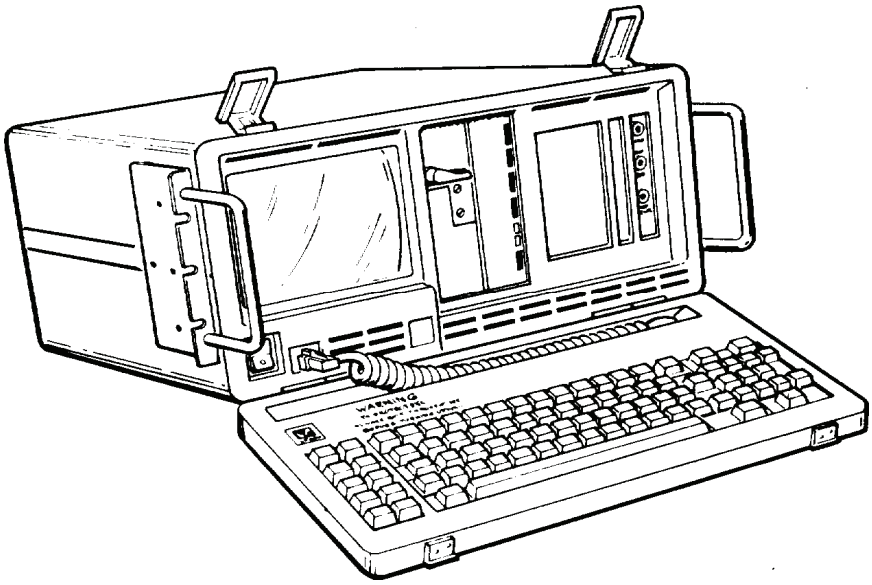
TECHNICAL MANUAL

OPERATOR'S MANUAL



TRANSMISSION TEST SET AN/USM-608 (NSN 6625-01-246-8206) (EIC: N/A)

HEADQUARTERS, DEPARTMENT OF THE ARMY
15 DECEMBER 1987

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

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

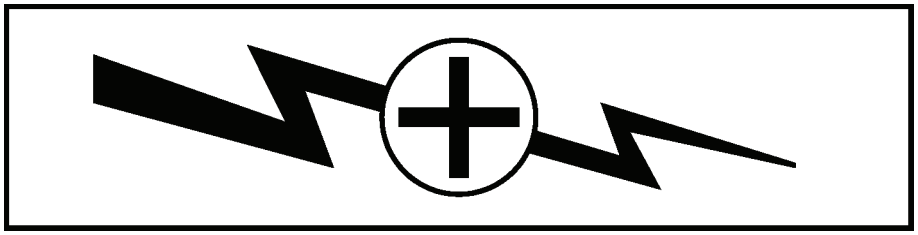
2 **IF POSSIBLE, TURN OFF THE ELECTRICAL POWER.**

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.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

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., 12 March 2007

OPERATOR'S MANUAL
FOR
TRANSMISSION TEST SET
AN/USM-608
(NSN 6625-01-246-8206) (EIC: N/A)

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 15 December 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 15 December 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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1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the outer margin of the page.

Remove Pages	Insert Pages
A and B	a and b
None	A/(B Blank)
i and ii	i and ii
iii and 1-0	iii and 1-0
1-1 and 1-2	1-1 and 1-2
A-1/(A-2 Blank)	A-1/(A-2 Blank)
B-1 and B-2	B-1 and B-2
DA Forms 2028-2	DA Forms 2028
Cover	Cover

2. File this change sheet in front of the publication for reference purposes.

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General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
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Date of issue for original and changed pages are:

Original	0	15 December 1987
Change	1	12 March 2007

Total number of pages in this publication is 76 consisting of the following:

Page No.	* Change No.	Page No.	*Change No.
Cover	1	1-2 through 1-14	0
a and b	1	2-1 through 2-38	0
A	1	A-1	1
B Blank	1	A-2 Blank	1
i and ii	1	B-1 through B-2	1
iii	1	Index 1 through Index-7	0
1-0	0	Index-8 Blank	0
1-1	1		

* Zero in this column indicates an original page.

TECHNICAL MANUAL
NO. 11-6625-3187-10

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 December 1987

OPERATOR'S MANUAL
FOR
TRANSMISSION TEST SET, AN/USM-608
(NSN 6625-01-246-8206) (EIC: N/A)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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 or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U. S. Army Aviation and Missile Command, AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via email, fax or the World Wide Web. Our fax number is: DSN 788-6546 or Commercial 256-842-6546. Our email address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual immediately preceding the hardcopy 2028. For the World Wide Web use: https://amcom2028.redstone.army.mil.

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TABLE OF CONTENTS

HOW TO USE THIS MANUAL

This manual tells you about the Transmission Test Set, AN/USM-608, and contains instructions on how to operate it. You must familiarize yourself with the operating procedures before using the test set to test transmission systems.

What does the test set do and how do you control it?

- Use the equipment description and technical principles of operations section to learn the characteristics, capabilities and features of the test set and how it works.
- Use the operator's controls and indicators section to learn what each switch, indicator and key does.

What information does the test set provide and what does it need?

- Use the first paragraph of the operation under usual conditions section to learn about the information the test set gives you and what information you need to give to the test set.
- Also use the first paragraph of the operation under usual conditions section to learn the meaning of the symbols that the test set displays.

How do you do a specific test using the test set?

- First, go to the procedure index in the second paragraph of the operation under usual condition section and find the test or action you want to perform. This will tell you what sub-paragraph to go to.
- Then, go to the paragraph referenced in the procedure index.
- You can also use the index in the back of this manual to find tests or other subjects of interest.

