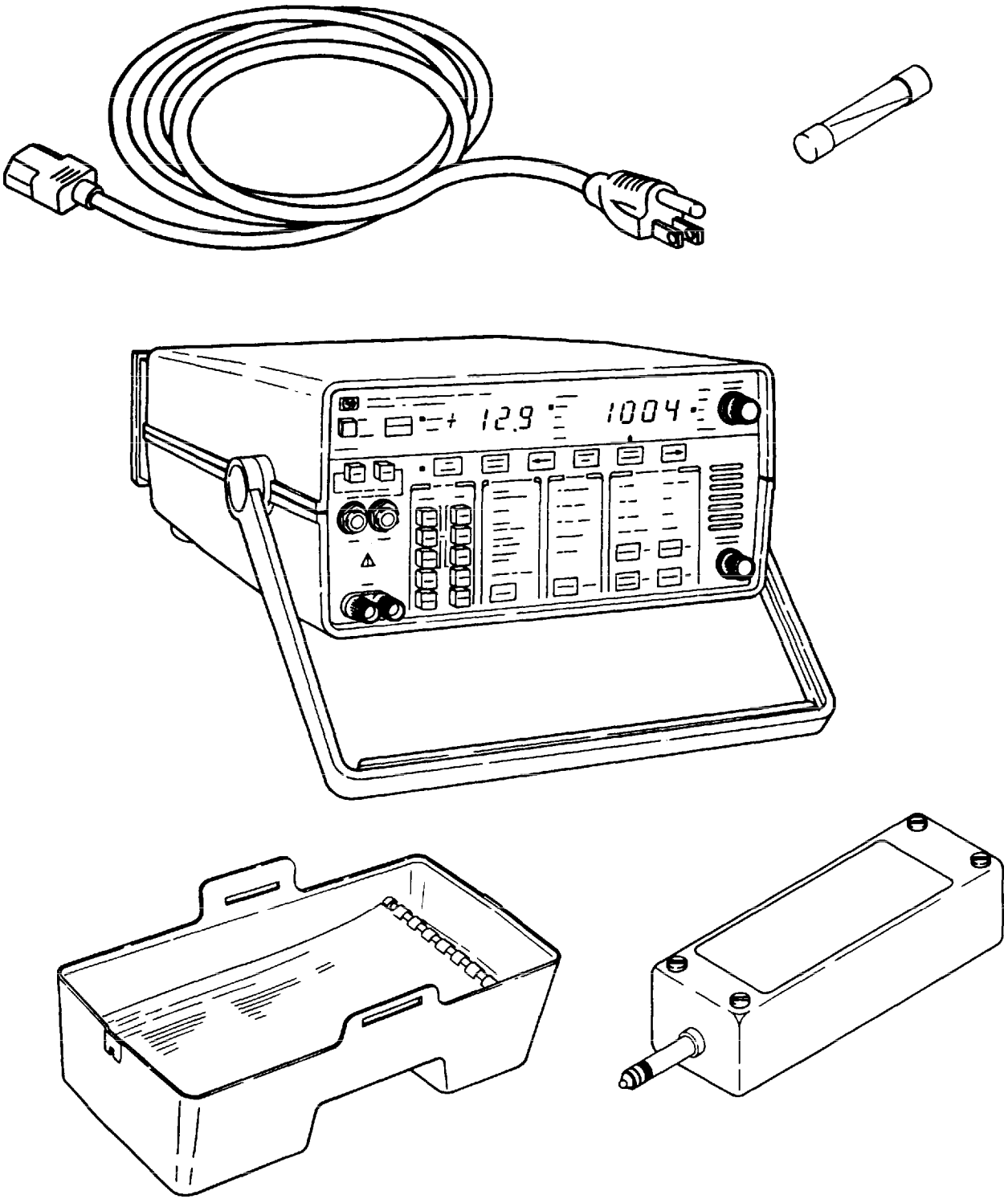


Figure 1-1. Transmission Test Set AN/USM-485

Section I. GENERAL INFORMATION

1-1. SCOPE.

This manual contains instructions for the operation of Transmission Test Set, AN/USM-485. Throughout this manual, the Transmission Test Set, AN/USM-485, is referred to as either the instrument or AN/USM-485.

1-2. CONSOLIDATED ARMY PUBLICATIONS AND FORMS INDEX.

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-3. MAINTENANCE FORMS, RECORDS, AND REPORTS.

a. Report of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA Pam 750-8, as contained in The Army Maintenance Management System (TAMMS) Users Manual.

b. Report of Packaging and Handling Discrepancies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAI 4140.55/SECNAVINST 4355.18A/AFJMAN 23-215.

c. Transportation Discrepancy Report (TDR) (DD 361). Fill out and forward Transportation Discrepancy Report (TDR) (DD 361) as prescribed in DA Pam 25-30.

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIRs).

If your AN/USM-485 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 or performance. Put it on an SF 368 (Product Quality Deficiency Report). Mail it to: Commander, US Army Aviation and Missile Command, AMSAM-MMC-MA-NM, Redstone Arsenal, AL 35898-5000. We'll send you a reply.

1-5. ADMINISTRATIVE STORAGE.

Administrative storage of equipment issued to and used by army activities will have Preventive Maintenance Checks and Services (PMCS) performed before storing. When removing the equipment from administrative storage, the PMCS checks should be performed to assure operational readiness.

1-6. DESTRUCTION OF ARMY ELECTRONICS MATERIEL.

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

1-7. GENERAL DESCRIPTION.

The AN/USM-485 is a portable, battery powered, Transmission Impairment Measuring Set (TIMS) which measures wideband data and voice impairments. The frequency range over which measurements are made is 20Hz to 110KHz. There are four permanently stored, fixed frequencies of 404, 1004, 2804, and 2713Hz. Any other four frequencies may be temporarily assigned and stored by the user.

1-8. INSTRUMENT IDENTIFICATION.

A 10 character serial number (0000A00000) is inscribed on the rear panel. The first four digits and the letter are the serial prefix. The serial prefix will change only if changes are made to the instrument. The last five numbers form the serial suffix which is unique to each instrument. An additional serial number appears on the information label located on the top cover.

1-9. SPECIFICATIONS.

RECEIVER SPECIFICATIONS:

- Level:
  - Range ..... -60 to +13dBm
  - Resolution 0.1dB
- Accuracy:
  - 20Hz-50Hz, -60 to +13dBm ..... ±1.0dB
  - 50Hz-200Hz, -60 to-40dBm ..... ±0.6dB
  - 50Hz-200Hz, -40 to +13dBm ..... ±0.5dB
  - 200Hz-15KHz, -60 to 40dBm ..... ±0.4dB
  - 200Hz-15KHz, -40 to +13dBm ..... ±0.2dB
  - 15KHz-60KHz, -60 to -40dBm ..... ±0.8dB
  - 15KHz-60KHz, -40 to +13dBm ..... ±0.5dB
  - 60KHz-85KHz, -60 to -40dBm ..... ±1.0dB
  - 60 KHz-85KHz, -40 to +13dBm ..... ±0.5dB
  - 85 KHz-110KHz, -60 to +13dBm ..... ±0.2dB
  - 1004Hz, -20 to +13dBm ..... ±1.0dB
- Frequency:
  - Range ..... 20Hz to 110KHz
  - Resolution:
    - 20Hz-10KHz ..... ±1Hz
    - 10KHz-110KHz ..... ±10Hz

TRANSMITTER SPECIFICATIONS:

- Level:
  - Range ..... -40 to +12.9dBm
  - Resolution 0.1dB
  - Flatness (-40 to +10dBm):
    - 20Hz-200Hz ..... ±1.0dB
    - 200Hz-15KHz ..... ±0.2dB
    - 15KHz-60KHz ..... ±0.5dB
    - 60 KHz-85KHz ..... ±0.5dB
    - 85KHz-110KHz ..... ±1.5dB
  - Holding Tone ..... 1004Hz ±0.1Hz (-40 to +10dBm)
- Frequency:
  - Range ..... 20 Hz to 110KHz
- Stability:
  - Frequency 0.1%/hour
  - Level ..... < .05dB/hour

Distortion (Measured with respect to fundamental, includes harmonics, spurious, and background noise within a filter with a 3dB bandwidth of 4KHz or $4f_0$, whichever is greater):

- 30Hz-100Hz, -40 to 0dBm ..... -40dB
- 30Hz-100Hz, 0 to +10dBm ..... -30dB
- 100Hz-4KHz, -40 to 0dbm ..... -50dB
- 100Hz -4KHz, 0 to +10dBm ..... -55dB
- 4KHz -110Hz, -40 to 0dBm ..... -4dB
- 4KHz -110Hz, 0 to +10dBm ..... -50dB
- 1004Hz (THD using 4KHz filter), 0dBm ..... -65dB

Store and Recall Functions:

- SF Skip ..... At power up skips a band from 2450-2750Hz
- Frequencies (at power up):
  - F1 ..... 404Hz
  - F2 ..... 1004Hz
  - F3 ..... 2804Hz
  - F4 ..... 2713Hz

User may define and store frequencies into F1 thru F4.

1-9. SPECIFICATIONS—Continued.

NOISE SPECIFICATIONS (with and without holding tone):

Range:
- 600Ω and 900Ω ..... 0 to 100dBrn
- 135 Ω ..... Lower limit is 7dB higher

Resolution ..... ldB

Accuracy:
- 10 to 100dBrn ..... ±1dB
- 0 to 10dBm ..... ±2dB

To Ground ..... 50 to 120dBm, ±2dB (no hold tone)

Filters provided:
- C-Message
- 3KHz flat
- 15 KHz flat
- Program
- 50KBit
- 1010Hz Notch filter with >50dB rejection from 995 to 1025Hz

Detector ..... QUASI RMS

Message Circuit Noise ..... Transmitter is quiet terminated

IMPULSE NOISE SPECIFICATIONS:

Level Range ..... -40 to +13dBm

Balanced
- Range ..... 30 to 109dBm
- Accuracy ..... ±1dB
- Resolution ..... ldB

Number of Counters 3

Threshold Ranges (600Ω):
- Low ..... 30 to 109dBm
- Mid ..... 4dB above low to a maximum of 109dBm
- High ..... 8dB above low to a maximumof 109dBm
- Loss of Holding Tone Indication ..... Minus sign (-)
- Threshold Accuracy (above 40dBm) ..... ±ldB

Count Capacity 0-9999

Count Rate ..... 8 counts/see

Timer Periods ..... 5, 15, 60 MIN and continuous

Timer Period Accuracy ..... ±5%

SIGNAL TO NOISE RATIO SPECIFICATIONS:

Signal Level Range ..... -40 to +13dBm

Ratio Range ..... 10 to 45dB

Resolution ..... ldB

P/AR (Peak to Average Ratio) SPECIFICATIONS:

Frequency ..... 16 frequencies between 140 and 3890Hz

Level Range ..... -40 to 0dBm

Resolution ..... ldB

Range/Accuracy:
- 30-110 units ..... ±2 units
- 110-120 units ..... ±4 units

1-9. SPECIFICATIONS—Continued.