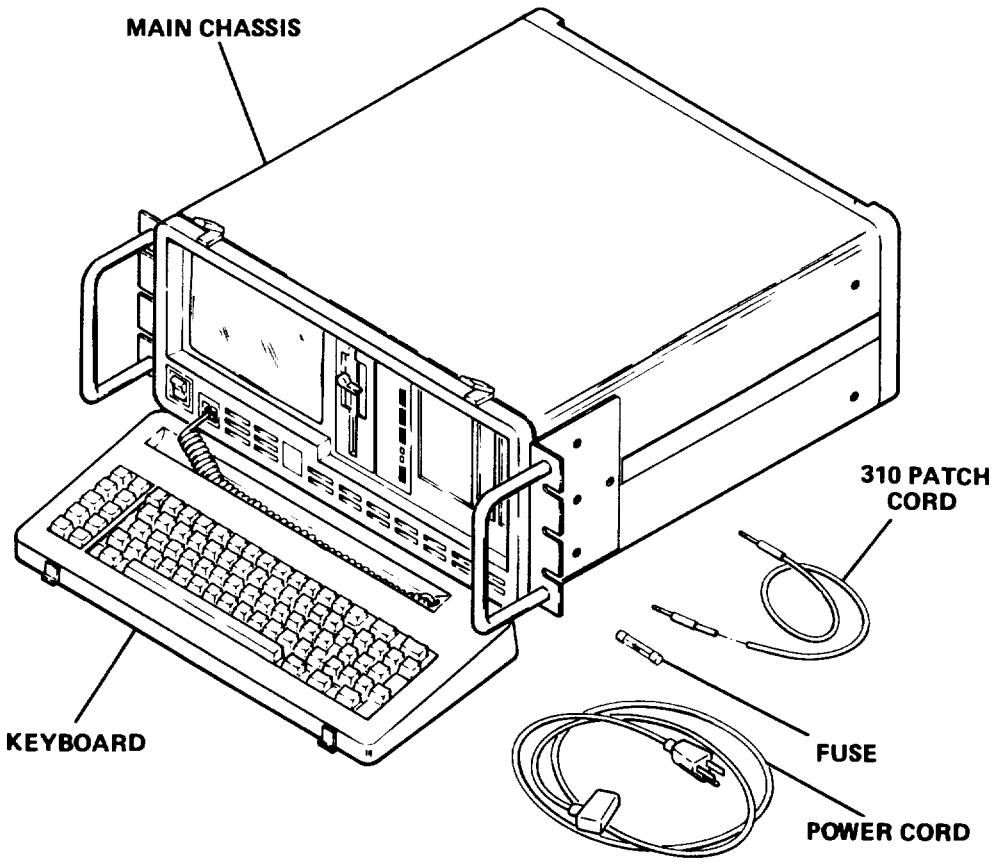


Figure 1-1. Transmission Test Set AN/USM-608

CHAPTER 1
INTRODUCTION

Section I. GENERAL INFORMATION

1-1. SCOPE

This manual describes the Transmission Test Set, AN/USM-608 (test set), and gives instructions for operation. The test set (fig. 1-1) is a combined Transmission Impairment Measurement Set (TIMS) and Return Loss (RL) tester designed to test telecommunications networks.

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

1-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your equipment 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. WARRANTY INFORMATION

LP COM warrants the goods manufactured by it to be free from defects in material and workmanship, under normal and proper use and service within specified operating conditions for 1 year from the date of shipment, provided however, that goods or parts which are replaced or repaired under this warranty are warranted only for the remaining unexpired portion of the original warranty period applicable to the goods, or 90 days from the

date of replacement or repair, whichever is longer. Report all defects in material or workmanship to your supervisor, who will take appropriate action through your organizational maintenance shop.

1-6 LIST OF ABBREVIATIONS

This list describes the abbreviations that are used in this manual.

Abbreviation	Term
AN/USM	Army-Navy/general utility-special-maintenance
CNT	count
CRT	cathode ray tube
CTRL	control key
CPU	central processing unit
dBrn	decibels referenced to one picowatt
DEG	degree
DIST	distortion
DLY	delay
DN	down
DSP	digital signal processor
EIR	equipment improvement recommendation
ENV	envelope
ERL	echo return loss
FILT	filter
GPIB	general purpose interface bus
IEEE	Institute of Electrical and Electronics Engineers
INCR	increment
L/F	level versus frequency
MSG	message
N-G	noise-to-ground
NSE	noise
P/AR	peak-to-average ratio
PAD	phase/amplitude display
PRGM	program filter
R	ring
RCV	receive
RL	return loss
S/N	signal-to-noise
SF	signal frequency
SNR	signal-to-noise ratio
SRL	singing return loss
SUPPR	suppressor
T	tip
TAMMS	the Army maintenance management system
TC	telecommunications
THYBD	transhybrid
TIMS	transmission impairment measurement set
TLP	transmission or test level point
VOL	volume
WB	wide band
WV	wave
XMIT	transmit
XMT	transmit

Section II. EQUIPMENT DESCRIPTION

1-7 EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

a. Characteristics.

- Measures peak-to-average ratio (P/AR)
- Measures level versus frequency
- Measures envelope delay
- Measures intermodulation distortion
- Measures phase and amplitude jitter
- Measures noise, both with and without tone
- Measures phase, gain and dropout transients
- Measures return loss

b. Capabilities and Features.

- Both four-wire and two-wire operation
- Monitor and dial/hold capability
- IEEE-488 remote control capability
- Sweep mode available for level versus frequency, envelop delay and return loss measurements.
- Remembers last test set-up
- Self-calibrating
- Automatic self test of computer circuits when power is applied
- Self test of measurement circuits can be manually selected by the operator at any time.
- Uses prompting menus for ease of operation

1-8 EQUIPMENT DATA

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
GENERAL TRANSMISSION/INTERFACE SPECIFICATIONS:		
I/O Configuration	310 Jacks	310 transmit jack is used
Measurement Type	Absolute and Test Level	Absolute and Test Level
Point (TLP) Point (TLP)		
TLP	-50to +10dB	-50to +10dB
Maximum DC Blocking	250V	250V
Measurement Mode	Terminated or Bridged	Terminated
Impedances	135, 600, 900, or 1200 Ohms, transmit and receive independent	600 or 900 Ohms

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
GENERAL TRANSMISSION/INTERFACE SPECIFICATIONS (Continued):		
Bridging Loss to 20 kHz	< 0.2 dB	Not applicable
Return Loss (Receiver and Transmitter)	> 20 dB from 50 Hz to 110 Hz; >30 dB from 200 Hz to 20 kHz; > 30 dB from 800 Hz to 110 kHz (at 135 Ohms)	Not applicable
Longitudinal Balance	Decreases 6 dB per octave over 4 kHz: >50 dB from 50 Hz to 4 kHz > 70 dB at 540 Hz > 80 dB at 60 Hz	Decreases 6 dB per octave over 4 kHz: >50 dB from 50 Hz to 4 kHz >70 dB at 540 Hz > 80 dB at 60 Hz
Transhybrid loss	Not applicable	Less than 30 dB
Hold Circuits	Two, each independent and each drawing 30 mA at 48 V	30 mA at 48 V
LEVEL/FREQUENCY MEASUREMENT SPECIFICATIONS:		
Transmitter Frequency:		
Range	50 Hz to 5000 Hz (voice band); 200 Hz to 110 kHz (wide band)	300 Hz to 5000 Hz
Resolution	1 Hz from 50 Hz to 110 kHz	1 Hz from 300 Hz to 5000 Hz
Accuracy	± 1 Hz from 50 Hz to 9999 Hz ± 10 Hz from 10 kHz to 110 kHz	± 1 Hz from 300 Hz to 5000 Hz
Transmitter Sweep:		
Mode	Single, repetitive, gain slope (404 Hz, 1004 Hz or 2804 Hz) or manual	Single, repel, gain slope (404 Hz, 1004 Hz or 2804 Hz) or manual
Frequency Increments	1 Hz to 1 10 kHz	1 Hz to 5 kHz
Increment Time	0.3, 1.0 or 3.0 Increment/s	0.3, 1.0 or 3.0 Increment/s
SF Skip	Out/In (skips band from 2450 Hz to 2750 Hz)	Out/In (skips band from 2450 Hz to 2750 Hz)
Holding Tone	1004±0.1 Hz	1004 ±0.1 Hz
Transmitter Level:		
Range	-40 dBm to ±10 dBm; ± 7 dBm max in wideband mode; ±5 dBm max at 135 Ohms	-40dBm to ±5dBm

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
LEVEL/FREQUENCY MEASUREMENT SPECIFICATIONS (Continued):		
Transmitter Level (Continued):		
Resolution	0.1 dB	0.1 dB
Accuracy	±0.1 dB (-30 to ± 10 dBm) at 1004 Hz; 0.1 dB (-50 to -40 dBm) at 1004 Hz	±0.5 dB at 1004 Hz
Flatness	± 0.5 dB, 50 Hz to 200 Hz; ±0.2 dB, 200 Hz to 4 kHz; ± 0.2 dB, 4 kHz to 15 kHz; ± 0.3 dB, 50 kHz to 100 kHz	± 0.5 dB, 300 Hz to 5000 Hz
Total Distortion	More than 50 dB below carrier at levels from - 40 to ± 10 dBm and frequencies from 100 Hz to 3.5 kHz; More than 40 dB below carrier at levels from -40 to ± 10 dBm and frequencies from 3.5 kHz to 20 kHz; More than 40 dB below carrier at levels from -30 to ±10 dBm and frequencies from 20 to 110 kHz; More than 35 dB below carrier at levels from -40 to -30 dBm and frequencies from 20 to 110 kHz; Holding tone more than 60 dB below carrier at levels from -30 to ± 10 dBm	More than 40 dB below carrier at levels from - 40 to ± 5 dBm and frequencies from 300 Hz to 5000 Hz
Receiver Frequency:		
Range	50 Hz to 5000 Hz (voice band); 200 Hz to 110 kHz (wide band)	300 Hz to 5000 Hz
Resolution	1 Hz from 50 Hz to 110 kHz	1 Hz from 300 Hz to 5000 Hz
Accuracy	± 1 Hz from 50 Hz to 9999 Hz; ± 10 Hz from 10 kHz to 110 kHz	± 1 Hz from 300 Hz to 5000 Hz
Receiver Level:		
Range	-40 dBm to ± 10 dBm	-40 dBm to ± 10 dBm (depending on transmit level and transhybrid loss corrections)

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
LEVEL/FREQUENCY MEASUREMENT SPECIFICATIONS (Continued):		
Receiver Level (Continued):		
Resolution	0.1 dB	0.1 dB
Accuracy	±0.1 dB at 1004 Hz	±0.5 dB at 1004 Hz
Flatness	±0.5 dB, 50 Hz to 200 Hz ±0.2 dB, 200 Hz to 4 kHz ±0.2 dB, 4 kHz to 15 kHz ±0.5 dB, 15 kHz to 100 kHz	±0.5 dB, 300 Hz to 5000 Hz
Filters	60 Hz high pass	Not applicable
Detector	Full wave average	Full wave average
NOISE/SIGNAL-TO-NOISE SPECIFICATIONS:		
Detector	True RMS	True RMS
Response	Normal and Damped per IEEE Spec P743	Normal and Damped per IEEE Spec P743
MESSAGE CIRCUIT NOISE:		
Transmitter:		
Mode	Quiet Termination	Quiet Termination
Receiver:		
Range Metallic	20 to 90 dBrn	20 to 90 dBm
Accuracy Metallic	± 1 dB	± 1.5 dB
Range to Ground	40 to 120 dBrn	Not applicable
Accuracy	±2 dB	Not applicable
Resolution	1 dB	1 dB
Filters	C-Message, 3 kHz Flat, 15 kHz Flat, Program, 5KB	C-Message, 3 kHz Flat
NOISE WITH TONE:		
Transmitter:		
Mode	1004 Hz Holding Tone (See L/F for Specs)	1004 Hz Holding Tone (See L/F for Specs)