LINE HOLDING SPECIFICATIONS:

Hold Circuits ..... 2 each, 23 ma

TRANSMIT/RECEIVE SPECIFICATIONS:

Impedance ..... 135Ω, 600Ω, 900Ω (independently setable for transmit and receive side)
Bridging Loss:
600Ω and 900Ω ..... 0.2dB to 20KHz
135Ω ..... 0.2dB above 50Hz
Circuit to Ground ..... No DC circuit path to ground from any input or output terminal under normal measurement conditions
Reversing Switch ..... Transmit and receive terminations
Terminals ..... WECO 310 type jacks

INPUT/OUTPUT PROTECTION SPECIFICATIONS:

Longitudinal ..... ≤200 VRMS (DC or 60Hz)
DC Blocking ..... ≤300V
Transients ..... <600V spike having l0µsec rise-time and 1000µsec falltime, applied through a 6Ω resistor to balanced input or from either terminal to ground

BATTERY OPERATION SPECIFICATIONS:

Battery Voltage ..... +6, +15.6, –15.6Vdc
Battery Operating Time ..... 2.5 hours at 25°C
Recharge Time ..... 17 Hours at 10 to 40°C
Protection ..... Both overcharge and deep discharge protection

OPERATING POWER REQUIREMENTS:

AC Voltage ..... 115/230 Vac
Frequency ..... 45 to 66Hz.
Battery Voltage ..... +6, +15.6, –15.6Vdc

ENVIRONMENTAL REQUIREMENTS:

Operating Temperature Range ..... -4 to +50°C (+24 to +122°F)
Operating Altitude ..... <4,570 meters (15,000 feet)
Operating Humidity ..... 5 to 95% at 40°C

OVERALL DIMENSIONS AND WEIGHT:

Height ..... 4.4 IN. (11.2cm)
Width ..... 10.2 IN. (25.9 cm)
Depth ..... 16.0 IN. (40.6cm)
Weight ..... 15.5 LB (7.1 kg) NET

1-10. STORAGE.

The instrument should be stored in a clean, dry environment. The following environmental limitations apply to both storage and shipment:

Temperature	-40°C to +75°C (-40 to + 165°F)
Humidity	5% to 95% (maximum wet-bulb temperature = 40°C)
Altitude	15,300 meters (50,000 feet)

1-11. SAFETY CONSIDERATIONS.

This product has been designed and tested according to International Safety Requirements. To insure safe operation and to keep the product safe, the information, cautions, and warnings in this manual must be heeded.

CAUTION

Before applying power, make sure that the rear power input module is set to the line voltage in use and that the correct fuse is installed.

1-12. RELATED MANUALS.

Operating information is summarized on a card in the instrument cover.

1-13. BATTERY OPERATION.

Nickel-Cadmium (NiCad) batteries enable the AN/USM-485 to be used in areas removed from AC power. Typical operating time is 2.5hrs when fully charged. The batteries are charged whenever the instrument is connected to an AC source and the POWER switch is in STBY.

1-14. WARRANTY INFORMATION.

The AN/USM-485 is warranted by Hewlett-Packard Company for one year. Warranty starts on the date of shipment to the original buyer. Report all defects in material or workmanship to your supervisor who will take appropriate action.

Section II INSTALLATION

2-1. INTRODUCTION.

This section contains information on initial inspection, preparation for use, and power requirements.

2-2. INITIAL INSPECTION.

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. If the contents are incomplete, if there is mechanical damage or defect, or if the instrument does not pass the self check, notify next higher level of maintenance.

2-3. PREPARATION FOR USE.

CAUTION

Before connecting this instrument to an AC power source, be sure that the rear panel line module is set to the same voltage as the AC source and that the correct fuse for that AC voltage is installed (0.5 Amp for 120 Vat, 0.25 Amp for 220 Vat).

BATTERY REQUIREMENTS.

This instrument requires 17 hours of charging time with POWER switch in STBY position and CHARGE indicator on.

NOTE

Battery does not charge with instrument POWER switch in ON position.

AC POWER REQUIREMENTS.

This instrument requires an AC power source of 100, 120, 220, or 240Vac, +5%-10%, 48 to 66Hz single phase. Power consumption is no more than 25 VA.

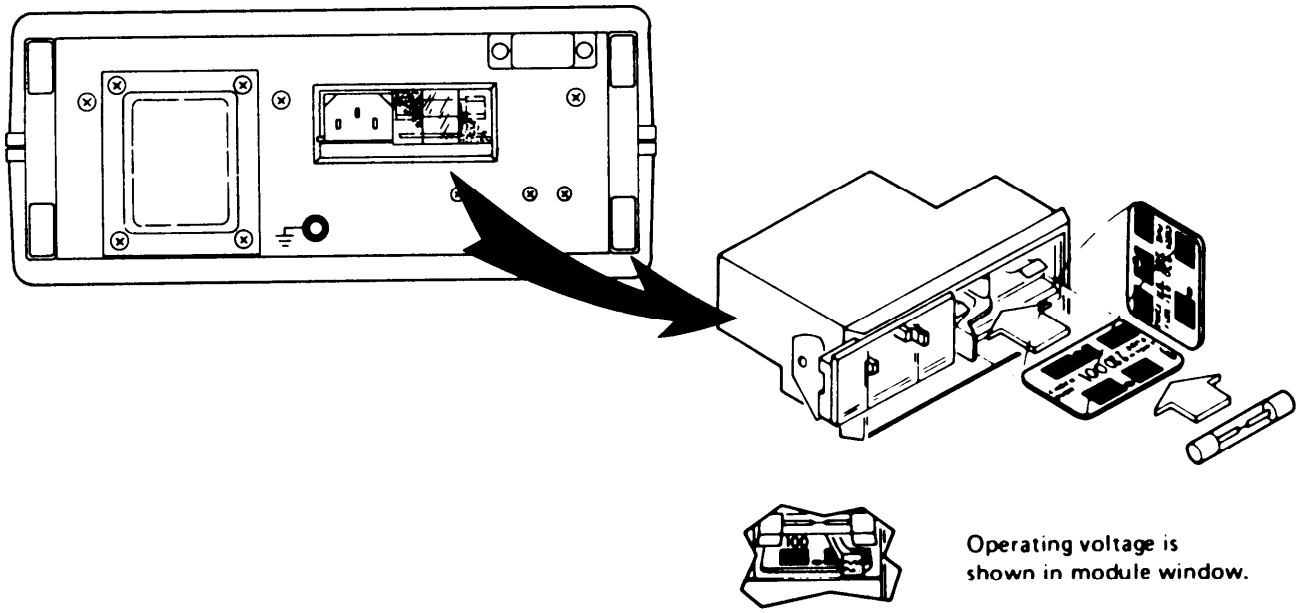
LINE VOLTAGE SELECTION

Perform the following instructions for line voltage selection.

NOTE

PC board and fuse are factory installed for 120 Vac operation.

1. Disconnect power cable.
2. Slide cover door to left.
3. Rotate FUSE-PULL to left. Remove the fuse.
4. Remove the PC board by pulling it out. Select operating voltage by positioning PC board to show desired voltage on top left side.
5. Reinsert the PC board.



6. Rotate FUSE-PULL back into normal position and reinsert fuse. Use table below to select correct fuse value.

Input Voltage	PC Board Position	Fuse
90 to 105	100	0.5 amp
108 to 126	115/120	0.5 amp
198 to 231	220	0.25 amp
216 to 252	230/240	0.25 amp

POWER CABLE

> Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal can make this instrument dangerous. Intentional interruption is prohibited.

This instrument is supplied with a three-wire power cable. When connected to an appropriate three-wire AC power receptacle, the cable grounds the instrument chassis.

2-4. OPERATING ENVIRONMENT.

TEMPERATURE

The instrument may be operated in temperatures from -4° to +50°C (24° to + 122°F) on both AC and battery power.

HUMIDITY

The instrument may be operated in environments with humidity from *5%* to 95% R.H. @ 40°C. However, the instrument should be protected from temperature extremes'which cause condensation within the instrument.

ALTITUDE

The instrument may be operated at altitudes up to 15,000 feet (4570 meters).

Section III PRINCIPLES OF OPERATION

3-1. GENERAL FUNCTIONAL DESCRIPTION.

(Fig 3-l). The AN/USM-485 is a Transmission Impairment Measurement Set which provides both the test signals and measurement capabilities required for testing the transmission characteristics of communications lines.

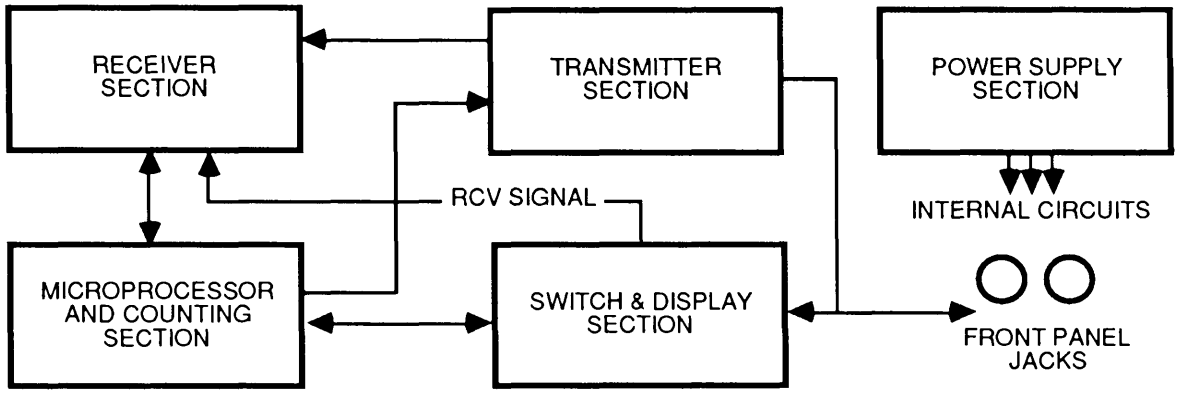


Figure 3-1. AN/USM-485 Simplified Block Diagram.

1. The Microprocessor and Counting section processes data from the receiver, controls counting functions, and controls general operation of the instrument. This section provides control and sequencing functions for all measurements. The counting circuitry provides impulse noise detector processing, frequent y measurement and drop-out detection.

2. The Receiver section processes signals, monitors frequency levels, and provides signals to the microprocessor and counting circuits. AC input from the switch board or transmitter board is filtered and autoranged by the receiver. It detects full wave average or quasi-rms level of the signal. Then a pulse stream with the frequency proportional to the level detected is sent to the microprocessor and counters. It also sends information to the microprocessor if the incoming signal exceeds preset thresholds.

3. The Transmitter section generates test signals for making measurements. This section receives frequency and signal information from the microprocessor, synthesizes the appropriate waveform, and sends it out through the switch board which provides a transmit monitor signal to the receiver board. In several measurement modes the transmitter has no output signal but is quiet terminated.

4. The Switch and Display section interfaces with communication lines and the operator. These circuits have four major functions:
   - Provide data storage and drive for the segment display and the annunciator LEDs.
   - Connect the front panel membrane switches to the microprocessor and counting circuits.
   - Provide an audio amplifier and speaker, to monitor the received signal and beep generating circuit signal when a touch button is pressed.
   - connect the front panel jacks to the transmitter and receiver after selection of the proper impedances.

   This section also provides dial connections and hold currents as required, and receiver termination selections are routed to the microprocessor and control circuits.

5. The power supply provides power for internal circuitry. +5Vdc at 600mA and ±14Vdc at 200mA are supplied when in LINE SWITCH is in ON position, and the three internal batteries are charged when in STBY. When fully charged, batteries provide 2.5 hours of portable operation.

Section IV OPERATION

4-1. INTRODUCTION.

This paragraph describes all of the operator controls and indicators for the AN/USM-485. Due to the large number of controls and indicators on the front panel, it is necessary to separate the panel into three different portions. Figure 4-1 (views A thru C) shows each portion of the front panel. The rear panel is shown in figure 4-2.

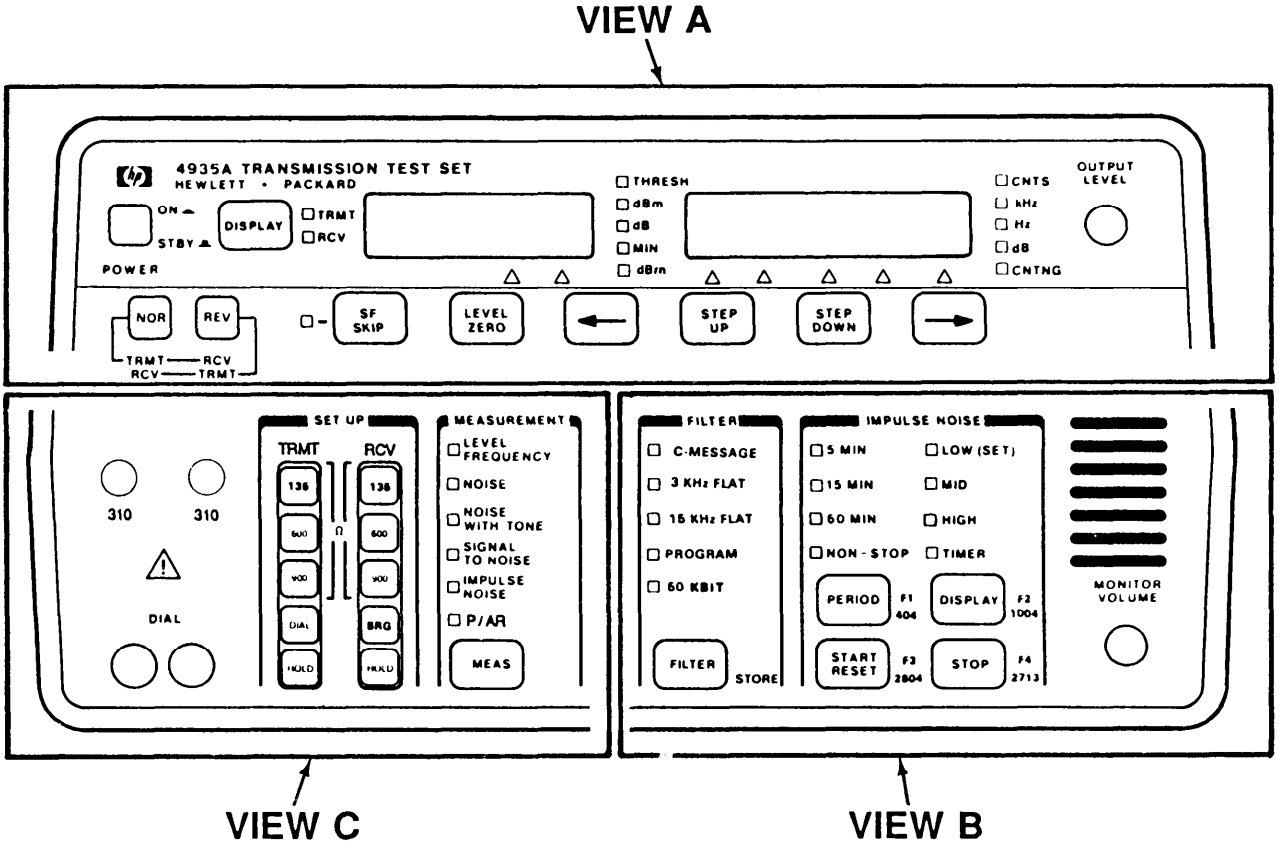
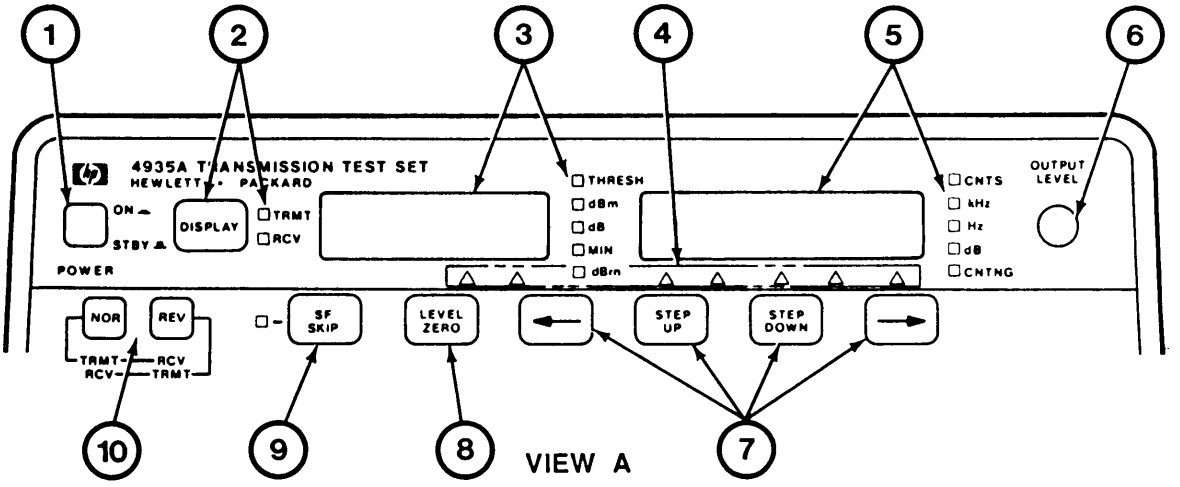
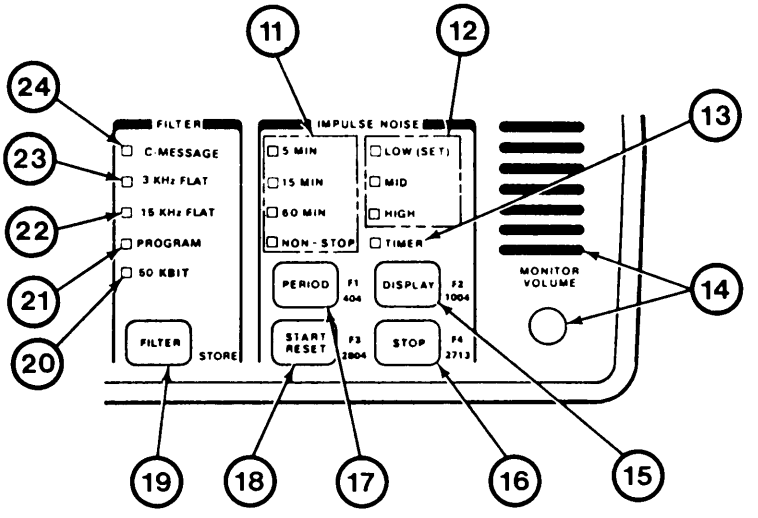


Figure 4-1. Operator's Controls, Indicators, and Connectors, front view.



KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
1	POWER Switch	Switches power to front panel when in ON position. In STBY position power is available to recharge battery.
2	DISPLAY key	Selects either the transmitted (TRMT) or the received (RCV) signal to be displayed. Corresponding LED will light.
3	Left Display	Corresponding LED lights to indicate if displaying THRESHold, dBm, dB, MINutes, or dBrn. Displays CHG when internal battery is being charged.
4	Digit Indicator	LED lights to indicate which digit can be changed using STEP UP or STEP DOWN keys.
5	Right Display	Corresponding LED lights to indicate if displaying CNTS (counts) , KHz, *Hz*, dB, or CNTNG (counting).
6	OUTPUT LEVEL Control	Adjusts the transmitter output level continuously from –40dBm to +12.9dBm. Output level is displayed on left display.
7	STEP UP, STEP DOWN, <—, and —> keys	In LEVEL FREQUENCY Mode (right display); <— or —> selects the position of digit to be increased or decreased. Lighted cursor indicates one of five digit positions. Digit value is incremented by pressing STEP UP and decremented by pressing STEP DOWN. Holding the STEP UP or STEP DOWN key depressed causes the actions to repeat. In IMPULSE NOISE RCV Mode (left display); <— or —> selects the position of the threshold digit to be increased or decreased. Lighted cursor indicates one of two digit positions. Digit value is incremented by pressing STEP UP and decremented by pressing STEP DOWN. THRESH LED, dBrn and LOW (SET) LED will be on.

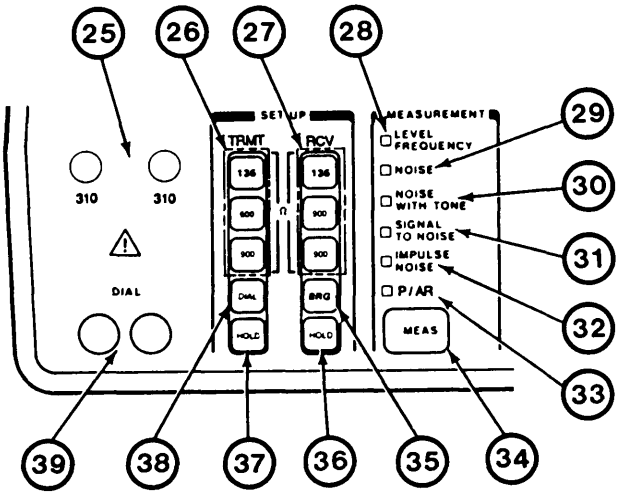
KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
8	LEVEL ZERO key	Sets a 0dB reference. All further measurements will be made in dB relative to this reference. dB LED will light. A "-" (minus) dB reading indicates levels higher than the reference level. operates only in RCV LEVEL FREQUENCY mode. Press once to set reference (dB), press again for absolute (dBm).
9	SF SKIP key	SF Skip (single frequency skip) automatically prevents the transmitter from transmitting within ± 150Hz (300Hz band) of a designated frequency. Preset frequency is 2600Hz This eliminates accidental disconnection by SF signaling units on dial-up lines. Operates only in LEVEL FREQUENCY mode. LED will light when key on. Any skipped frequency can be programmed using the STORE key.
10	NOR and REV keys	NOR switch depressed connects the left jack to the transmitter and the right jack to the receiver. REV switch depressed connects the left jack to the receiver and the right jack to the transmitter. Both switches out simultaneously or depressed simultaneously internally loops the transmitter to the receiver.



VIEW B

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
11	5 MIN/15 MIN/60 MIN/ NON-STOP LED's	Indicates time for counting in IMPULSE mode. Press PERIOD key to select desired time. Left display will indicate time selected/remaining in MINutes with TIMER LED on. Only operates in RCV IMPULSE MEASUREMENT mode.
12	LOW (SET)/MID/HIGH LED's	Indicates threshold level for counting in IMPULSE mode. Press DISPLAY key to select desired level. Any threshold value can be entered using LOW (SET), then STEP UP, and STEP DOWN keys. Left display will indicate THRESHold level in dBrn, Only operates in RCV IMPULSE MEASUREMENT mode,
13	TIMER LED	Allows IMPULSE NOISE mode selected/remaining time to be shown in left display. Press DISPLAY key to select. Only operates in RCV IMPULSE MEASUREMENT mode.
14	MONITOR VOLUME Control and Speaker	Permits adjustable volume for listening to the circuit under test (RCV) or to the Test Set Transmitter (TRMT).
15	DISPLAY (F2 1004) key	In RCV IMPULSE MEASUREMENT mode, changes the display through each of the threshold values and their impulse noise counts then displays the TIMER setting selected by the PERIOD key. Provides the 1004Hz preprogrammed frequency for LEVEL FREQUENCY Mode.
16	STOP (F4 2713) key	In RCV IMPULSE MEASUREMENT mode, stops the impulse noise test but retains the displayed count values. Provides the 27 13Hz preprogrammed frequency for LEVEL FREQUENCY Mode.
17	PERIOD (F I 404) key	In RCV IMPULSE MEASUREMENT mode, sets the timer for the impulse noise test (5 MIN, 15 MIN, 60 MIN or NON-STOP). Provides the 404Hz preprogrammed frequency for LEVEL FREQUENCY Mode.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
18	START RESET (F3 280) key	In RCV IMPULSE MEASUREMENT mode, starts the impulse noise test and resets the count to zero for every threshold. Provides the 2804Hz preprogrammed frequency for LEVEL FREQUENCY Mode.
19	FILTER (STORE) key	Selects desired weighting filter. Selected filter LED will light. In LEVEL FREQUENCY MEASUREMENT mode, the STORE function enables frequencies on right display to be stored for recall using the Fl, F2, F3, or F4 keys. The STORE function is also used to change the SF SKIP Frequency.
20	50KBit	This filter is designed to measure weighted noise on wideband data circuits. Selection of this filter in IMPLUSE MEASUREMENT mode will quiet terminate the transmitter instead of sending a hold tone.
21	Program	This weighted filter is designed for weighted noise measurements on program channels used primarily by the broadcast industry to communicate between studio and transmitter site. Selection of this filter in IMPLUSE MEASUREMENT mode will quiet terminate the transmitter instead of sending a hold tone.
22	15 KHz Flat	This filter is designed for measurements on program channels. Like the 3KHz flat filter, it includes low frequency noise in the measurement. Selection of this filter in IMPLUSE MEASUREMENT mode will quiet terminate the transmitter instead of sending a hold tone.
23	3KHz Flat	This filter has a response that provides much less attenuation to the low frequencies (60Hz to 500Hz) than the C-message filter. By comparing a 3KHz flat noise measurement to a C-message noise measurement, the relative influence of low frequency noise (60Hz commercial power, 20Hz ringing, etc) can be determined.
24	C-Message	This filter measures noise signals. C-message weighting is used to evaluate the effects of noise on voice grade data circuits. C-weighting is valid for data transmission since the response characteristic is relatively flat over most of the frequency range for data transmission (600Hz to 3000Hz).