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
NOISE/SIGNAL-TO-NOISE SPECIFICATIONS (Continued):		
NOISE WITH TONE (Continued):		
Receiver:		
Range	20 to 90 dBm	20 to 90 dBrn (Holding Tone at -50 dBm or limited by Transhybrid Loss)
Accuracy	±1 dB	±1.5 dB
Resolution	1 dB	1 dB
Filters	C-Message, 3 kHz Flat	C-Message, 3 kHz Flat
Notch	Notch at 1010 Hz; greater than 50 dB Rejection from 995 to 1025 Hz	Notch at 1010 Hz; greater than 50 dB Rejection from 995 to 1025 Hz
SIGNAL-TO-NOISE:		
Transmitter:		
Mode	1004 Hz Holding Tone (See L/F for Specs) L/F for Specs)	1004 Hz Holding Tone (See
Receiver:		
Signal Level Range	-40 to ± 10 dBm	-40 to ± 10 dBm (Depending on Transmit Level & Transhybrid Loss Corrections)
S/N Ratio Range	10 to 40dB	10 to 40 dB
Resolution	1 dB	1 dB
Accuracy	±1 dB	±1 dB
Filters	C-Message, 3 kHz Flat, 1010 Hz Notch	C-Message, 3 kHz Flat, 1010 Hz Notch
ENVELOPE DELAY SPECIFICATIONS:		
Operating Modes	Normal, Repeat	Not applicable
Transmitter:		
Frequency Range	200 Hz to 110 Hz	Not applicable

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
ENVELOPE DELAY SPECIFICATIONS (Continued):		
Transmitter (Continued):		
Level Range	-40 to ±0 dBm	Not applicable
Accuracy	See L/F for Specs	Not applicable
Modulation Frequency	83-1/3 Hz, ±0.1%	Not applicable
Modulation Mode	50%, AM	Not applicable
Sweep	See L/F for Specs	Not applicable
Receiver:		
Delay Range	-3000 to ± 9000 *u*sec	Not applicable
Delay Accuracy	± 10 *u*sec, 600 Hz to 4000 Hz, ± 30 isec, 200 Hz to 600 Hz, ±20 *u*sec, 4 kHz to 110 kHz	Not applicable
Resolution	1 *u*sec	Not applicable
Level Range	-40 to ± 10 dBm	Not applicable
INTERMODULATION DISTORTION SPECIFICATIONS:		
Transmitter (4 Tone):		
Frequencies	857, 863, and 1372 and 1388 Hz	857, 863, and 1372 and 1388 Hz
Level Range	-40 dBm to O dBm	-40 dBm to -6 dBm
Level Accuracy	±1 dB	±2 dB
Level Resolution	1 dB increments	1 dB increments
Distortion	70 dB or more below individual tone level	60 dB or more below individual tone level
Receiver:		
Input Signal Range	-40 dBm to O dBm	-40 dBm to 0 dBm (depending on transmit level and transhybrid loss correction)
Measurement Range	10 dB to 70 dB with transmitter off; 10 dB to 55 dB with transmitter on	10 dBm to 70 dBm (depending on transmit level and transhybrid loss correction)
Accuracy	± 1 dB	± 1 dB
Resolution	1 dB	1 dB

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
INTERMODULATION DISTORTION SPECIFICATIONS (Continued):		
Filters	Second order products centered at 520 Hz and 2240 Hz; third order products centered at 1900 Hz	Second order products centered at 520 Hz and 2240 Hz; third order products centered at 1900 Hz
P/AR SPECIFICATIONS:		
Transmitter:		
Frequencies	Signal spectrum is a complex pulse train of 16 frequencies between 140 Hz and 3890 Hz designed to meet the requirements of Bell PUB41009 and IEEE Spec P743	Signal spectrum is a complex pulse train of 16 frequencies between 140 Hz and 3890 Hz designed to meet the requirements of Bell PUB41009 and IEEE Spec P743
Level	-40 dBm to O dBm	-40 dBm to O dBm
Accuracy	1.0 dB	± 1.0 dB
Resolution	0.1 dB	0.1 dB
Receiver:		
P/AR Range	40 to 120 P/AR units	40 to 120 P/AR units
P/AR Accuracy	±2 P/AR units (40-110 units); ±4 P/AR units (110 to 120 units)	±2 P/AR units (40-110 units); ±4 P/AR units (110 to 120 units)
Resolution	1 P/AR unit	1 P/AR unit
Level	-40 dBm to O dBm	-40 dBm to 0 dBm (depending on level and transhybrid loss correction)
Level Accuracy	±0.2 dB	±0.2 dB
Level Resolution	0.1 dB	0.1 dB
Detectors	Full wave rectified average, absolute peak, and RMS	Full wave rectified average, absolute peak, and RMS
PHASE-AMPLITUDE JITTER SPECIFICATIONS:		
Transmitter:	1004 Hz holding tone (see L/F for specs)	1004 Hz holding tone (see L/F for specs)
Receiver:		
Frequency Range	990 Hz to 1030 Hz	990 Hz to 1030 Hz

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
PHASE-AMPLITUDE JITTER SPECIFICATIONS (Continued):		
Receiver (Continued):		
Level Range	-40 dBm to ± 10 dBm	-40 to ± 10 dBm (depending on transmit level and transhybrid loss correction)
Weighting	Bell Standard (20 Hz - 300 Hz) Bell Standard ± LF (4 Hz - 300 Hz) Low frequency (LF) (4 Hz - 20 Hz) (4 Hz - 20 Hz)	Bell Standard (20 Hz - 300 Hz) Bell Standard ± LF (4 Hz - 300 Hz) Low frequency (LF)
PHASE JITTER:		
Measurement Range	0.0 degrees to 45.0 degrees peak to peak	0.0 degrees to 45.0 degrees peak to peak
Accuracy	±0.2 degrees, ±+5% of reading	±0.3 degrees, +5% of reading
Resolution	0.1 degree	0.1 degree
AMPLITUDE JITTER:		
Measurement Range	0.0% to 45.0% peak to peak	0.0% to 45.0% peak to peak
Accuracy Range	± 0.2% peak to peak, + 5% of reading	± 0.3% peak to peak, ± 5% of reading
Resolution	0.1%	0.1%
RETURN LOSS SPECIFICATIONS:		
Measurement Modes	SRL HIGH, SRL LOW, ERL and sine wave	SRL HIGH, SRL LOW, ERL and sine wave
Transmit Level Range	-40 to O dBm	-10 to -6 dBm
Measurement Range	0 to 50 dB	0 to 40 dB
Accuracy	± 0.5 dB	± 0.5 dB
Resolution	0.1 dB	0.1 dB
4W Transhybrid loss compensation	-10 to ± 30 dB	Not Applicable
2W Reference Impedance	Not Applicable	600 Ohm or 900 Ohm ± 1% in series with 2.16 *u*f ± 1% capacitor
TRANSIENT SPECIFICATION:		
Transmitter:	1004 Hz holding tone (see L/F for specs)	1004 Hz holding tone (see L/F for specs)