VIEW C

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
25	TRMT/RCV Jacks	Provides connection between the AN/USM-485 and the circuit under test. Pressing the NOR button selects the transmit function for the left jack. The right jack simultaneously performs the receive function. If the REV button is pressed in, the functions are reversed. Type WECO 310 connector.
26	(TRMT) 135Ω 600Ω, 900Ω	Provides terminating impedance to match the lines' characteristic impedance. The impedance selected must match the impedance of the circuit under test, or incorrect measurements will be obtained.
27	(RCV) 135Ω, 600Ω, 900Ω	Provides terminating impedance to match the lines' characteristic impedance. The impedance selected must match the impedance of the circuit under test, or incorrect measurements will be obtained.
28	LEVEL FREQUENCY (Blue)	The LEVEL FREQUENCY measurement identifies the amplitude versus frequency response of a voice channel, 1004Hz loss, frequency shifts, and attenuation distortion. 1004Hz LOSS. This measurement determines the point to point loss (or gain) of a 1004Hz test tone transmitted over a voice channel. FREQUENCY SHIFT. This measurement checks for any difference in the received frequency with reference to the transmitted frequency (frequency translation) as caused by carrier facilities. ATTENUATION DISTORTION. This measurement checks the amplitude versus frequency characteristics of a circuit using a single frequency measurement technique and defines the circuit's usable bandwidth.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
29A	NOISE	Used to determine and measure the effects of background noise and tones.
29B	NOISE TO GROUND	Used to measure the longitudinal noise present on a telephone circuit, with reference to ground. The basic measurement technique used for the noise to ground measurement is very similar to the noise measurement; the main difference lies in the use of a ground reference and noise to ground adapter. Noise to ground measurements are usually made for troubleshooting purposes; to measure the magnitude of longitudinal signals, which may indicate the susceptibility of a cable pair to electrical coupling from external sources. These measurements are also made to coordinate new installations with power companies, to minimize power line coupling.
30	NOISE WITH TONE	Used to determine and measure the effects of background noise and tones. This measurement technique is used to condition compandors and/or quantizes in the transmission system to their normal operating levels for continuous data signals. Therefore, noise levels are received which duplicate levels present under operating conditions.
31	SIGNAL TO NOISE	The signal to noise mode allows measurement of the ratio of received signal plus noise power to noise power (S + N/N). This is one of the most important parameters for determining the quality of a line.
32	IMPULSE NOISE	The impulse noise measurement counts the number of noise spikes above a selected threshold level during a specified time period.
33	P/AR	The AN/USM-485 uses the peak to average ratio (P/AR) to measure the channel dispersion (spreading in time of signal amplitude) due to transmission imperfections. The P/AR measurement is a single number rating of the fidelity of voiceband channel and is a weighted measure of the total attenuation, phase distortion, and noise. The P/AR rating is derived by comparing the P/AR of an ideal signal with the P/AR of the output signal of the system under test.
34	MEAS key	Selects measurement to be made. Lighted LED indicates selected measurement mode.
35	(RCV) BRG	Connects the RCV jack through high impedance (greater than 10KΩ) When the AN/USM-485 bridges the circuit under test instead of terminating the line.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
36	(RCV) HOLD	Connects the receive hold circuits to the RCV jack to hold the dial-up lines.
37	(TRMT) HOLD	Connects the transmit hold circuits to the TRMT jack to hold the dial-up lines.
38	(TRMT) DIAL	Disconnects TRMT jack from the transmitter and connects the TRMT jack to the DIAL binding posts.
39	DIAL Binding Posts	Used to connect handset to dial-up a line through the TRMT jack. Allows dialing, talking, and listening on the circuit under test.

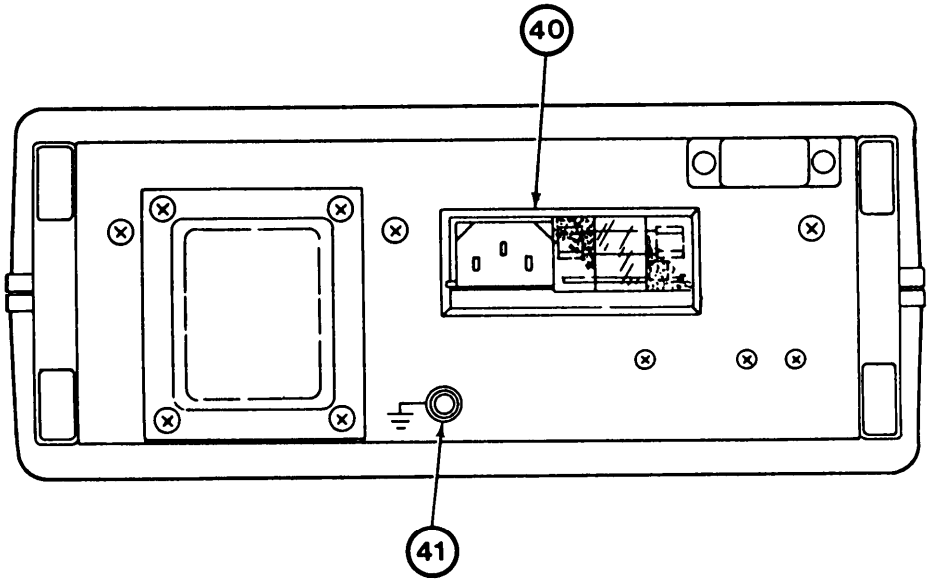
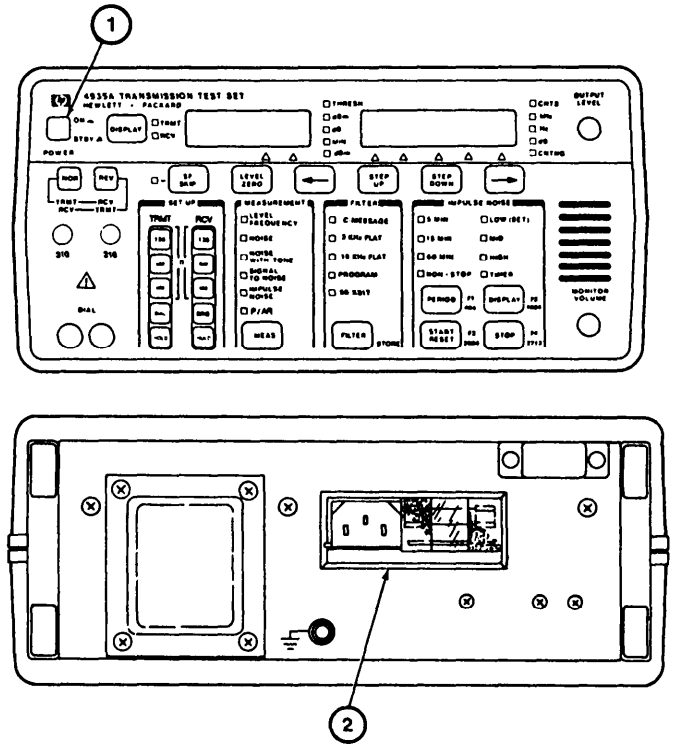


Figure 4-2. Operator's Controls, Indicators, and Connectors, rear view.

KEY	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
40	Line Power Module	Used as power input connector for AN/USM-485, Also contains line fuse and voltage selection facilities. Voltage selection provided for operation from 100, 120, 220, or 240Vac. Number visible in window displays nominal line voltage for which the AN/USM-485 is set to operate. Power input connector accepts female end of power cable (supplied). Protective grounding conductor connects to AN/USM-485 through this connector.
41	Ground Post	Binding post connector for AN/USM-485 ground.

4-2. TURN-ON PROCEDURE.



A.C. POWER

1. Perform all items under preparation for use (para 2-3).
2. Verify that POWER switch (1) is set to STBY. Connect power cable to connector on line power module (2) on rear panel.

WARNING

Always connect power cord to a properly grounded 3 wire power outlet.

3. Move POWER switch (1) from STBY to ON.

BATTERY POWER

WARNING

For operator protection during battery operation, connect the chassis terminal on the rear panel to earth ground.

1. Press POWER switch (1) from STBY to ON without power cable connected. When switching between battery and AC power, cycle the POWER button from STBY to ON again.

NOTE

Proper care in charging and discharging NiCad batteries can dramatically improve their lives (para 4-4).

INITIAL CONDITION

1. Verify that all LED's light for approximately five seconds while the self-check procedures are performed. If an error message is displayed, see paragraph 4-5 for probable cause. Verify front panel conditions are as follows:

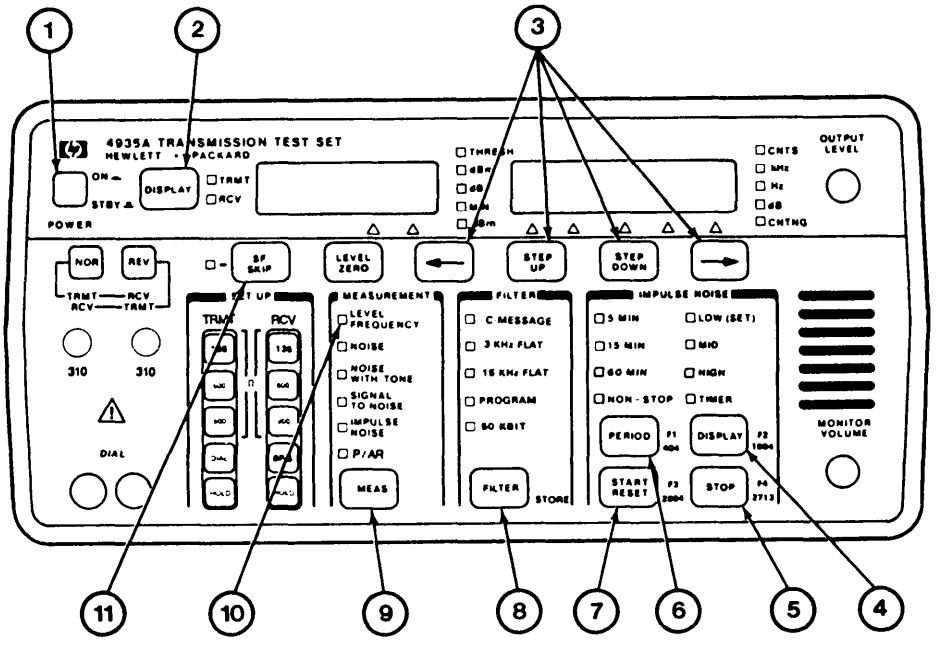
DISPLAY	TRMT
LEFT DISPLAY	-65 to +13dBm*
RIGHT DISPLAY	1004Hz
MEASUREMENT	LEVEL FREQUENCY
F1	404Hz**
F2	1004Hz**
F3	2804Hz**
F4	2713Hz**

* Dependent upon OUTPUT LEVEL control knob position.
** Initialized value. To verify, press key.

2. If all above conditions are correct, AN/USM-485 is ready for operation. If indication is incorrect, notify next higher level of maintenance.

4-3. STORE PROCEDURE.

Up to four frequencies from 20Hz to 110KHz can be stored for recall at a later time into Fl, F2, F3, or F4 registers. Frequencies from 170Hz to 109850HZ can be stored into SF SKIP. The parameters do not remain stored with AN/USM-485 in standby.



1. To store a frequency:
   - Press DISPLAY key (2) to TRMT.
   - Press MEAS key (9) to LEVEL FREQUENCY (10) mode.
   - Use STEP UP, STEP DOWN, —>, and <— keys (3) to change value in right display to desired frequency.
   - Press STORE key (8) and desired key F1 (6), F2 (4), F3 (7), F4 (5), or SF SKIP (1 1). If a frequency has been stored at location selected, it will be erased and new frequency will be stored in its place.

2. To recall a frequency:

- Press DISPLAY key (2) to TRMT.
- Press MEAS key (9) to LEVEL FREQUENCY (10) mode.
- Press desired key F1 (6), F2 (4), F3 (7), F4 (5), or SF SKIP (11). Frequency will be displayed in right display.

3. To reset AN/USM-485 to the turn-on condition:

- Press POWER SWITCH (1) to STBY then ON.

4-4. BATTERY OPERATION.

DISCHARGING BATTERIES

Regular discharge charge cycles are recommended to maintain battery capacity. The instrument should be operated until batteries are discharged (instrument stops working) then recharged, at least every 30 days. Normal recharge time is about 17 hours. Typical battery life under normal operating conditions should be at least 100 charge discharge cycles.

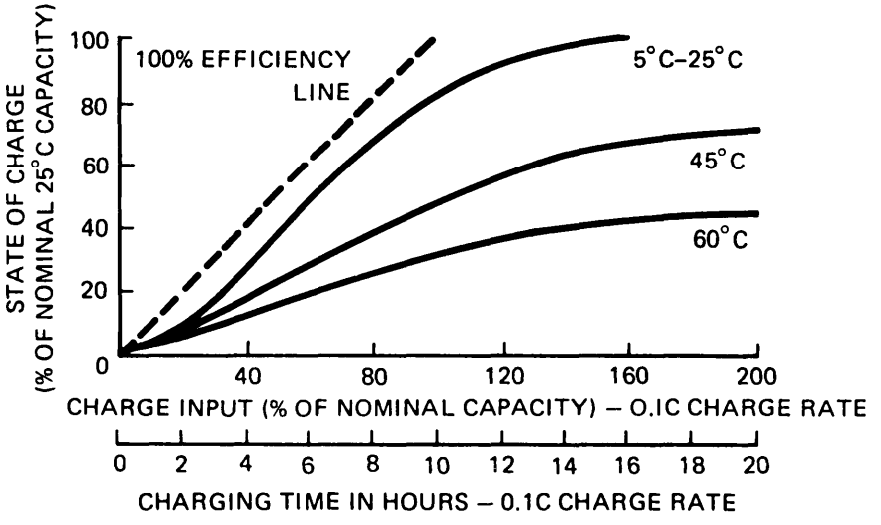
CHARGING BATTERIES

NOTE

Batteries do not charge when AN/USM-485 is operating from an AC source.

The internal battery pack consists of three rechargeable battery packs (+6V, +15.6V and–15.6V). These provide typically two and a half hours of continuous use without recharging. To recharge the battery packs, connect the AN/USM-485 to an AC power source and press power switch to STBY. Normal recharge time is about 17 hours.

The batteries may be charged at temperatures between -4°C and +50°C, but have greater charge capacity if charged between 5°C and 25°C (41°F and 77°F). At temperatures above 25°C the charge acceptance falls off as shown below. For example, a cell charged at 45°C accepts about 60-7090 of its rated capacity. Temperatures below 5°C cause pressure to build up within the cell as it is charged, which could result in venting of the cell. This results in a permanent degradation of the battery capacity due to loss of electrolyte.



At low temperatures, the batteries cannot fully discharge even if they were fully charged at room temperature. At high temperatures, this same effect takes place to a lesser degree, in addition to the problem of charge acceptance previously mentioned.

4-5. ERROR MESSAGES.

See table 4-1 for a list of error messages and probable cause.

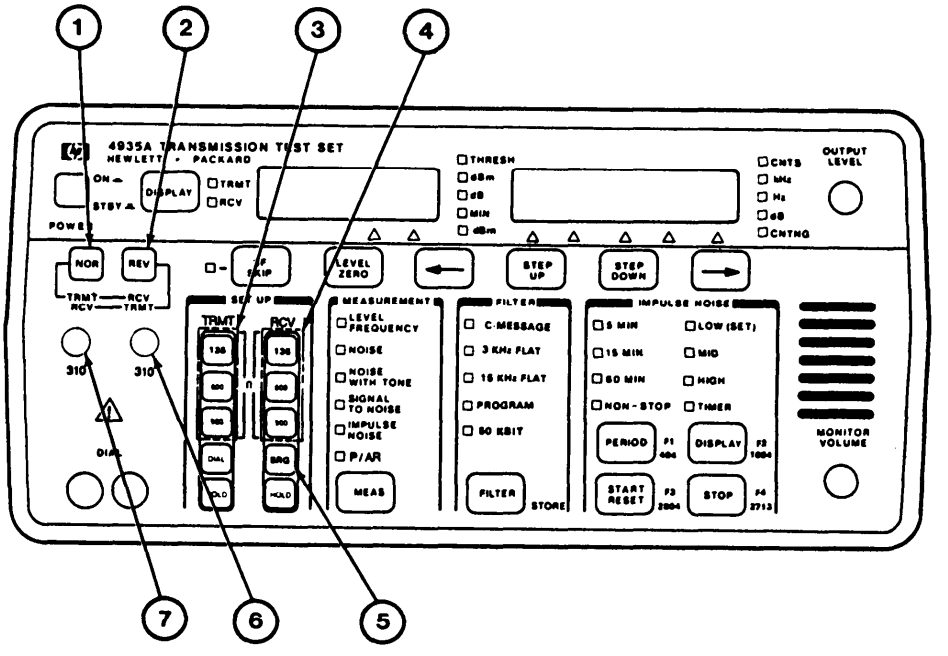
NOTE

Errors 0 through 6 indicate there are problems during self-check. Errors 7 and 8 indicate problems during a particular measurement. After startup self-check, the instrument automatically goes into Transmit Mode, LEVEL FREQUENCY. Even if error messages occur, the instrument continues to operate correctly except for those measurements affected by the displayed errors.

Table 4-1. Error Messages.

ERROR	PROBABLE CAUSE	CORRECTIVE ACTION
Err 0	Test signal cannot be measured through C-Message filter.	Notify next higher level of maintenance.
Err 1	Test signal cannot be measured through 3KHz flat filter.	Notify next higher level of maintenance.
Err 2	Test signal cannot be measured through 15KHz flat filter.	Notify next higher level of maintenance.
Err 3	Test signal cannot be measured through Program filter.	Notify next higher level of maintenance.
Err 4	Test signal cannot be measured through 50 kBit filter.	Notify next higher level of maintenance.
Err 5	Test signal cannot be measured through P/AR filter.	Notify next higher level of maintenance.
Err 6	Error in LEVEL FREQUENCY signal path.	Notify next higher level of maintenance.
Err 7	Received 1004 Hz tone is below -46 dBm or above+13 dBm in NOISE WITH TONE or SIGNAL TO NOISE.	Verify proper operational procedure.
Err 8	IMPULSE NOISE threshold is set too high. The upper limit varies with the receive impedance as follows: RCV Ω 135Ω: =116 dBm Upper Limit RCV Ω600 Ω:= 109 dBm Upper Limit RCV Ω900 Ω: = 107 dBm Upper Limit	Verify proper operational procedure.
Err 0— Err 5+ Err 6	System Failure.	Notify next higher level of maintenance.

4-6. MEASUREMENT SET UP.



POWER

1. Perform turn-on procedures (para 4-2).

SET UP

Connect circuit to be tested to TRMT/RCV jacks (6 or 7).

Do not connect more than 200Vdc or 10Vrms at 60Hz to TRMT/RCV jacks.

NOR-REV

- Press in the NOR key (1) to connect the left jack (7) to the transmitter circuit and the right jack (6) to the receiver circuit.
- To reverse the direction of the test press the REV key (2).

IMPEDANCE

- Press the TRMT impedance Ω's key (3) that matches the impedance of the circuit on the TRMT jack.
- Press the RCV impedance Ω's key (4) that matches the impedance of the circuit on the RCV jack. If the test set is to be used in the bridged mode press the BRG key (5) also. This means that in the bridged mode two RCV Setup keys will be pressed in.

NOTE

Do not leave the BRG key IN if the instrument is actually terminating the circuit as it will cause a 6dB error.

4-7. LEVEL AND FREQUENCY MEASUREMENTS.

The LEVEL FREQUENCY measurement identifies the amplitude versus frequency response of a voice channel, 1000Hz loss, frequency shifts, and attenuation distortion.

1004 Hz LOSS.

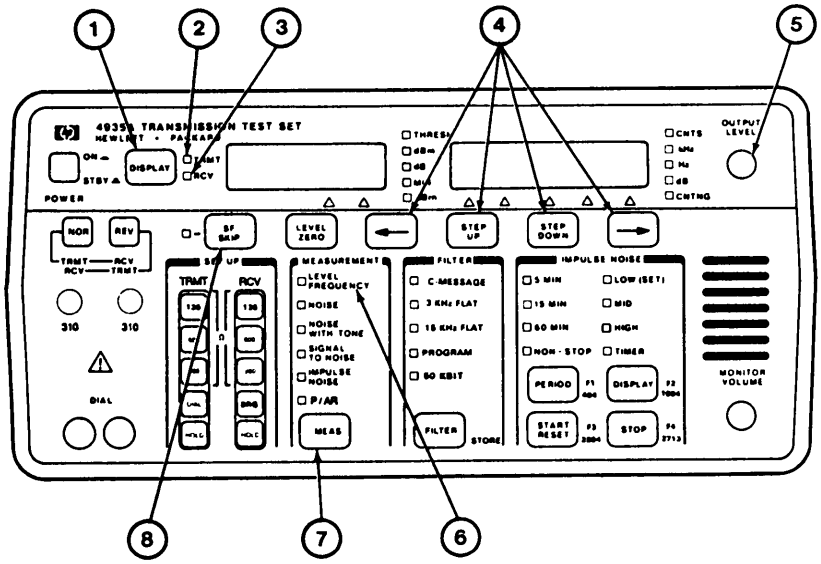
To make this measurement, a 1004Hz test frequency is transmitted at the data level. At the receiving AN/USM-485, the received loss or gain is measured (in dBm).

FREQUENCY SHIFT

To make this measurement, a test tone of known frequency is transmitted. At the receiving end, the received frequent y is observed and compared with the transmitted frequency. Any difference between transmitted and received frequencies indicates a frequency shift in the test signal. This measurement is not valid when measured on looped around carrier facilities.

ATTENUATION DISTORTION

To make this measurement a 1004Hz test frequency is transmitted at the data level. At the receiving AN/USM-485 the power is recorded as the reference level at 1004Hz. Frequencies between 20Hz and 110KHz can be transmitted. The different power readings may be compared to the 1004 Hz reference to obtain the frequency attenuation characteristics of the voice channel in dB.



LEVEL AND FREQUENCY-TRANSMITTER

1. Perform measurement setup (para 4-6).
2. Use MEAS key (7) to select LEVEL FREQUENCY (6).
3. Press DISPLAY key (1) to display the transmitted signal. TRMT light (2) will come ON. Level can be read in the left display and frequency in the right.
4. If SF signaling units are used on the circuit under test, press SF SKIP key (8) to turn on SF SKIP. When the light is on the transmitter is blanked from 2450Hz to 2750Hz or *150 Hz around a stored SF SKIP frequency.
5. Turn OUTPUT LEVEL knob (5) to adjust the level of the transmitted signal to DATA LEVEL. DATA LEVEL is usually 13 dB below the transmission level point (TLP). A + sign indicates the level is >+13 dBm. A – sign indicates the level is <- 40 dBm.
6. Use the STEP UP and STEP DOWN keys (4) to set the desired frequency or press Fl, F2, F3 or F4 to recall any stored frequency.