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification
TRANSIENT SPECIFICATION (Continued):		
Receiver:		
Level	-40 dBm to ± 10 dBm	-40 to ± 10 dBm (depending on transmit level and transhybrid loss correction)
Frequencies	990 Hz to 1030 Hz	990 Hz to 1030 Hz
Filter	C-Notch	C-Notch
Count Rate	7, 8 or 100 per second	7, 8 or 100 per second
Count Range	0 to 9999 counts	0 to 9999 counts
Timer	1 to 9999 minutes in 1 minute increments	1 to 9999 minutes in 1 minute increments
Hit/Dropout Guard	4 msec, nominal	4 msec, nominal
Interval Counting Hierarchy	Impulse noise counts are interlocked with hit and dropout occurrences in accordance with Bell System/IEEE P743 Specifications	Impulse noise counts are interlocked with hit and dropout occurrences in accordance with Bell System/IEEE P743 Specifications
THRESHOLDS:		
Count without tone Impulse Noise Range	30 to 110 dBrn in 1 dB steps	30 to 110 dBrn in 1 dB steps
Normal Impulse Noise Range	30 to 110 dBrn in 1 dB steps, limited to holding tone level -30 dB/± 15 dB	30 to 110 dBrn in 1 dB steps, limited to holding tone level -30 dB/± 15 dB
Threshold Spread	2, 4, 6, 8 dB	2, 4, 6, 8 dB
Threshold Accuracy	1 dB	±2 dB
Phase Hit Range	5 degrees to 45 degrees peak in 5 degree steps	5 degrees to 45 degrees peak in 5 degree steps
Phase Hit Range Accuracy	± 0.5 degrees, ± 10.0% of threshold	±0.5 degrees, + 10.0% of threshold
Gain Hit Range	2 to 10 dB in 1 dB steps	2 to 10 dB in 1 dB steps
Gain Hit Range Accuracy	± 0.5 dB	± 1.0 dB
Dropout	12 ± 1 dB decrease in level	12 ± 1 dB decrease in level

1-8 EQUIPMENT DATA (CONTINUED)

Parameter	Four-Wire (4-W) Specification	Two-Wire(2-W) Specification

NOTE

The following specifications apply to both four-wire and two-wire operation

GPIB (IEEE-488) INTERFACE BUS SPECIFICATIONS:

Address Selections	00 to 30
Functions	SH1, AH1, T5 or T6, L4 or L6, SR1, RL1, PP1, DC1, DTO, and CO
Master/Slave Control	Will perform remote end-to-end test when used with an external unit
POWER REQUIREMENTS:	120, 100, 220 or 240 VAC + 5%, -2 %, 43 to 63 Hz, 150 Watts maximum.

Section III. TECHNICAL PRINCIPLES OF OPERATION

1-9 FUNCTIONAL DESCRIPTION

The test set (fig. 1-2) is a small computer system dedicated to telephone line testing. The following is a brief description of the test set.

(1) The central processing unit (CPU) controls the operation of the whole test set. It sends commands to and receives information from the circuits that do the testing, store the software and interact with the operator. The CPU contains a microcomputer, memory and interface circuits. It also contains a small program. When the power is turned on, that program does a self test of the CPU itself and then checks to see if it can communicate with the other circuits connected to the data bus. After this program finishes, it gets the main program from the hard disk drive. After that, the CPU runs the main program. This main program is called a disk operating system. It controls the normal operation of the test set and calls other programs that communicate with the operator and control the TIMS and RL tester.

(2) The interface board is part of the two-board set that forms the TIMS and RL tester. It is controlled by the digital signal processing (DSP) board. The interface board contains termination devices, amplifiers and relays. Under control of the DSP board, the interface board changes XMT and RCV connector terminations, switches transmit or receive signals to the DIAL/MON connector, switches between tip and ring, amplifies transmit signals from the DSP board and scales receive signals for the DSP board.

(3) The DSP board does all of the TIMS and RL testing, using the interface board as its contact with the telephone system under test. The DSP board contains two, high-speed microprocessors, each with their own memory. They control the tests and do all the test calculations. A transmit signal is produced by changing digital data to an analog signal and sending the signal to the interface board along with control signals to tell it what to do. A receive signal is conditioned by the interface board (under DSP control) and sent to the DSP board, where it is changed to digital data and processed.