LEVEL AND FREQUENCY-RECEIVER

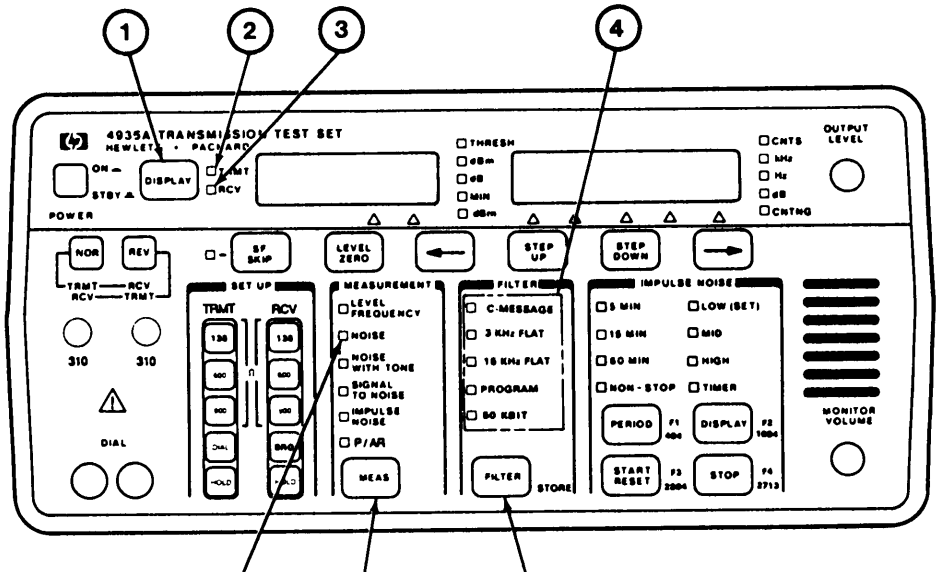
1. Perform measurement setup (para 4-6).
2. Use MEAS key (7) to select LEVEL FREQUENCY (6).
3. Press DISPLAY key (1) to display the received signal. The RCV light (3) will come ON.
4. Read the RCV level in the left display. A + sign indicates the received signal is >+13 dBm. A - sign indicates received level is <-78 dBm.
5. For attenuation distortion measurements press LEVEL ZERO key to set the received level at 0 dB. All subsequent level measurements will be made relative to this point. A negative reading indicates levels higher than the reference level.

4-8. NOISE MEASUREMENT.

This measurement is obtained by measuring the noise present on a line with a quiet termination on one end (when configured as a transmitter) and a weighted noise measuring device on the other end (when configured as a receiver).

Received noise levels are displayed in units of dBm, or dB with respect to reference noise (1000Hz tone at -90dBm (0dBm)). For example, a noise reading of 20dBrn has an RMS power of -70dBm (20-90=-70).

It is recommended that noise be measured with the 3KHz flat weighted filter to include the effects of power line related noise.



NOISE - TRANSMITTER

1. Perform measurement setup (para 4-6).
2. Press DISPLAY key (1) to display the transmitted signal. TRMT light (2) will be on.
3. Press MEAS key (6) to select NOISE (7).

NOTE

There will be no values displayed because in this configuration the transmitter is turned off and a quiet termination is supplied to the TRMT jack.

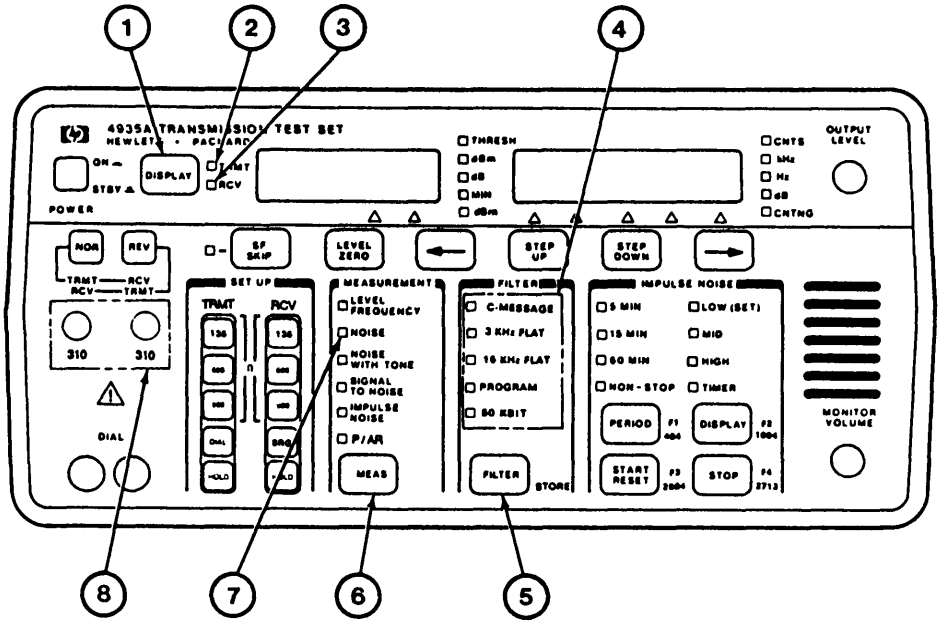
NOISE - RECEIVER

1. Perform measurement setup (para 4-6).
2. Press DISPLAY key (1) to display the received signal. RCV light (3) will be on.
3. Press MEAS key (6) to select NOISE (7).
4. Press FILTER key (5) to select the desired filter (4).
5. Read the dBm noise level in the left display. A"-" in the left display indicates under range (<0 dBm).

4-9. NOISE TO GROUND MEASUREMENT.

This measurement is obtained by measuring the voice channel with a quiet termination on one end (when configured as a transmitter) and a frequency weighted filter and detector on the other end (when configured as a receiver).

The relative line balance of an end loop can be calculated by subtracting the measured noise to ground (Ng) value from the measured message circuit noise (Nm) value. This calculation is only valid if the measurements are made on a twisted pair and it is assumed that the message circuit noise is caused by longitudinal noise converted to message circuit noise by line imbalance. It is recommended that noise to ground be measured with the 3KHz flat weighted filter to include the effects of power line related noise.



NOISE TO GROUND - TRANSMITTER

1. Perform measurement setup (para 4-6).
2. Press DISPLAY key (1) to display the transmitted signal. TRMT light (2) will be on.
3. Press MEAS key (6) to select NOISE (7) which provides a quiet termination to the TRMT jack (8).

NOISE TO GROUND - RECEIVER

NOTE

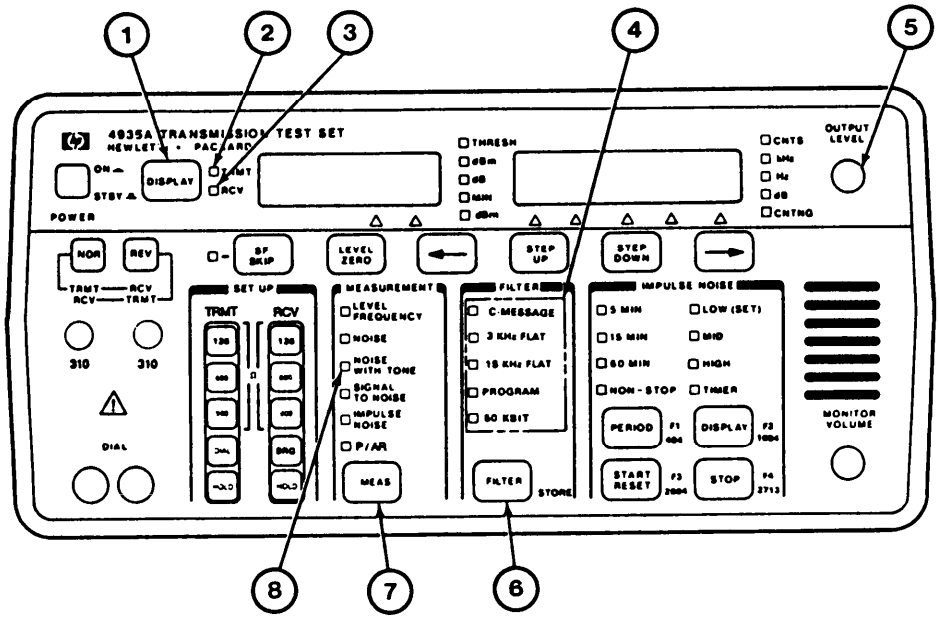
For valid NOISE TO GROUND measurements the test set must be properly grounded. Connect the rear panel chassis ground post to a known good ground.

1. Perform measurement setup (para 4-6).
2. Press DISPLAY key (1) to display the received signal. RCV light (3) will be on.
3. Connect Noise to Ground Adapter to RCV jack (8). Connect line under test to Noise to Ground Adapter.
4. Press MEAS key (6) to select NOISE (7).
5. Use FILTER key (5) to select the desired filter (4).
6. Add 30dBrn to value in the left display for correct noise level reading.

4-10. NOISE WITH TONE MEASUREMENT.

To make this measurement a 1004Hz test frequency (holding tone) is transmitted at a data level. At the receiving AN/USM-485, the 1004Hz holding tone is selectively attenuated by at least 50dB using a notch filter (all frequencies between 995Hz and 1025Hz are attenuated by 50dB). The remaining received signal (noise) is passed through a filter for measurement. The received noise level is displayed in units of dBm. The AN/USM-485 combines the notch with any of the five filters.

It is recommended that noise with tone be measured with the 3KHz flat weighted filter to include the effects of power line related noise.



NOISE WITH TONE - TRANSMITTER

1. Perform measurement setup (para 4-6).
2. Press MEAS key (7) to select NOISE WITH TONE (8).
3. Press DISPLAY key (1) to display the transmitted signal. TRMT light (2) will be on and 1004Hz should be in right display.
4. Turn OUTPUT LEVEL knob (5) to adjust 1004 Hz signal to data level in left display (usually 13 dB below the transmission level point).

NOISE WITH TONE - RECEIVER

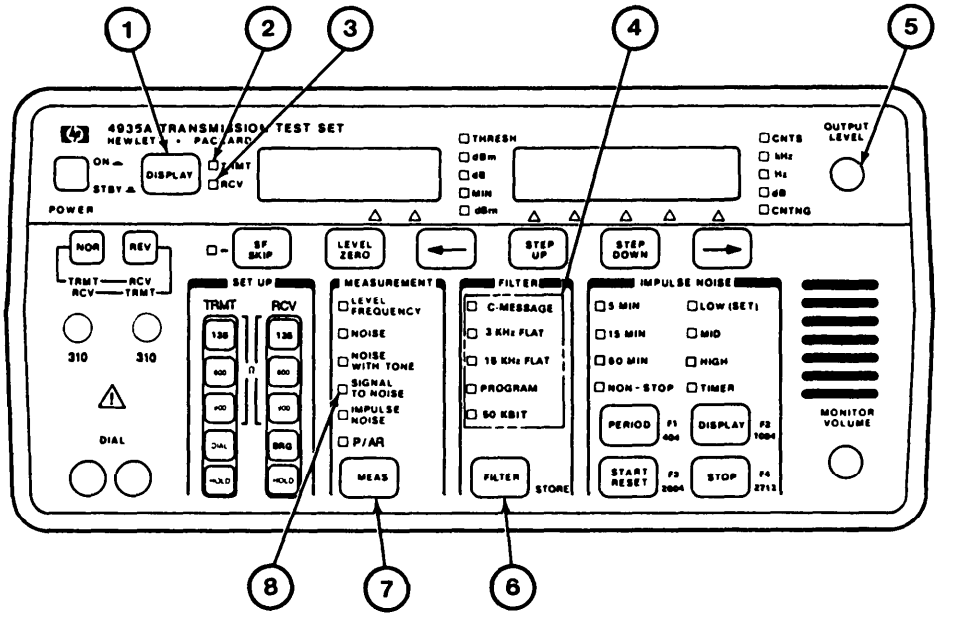
1. Perform measurement setup (para 4-6).
2. Press MEAS key (7) to select NOISE WITH TONE (8).
3. Press DISPLAY key (1) to display the received signal. RCV light (3) will be on.
4. Press FILTER key (6) to select the desired filter (4).
5. Read dBrn in left display.