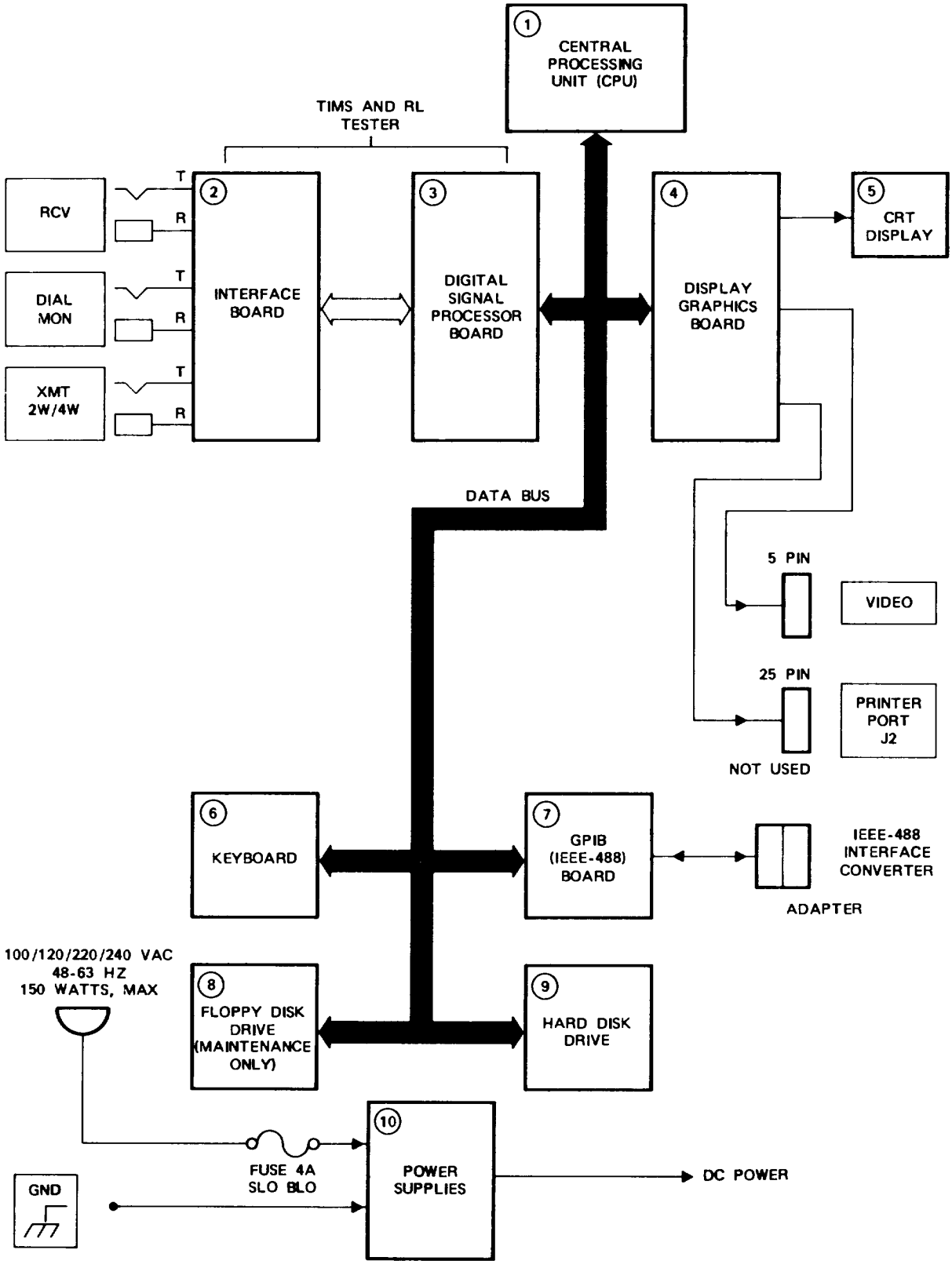


Figure 1-2. Test Set Block Diagram

Using the data bus, the CPU tells the DSP what test to do and gives it the operator's entries. The DSP sends its test results to the CPU.

(4) The display graphics board changes data from the CPU into images for display on the CRT and on an external monitor. This board also has a printer port (PRINTER PORT J2), but it is not used.

(5) The CRT display displays menus and data at a high resolution. Its input is provided by the display graphics board.

(6) The operator uses the keyboard to tell the microprocessor what he wants to do. Only the keys that are necessary to select and control TIMS and RL testing are used. These keys are the ones with legends. The other keys cannot be used.

(7) The general purpose interface bus (GPIB) board allows the CPU to talk and listen on a common bus with other equipment. This allows an external computer or other device to operate the test set without an operator at the test set keyboard.

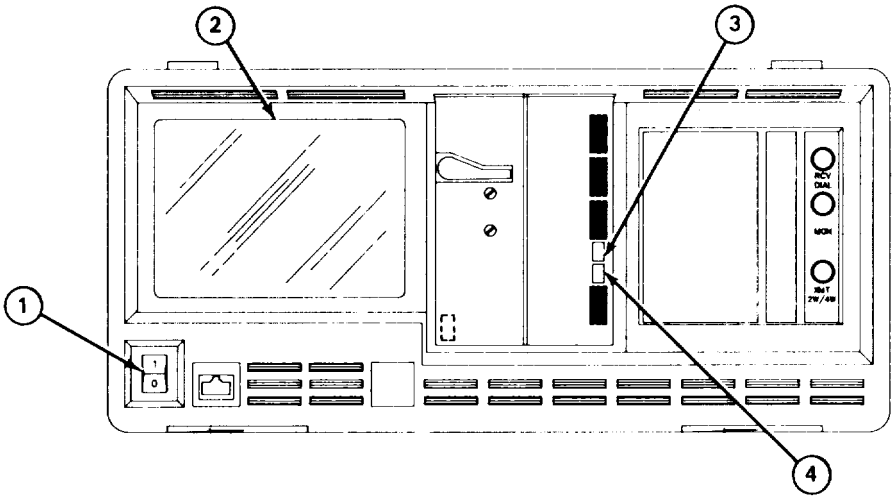
(8) The floppy disk drive lets maintenance personnel align the test set and update the programs that are in the hard disk drive. The operator never uses the floppy disk drive.

(9) The hard disk drive contains the disk operating system and several other programs and data files. The drive can hold 10 million bytes (eight-bit codes).

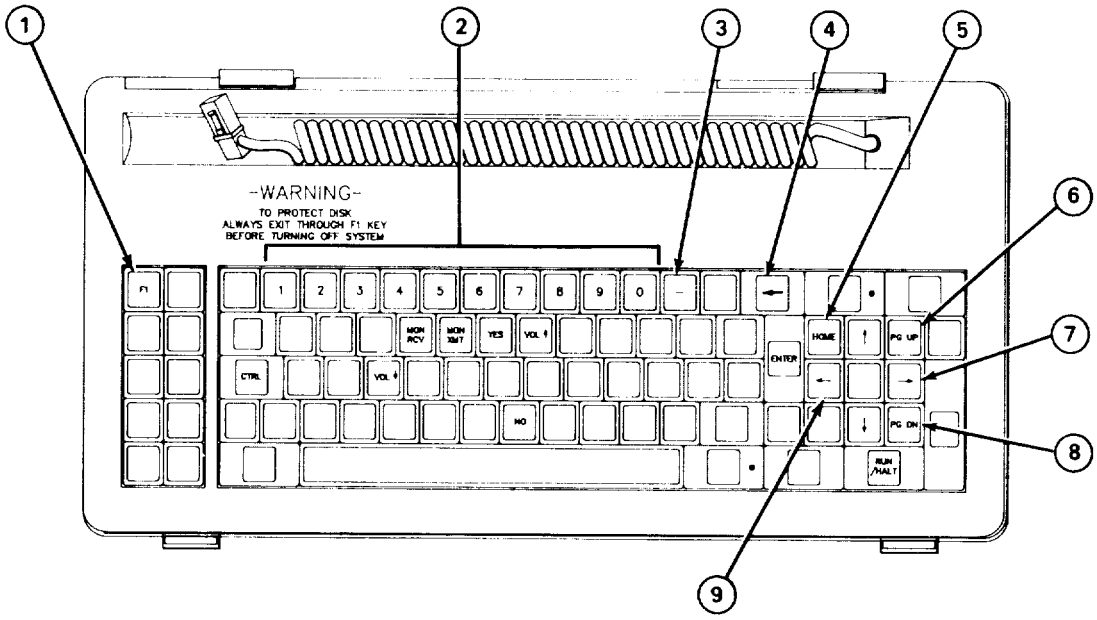
(10) The power supplies use 110, 120, 220 or 240 VAC at between 48 and 63 Hz as their main power source. These voltages are selectable on the back panel of the test set but, as shipped, the test set is ready for operation at 115 to 120 VAC. Several tests require that the test set share a common grounding point with the telephone system that it is testing. A grounding lug on the rear of the test set is used for this purpose.

CHAPTER 2
OPERATING INSTRUCTIONS

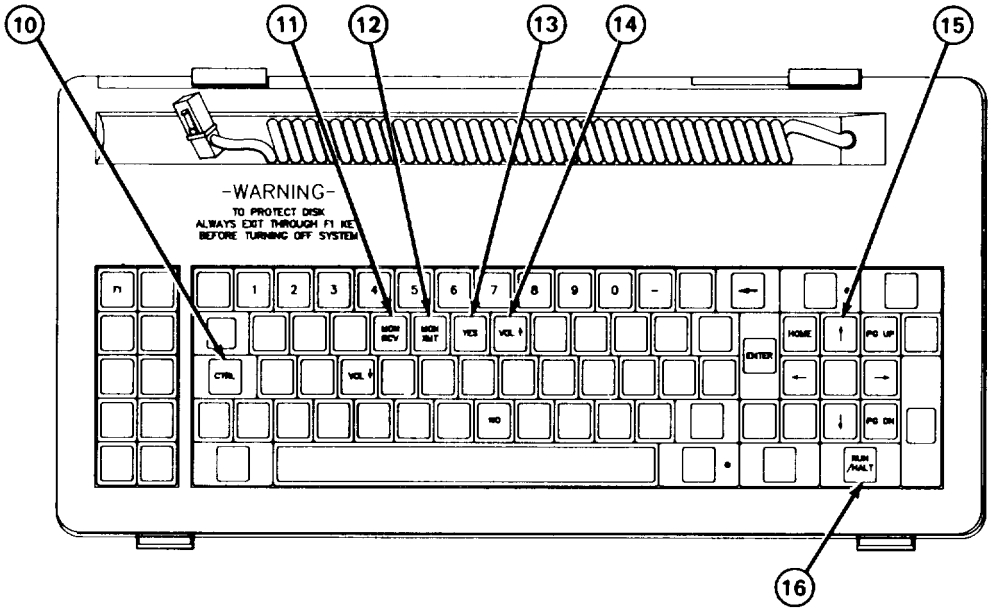
Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS



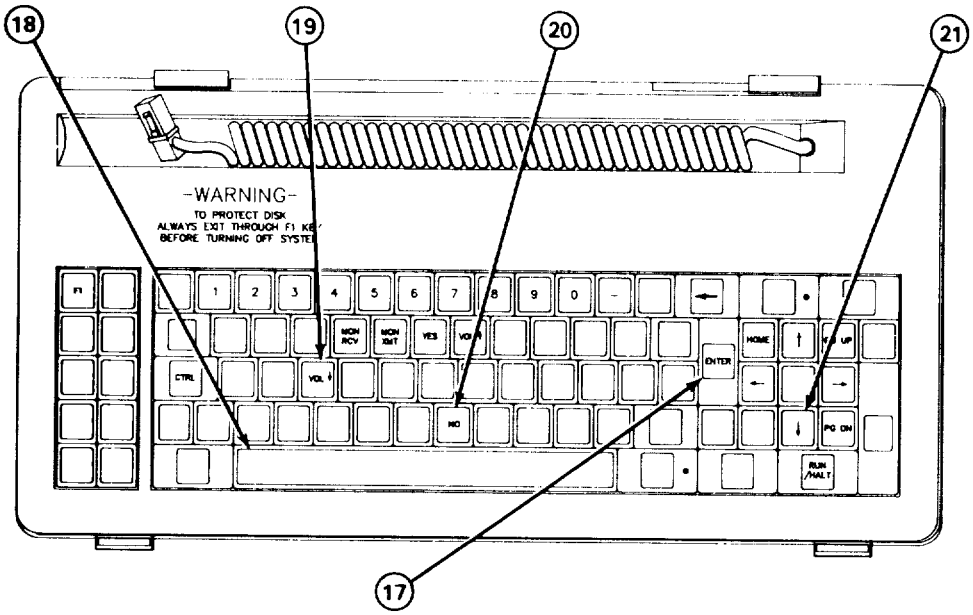
Key	Control Or Indicator	Function
1	Power Switch	Turns test set power on or off
2	Cathode Ray Tube (CRT) Display	Displays menus, instructions and test values
3	Hard Disk Drive Power Indicator	Lights when power is applied to the test set
4	Hard Disk Drive Access Indicator	Lights when software is being loaded into memory for use