NOTE

Err 7 in the right display indicates the received 1004 Hz tone has dropped below 46 dBm or exceeded +13 dBm.

4-11. SIGNAL TO NOISE MEASUREMENT.

To make this measurement, a 1004Hz test frequency is transmitted over the line. At the receiving AN/USM-485, the 1004 Hz signal is selectively attenuated by at least 50dB in the notch filter, usually C-message weighted. The remaining received signal (noise) is then compared with the original signal plus noise signal. The computed signal to noise ratio is displayed in units of dB.(when configured as a receiver).



SIGNAL TO NOISE - TRANSMITTER

1. Perform measurement setup (para 4-6).
2. Press MEAS key (7) to select SIGNAL TO NOISE (8).
3. Press DISPLAY key (1) to display the transmitted signal. TRMT (2) light will be on.
4. Turn OUTPUT LEVEL knob (5) to adjust 1004 Hz signal to data level (usually 13 dB below the transmission level point).

SIGNAL TO NOISE - RECEIVER

1. Perform measurement setup (para 4-6).
2. Press MEAS key *(7)* to select SIGNAL TO NOISE (8).
3. Press DISPLAY key (1) to display the received signal. RCV light (3) will be on.
4. Press FILTER key (6) to select the desired filter (4).
5. Read the Signal to Noise ratio as dB in the right display. The received level is displayed in the left display.

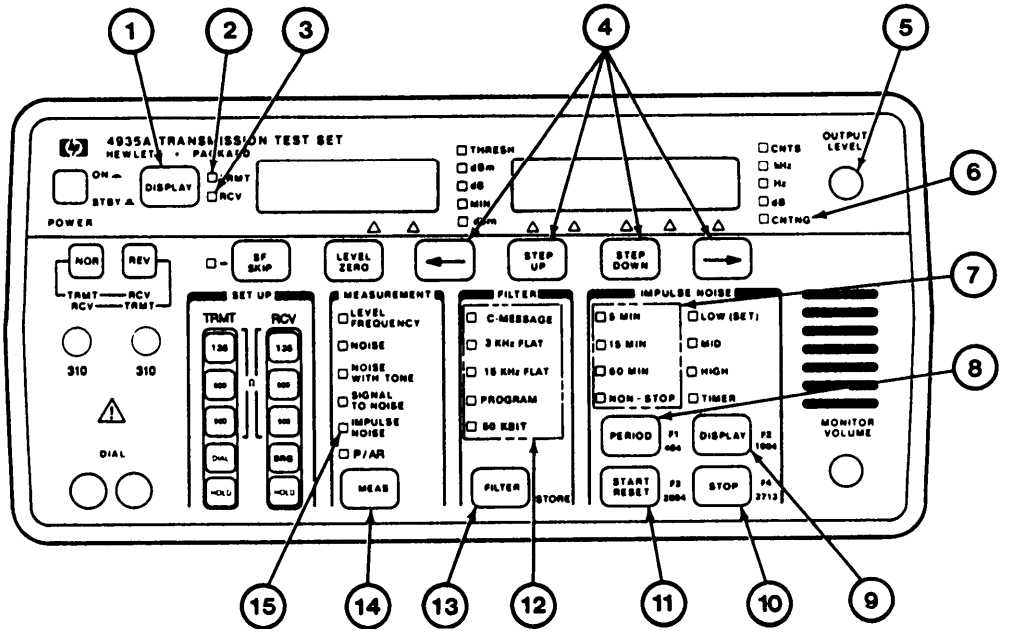
NOTE

Err 7 indicates the received 1004 Hz tone has dropped below -46 dBm or exceeded +13 dBm.

4-12. IMPULSE NOISE MEASUREMENT.

The 3 level Impulse Noise Mode measures one of the most important transient phenomena. Transient phenomena can cause data transmission errors and/or interruptions to datacom systems.

Impulse noise is that component of the received noise signal which is much greater in amplitude than the normal peaks of the message circuit noise. It occurs as short duration spikes and/or bursts of energy.



IMPULSE NOISE - TRANSMITTER

1. Perform measurement setup (para 4-6).
2. Press MEAS key (14) to select IMPULSE NOISE (15).
3. Press DISPLAY key (1) to display the transmitted signal. TRMT light (2) will be on.
4. Press FILTER key (13) to select the same filter (12) as the receiver will use.

NOTE

Although the transmitted signal is not affected by the filter, selecting either the 15KHz Flat, Program or 50Kbit filter will quiet terminate the transmitter instead of sending a hold tone.

5. Turn OUTPUT LEVEL knob (5) to adjust the level to data level (usually 13 dB below transmission level point), when not quiet terminated.

IMPULSE NOISE - RECEIVER

1. Perform measurement setup (para 4-6).
2. Press MEAS key (14) to select IMPULSE NOISE (15).
3. Press DISPLAY key (1) to display the received signal. RCV light (3) will be on.
4. Press FILTER key (13) to select the appropriate filter (12).

5. Use STEP UP, STEP DOWN and <—, and —> keys (4) to adjust the level of the LOW threshold shown in the left display. The LOW threshold may be set at any value between 30 and 109 dBm @ 600Ω.

NOTE

Err 8 indicates the threshold is set out of limits.

6. Press PERIOD key (8) to set the time of the test to 5 MIN, 15 MIN, 60 MIN or NON-STOP (7).
7. Press START RESET key (11) to start the test. The CNTNG LED (6) by the right display will go on to indicate that the test is in progress. Press DISPLAY key (9) to see how many counts have been accumulated at each threshold by. If NON-STOP (7) is selected, STOP key (10) must be pressed to stop counting.
8. The left display shows threshold or minutes; the right display shows the number of counts for the threshold selected.

NOTE

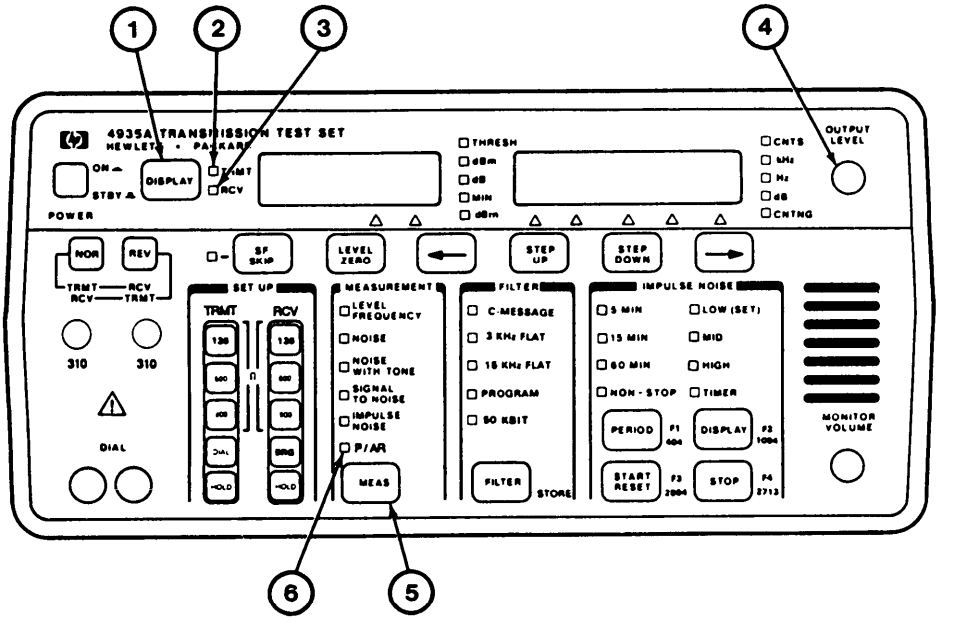
The 1010 Hz notch filter is automatically used when the C Message or 3 kHz flat filter is selected, it is not used for the other filters.

A minus sign in the counts display indicates that the tone has dropped below -46 dBm for more than 1 sec during the test. Tone dropout could cause invalid count totals.

4-13. PEAK TO AVERAGE RATIO (P/AR) MEASUREMENT.

The P/AR rating is derived by comparing the P/AR of an ideal signal with the P/AR of the output signal of the system under test. The P/AR measurement is most sensitive to envelope delay distortion and is also affected by noise, bandwidth reduction, gain ripples, nonlinearities such as compression and clipping, and other impairments. P/AR is simpler to understand than envelope delay because it is only one number instead of a curve. Also P/AR can be measured in loop around mode with only one instrument, unlike envelope delay. If the P/AR signal were received entirely undistorted, the P/AR rating would be 100, while a circuit that causes a 10% reduction in the peak to average ratio has a P/AR rating of 80.

The P/AR measurement provides little information about the nature of the fault condition in any particular case. However, since P/AR is a figure of merit for the channel, it can be used as a benchmark for future reference. After other measurements are made and a channel is considered acceptable, the P/AR rating can be recorded for future reference. In case of a suspected trouble on the channel, P/AR may be measured first and be compared to the benchmark P/AR value. Deviations in excess of ±4 P/AR units from an initial P/AR value provides sufficient reason to suspect that some channel characteristic has changed significantly.



P/AR - TRANSMITTER

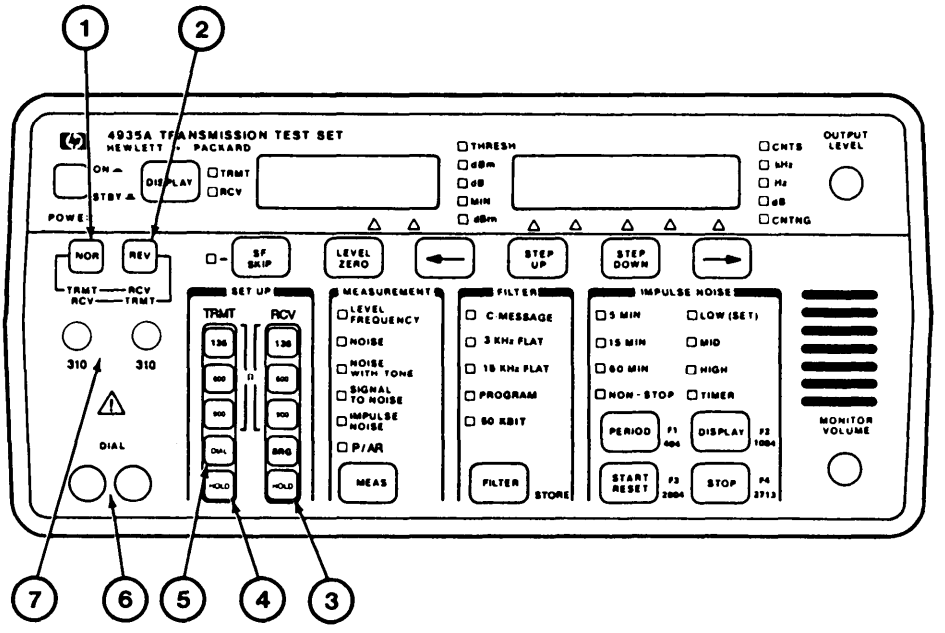
1. Perform measurement setup (para 4-6).
2. Press DISPLAY key (1) to display the transmitted signal. TRMT light (2) will be on.
3. Press MEAS key (5) to select P/AR (6).
4. Use OUTPUT LEVEL knob (4) to adjust signal level to data level. Maximum output for P/AR is +3dBm.

P/AR - RECEIVER

1. Perform measurement setup (para 4-6).
2. Press DISPLAY key (1) to display the received signal. RCV light (3) will be on.
3. Press MEAS key (5) to select P/AR (6).
4. Read P/AR units in right display.

4-14. DIAL AND HOLD PROCEDURE.

The AN/USM-485 has the capability to hold wet dial-up lines (lines where the central office provides battery. For example, Direct Distance Dialing network (DDD)). Dialing can be accomplished with a butt-in. The procedure is as follows:



1. Connect circuit to left TRMT/RCV jack (7).
2. Push NOR key (1) to connect TRMT side to left jack.
3. Connect the butt-in handset to the DIAL binding posts (6).
4. Push TRMT DIAL key (5). Use the butt-in to dial the remote end of the circuit,
5. After the circuit is answered, push the TRMT HOLD key (4) to hold the circuit.
6. Push the TRMT DIAL key (5) again to release it. This disengages the dial circuitry and allows testing.

- If the AN/USM-485 is designated the receive set, press RCV HOLD key (3) and then push REV key (2) to connect RCV side to left TRMT/RCV jack (7).

Section V STORAGE AND SHIPMENT

5-1. STORAGE AND SHIPMENT.

ENVIRONMENT

The AN/USM-485 may be stored and shipped within the following environmental limits:

Temperature ..... 40°C to +75°C (-40°F to +167°F)

Humidity ..... 90% R.H. @ 65°C

Altitude ..... < 15,300 meters (50,000 feet)

Do not store or ship where temperature extremes will cause condensation within the instrument.

5-2. INSTRUMENT PACKAGING.

ORIGINAL PACKAGING

Package AN/USM-485 in original shipping container.

OTHER PACKAGING

Use these general instructions for packaging with commercially available materials.

1. Wrap the instrument in heavy paper or plastic.
2. Use a strong shipping container such as a double-wall carton with 275 lbs. burst test.
3. Use a layer of shock absorbing material, 70-100 mm (3-4 in.) thick. This provides a firm cushion and prevents movement inside the container. Protect the front panel with cardboard or the front cover.
4. Seal the carton securely and mark it “FRAGILE” to ensure careful handling.

APPENDIX A
REFERENCES

A-1. SCOPE.

This appendix lists all forms, field manuals, technical manuals, and miscellaneous publications referenced in this manual.

A-2. FORMS.

Product Quality Deficiency Report ..... Form SF 368

Recommended Changes to Publications and Blank Forms ..... DA Form 2028

Report of Discrepancy (ROD) ..... Form SF 364

Transportation Discrepancy Report (TDR) ..... Form DD 361

A-3. TECHNICAL MANUALS.

Procedures for Destruction of Electronics Materiel
to Prevent Enemy Use (Electronics Command) ..... TM 750-244-2

A-4. MISCELLANEOUS PUBLICATIONS.

Common Table of Allowance, Expendable/Durable Items
(Except Medical, Class V, Repair Parts, and Heraldic Items) ..... CTA 50-970

Consolidated Army Publications and Forms Index ..... DA Pam 25-30

First Aid ..... FM 4-25.11

Reporting of Supply Discrepancies ..... AR 735-11-2

Safety Requirements for Maintenance of Electrical
and Electronic Equipment ..... TB 385-4

The Army Maintenance Management System (TAMMS) Users Manual ..... DA Pam 750-8

The American Society of Mechanical Engineers,
Abbreviations and Acronyms ..... ASME Y14.38

APPENDIX B
COMPONENTS OF END ITEM AND BASSIC ISSUE ITEMS LIST

SECTION I. INTRODUCTION

B-1. SCOPE.

This appendix lists Components of End Item (COEI) and Basic Issue Items (BII) for the AN/USM-485 to help you inventory items required for safe and efficient operation.

B-2. GENERAL.

The COEI and BII list is divided into the following sections:

a. Section II - Components of End Item. This listing is for information purposes only and is not authority to requisition replacements. These are part of the end item, but are removed and/or separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III - Basic Issue Items. These are the minimum essential items required to place the AN/USM-485 in operation, to operate it, and perform emergency repairs. Although shipped separately packaged, BII must be with the AN/USM-485 during operation and whenever it is transferred between property accounts. This manual is your authority to request items based on TOE/MTOE authorization of the end item.

B-3. EXPLANATION OF COLUMNS.

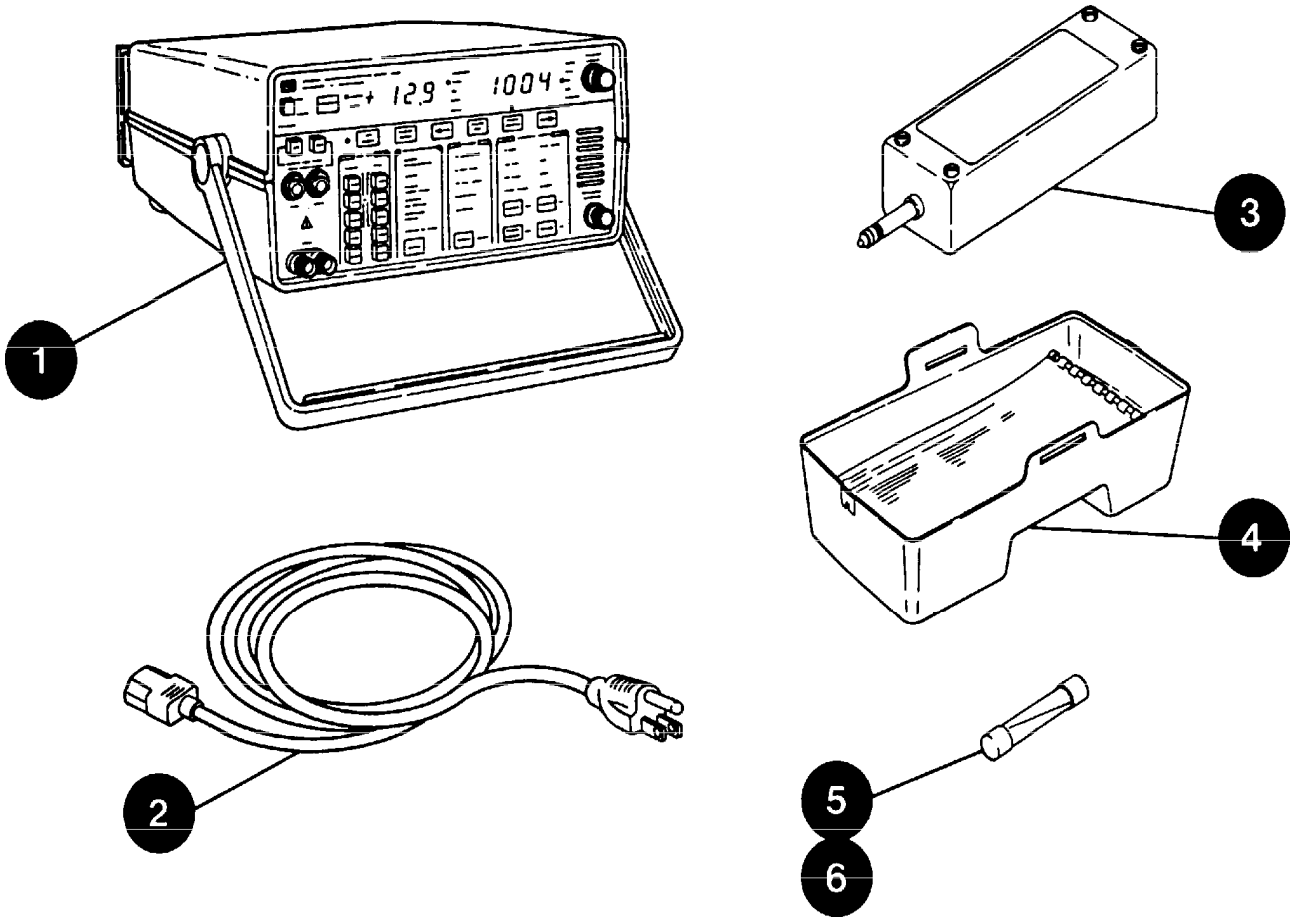
a. Column (1) - Illustration Number (Illus Number). This column indicates the number of the illustration in which the item is shown.

b. Column (2) - National Stock Number. This column indicates the National Sock Number assigned to the item and will be used for requisitioning purposes.

c. Column (3) - Description. This column indicates the federal item name and, if required, a description to identify and locate the item. The last line for each item indicates the Commercial and Government Entity Code (CAGEC) (in parentheses) followed by the part number.

d. Column (4) - Unit of Measure (U/M). This column indicates the measure used in performing the actual operation/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

e. Column (5) - Quantity Required (Qty Rqr). This column indicates the quantity of the item authorized to be used with/on the equipment.



Section II. COMPONENTS OF END ITEM

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION CAGEC AND PART NUMBER	(4) U/M	(5) QTY RQR
1	6625-01-205-6492	TRANSMISSION TEST SET (80063) A3049245	EA	1
2	6150-00-041-5038	CABLE ASSEMBLY, POWER, ELECTRICAL (16428) CH7147	EA	1
3	5935-01-265-4620	ADAPTER, CONNECTOR (1LQK8) 18064A	EA	1
4		FRONT COVER (1LQK8) 4040-2171	EA	1
5	5920-00-043-2641	FUSE, CARTRIDGE (81349) F02A250V1/4A	EA	1
6	5920-00-280-8344	FUSE CARTRIDGE (81349) F02A250V1/2A	EA	1

APPENDIX C
ADDITIONAL AUTHORIZATION LIST

SECTION I. INTRODUCTION

C-1. SCOPE.

This appendix lists additional items you are authorized for the support of the AN/USM-485.

C-2. GENERAL.

This list identifies items that do not have to accompany the AN/USM-485 and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. EXPLANATION OF LISTING.

National Stock Numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorized the item(s) to you.

Section II. ADDITIONAL AUTHORIZATION LIST

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION CAGEC and PART NUMBER USABLE ON CODE	(3) U/M	(4) QTY AUTH
5920-00-043-2641	FUSE, CARTRIDGE (81349) F02A250V1/4A	EA	1
5920-00-280-8344	FUSE, CARTRIDGE (81349) F02A250V1/2A	EA	1

By Order of the Secretary of the Army:

JOHN **A.** WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R.L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
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These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: “Whomever” whomever@wherever.army.mil
To: 2028@redstone.army.mil

Subject: DA Form 2028

1 ***From: Joe Smith***
2 *Unit: home*
3 ***Address: 4300 Park***
4 ***City***: Hometown
5 ***St: MO***
6 ***Zip: 77777***
7 ***Date Sent***: 19--OCT--93
8 ***Pub no***: 55--2840--229--23
9 ***Pub Title: TM***
10 ***Publication Date***: 04--JUL--85
11 *Change Number*: 7
12 *Submitter Rank*: MSG
13 ***Submitter FName***: Joe
14 *Submitter MName*: T
15 ***Submitter LName***: Smith
16 ***Submitter Phone***: 123--123--1234
17 ***Problem: 1***
18 *Page: 2*
19 *Paragraph: 3*
20 *Line: 4*
21 *NSN: 5*
22 *Reference: 6*
23 *Figure: 7*
24 *Table: 8*
25 *Item: 9*
26 *Total: 123*

27 ***Text***:
This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25--30; the proponent agency is ODISC4.	Use Part II (*reverse*) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE 8/30/02

TO: (*Forward to proponent of publication or form)(Include ZIP Code*)	FROM: (*Activity and location)(Include ZIP Code*)
Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM--MMC--MA--NP Redstone Arsenal, AL 35898	MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565

PART 1 - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 9-1005-433-24	16 Sep 2002	Organizational, Direct Support, And General Support Maintenance Manual for Machine Gun, .50 Caliber M3P and M3P Machine Gun Electrical Test Set Used On Avenger Air Defense Weapon System

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON
1	WP0005 PG 3		2			Test or Corrective Action column should identify a different WP number.

* *Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788-1234	

TO: (Forward direct to addressee listed in publication)	FROM: (Activity and location) (Include ZIP Code)	DATE
Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	8/30/02

PART II - REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III - REMARKS (*Any general remarks or recommendations or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.*)

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MSG, Jane Q. Doe, SFC	788-1234	

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PART 1 --ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON

* *Reference to line numbers within the paragraph or subparagraph.*

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PART II --REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

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PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART **II**I **--REMARK**S *(Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

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ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON

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PIN: 061637-000