Index	Key	Function
1	F1	Displays the MAIN MENU and prepares the test set for removing power.
2	1 through 9, 0	Numerical entry keys.
3	- (minus) Minus sign key.	
4	← (backspace)	Deletes the number to the left of the line cursor. when entering numerical values in a parameter entry box. Cursor moves left one, allowing you to enter another number. If you are changing values by scrolling, pressing this key positions the line cursor to the previous digit Use the↑and the ↓ to increment or decrement the digit.
5	HOME	If you are in a measurement page series and a test is not being run, pressing this key displays the TRANSMISSION MEASUREMENT FUNCTIONS menu. If you are in the TRANSMISSION MEASUREMENT FUNCTIONS menu, pressing this key displays the MAIN MENU.
6	PG UP	If you are in a measurement page series and a test is not being run, pressing this key displays the previous measurement page.
7	→(right arrow)	Moves the bar cursor to the next parameter selection box up or to the right. Not used with menu displays.
8	PG DN	If you are in a measurement page series and a test is not being run, pressing this key displays the next measurement page.
9	←(left arrow)	Moves the bar cursor to the next parameter selection box down or to the left Not used with menu displays.



Index	Key	Function
10	CTRL	Press this key and the VOL ↑ at the Same time to cause the test set to enter default selections for all circuit interface and measurement parameter values.
11	MON RCV	Pressing this key connects the received signal to the DIAL/MON connector.
12	MON XMT	Pressing this key connects the transmit signal to the DIAL/MON connector
.		
13	YES	When a question is displayed, pressing this key answers yes.
14	VOL↑	Pressing this key during a measurement involving a tone increases the volume of the tone.
15	↑(up arrow)	If you are in a menu, this key moves the bar cursor up. If the CIRCUIT INTERFACE 1 or a measurement page is displayed, this key changes the selection or value in the parameter selection box indicated by the bar cursor. If the line cursor is under a number in a parameter entry box, pressing this key increments the number. Use the CRT FREEZE/RESUME key to position the line cursor in the box.
16	RUN/HALT	If you are in the measurement page, pressing this key once starts the measurement. Pressing the key again stops the measurement.



Index	Key	Function
17	ENTER	When a menu is displayed, pressing this key selects the function indicated by the bar cursor. If the CIRCUIT INTERFACE 1 or measurement page is displayed, pressing this key causes the test set to accept the value that you have typed into a parameter selection box if that value is in range.
18	CRT FREEZE/RESUME	If you are in a parameter selection box, pressing this key positions the line cursor to next digit. Use the ↑ or ↓ key to increment or decrement the digit.
19	VOL ↓	Pressing this key during a measurement involving a tone decreases the volume of the tone.
20	NO	When a question is displayed, pressing this key answers no.
21	(down arrow)	If you are in a menu, this key moves the bar cursor down. If the CIRCUIT INTERFACE 1 or measurement page is displayed, this key changes the selection or value in the parameter selection box indicated by the bar cursor. If the line cursor is under a number in a parameter entry box, pressing this key decrements the number. Use the CRT FREEZE/RESUME key to position the line cursor in the box.

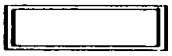
Section II. OPERATION UNDER USUAL CONDITIONS

2-1 CRT DISPLAY FORMATS

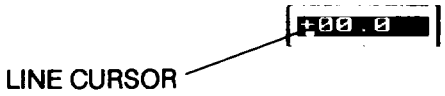
a. Cursors and Symbols.

BAR CURSOR – Marks your location on the screen.

PARAMETER ENTRY BOX – Boxes with single lines around them are where you enter values.



LINE CURSOR – If you are in a location where a value can be typed in, this underline marks the spot where the number you type will be placed.



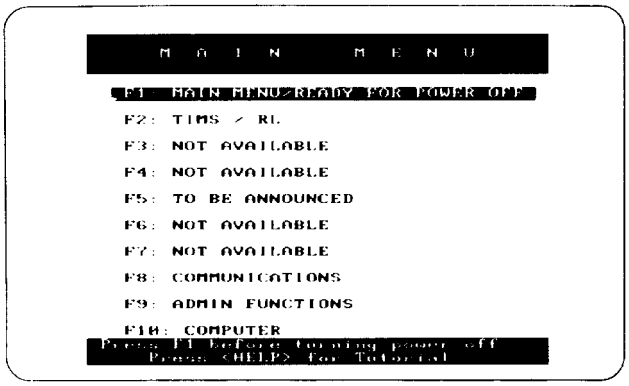
MEASUREMENT DISPLAY BOX – Boxes with double lines around them are where measurement values will be displayed.

This symbol means that the signal is below the measurement range limit.

This symbol means that the signal is above the measurement range limit.

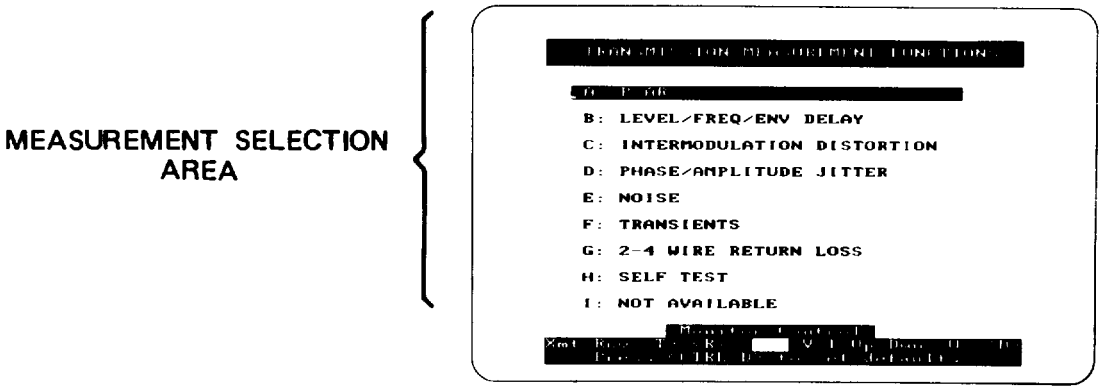
These symbols mean that a signal cannot be detected.

b. *Main Menu*. Pressing the F1 key always displays this menu.

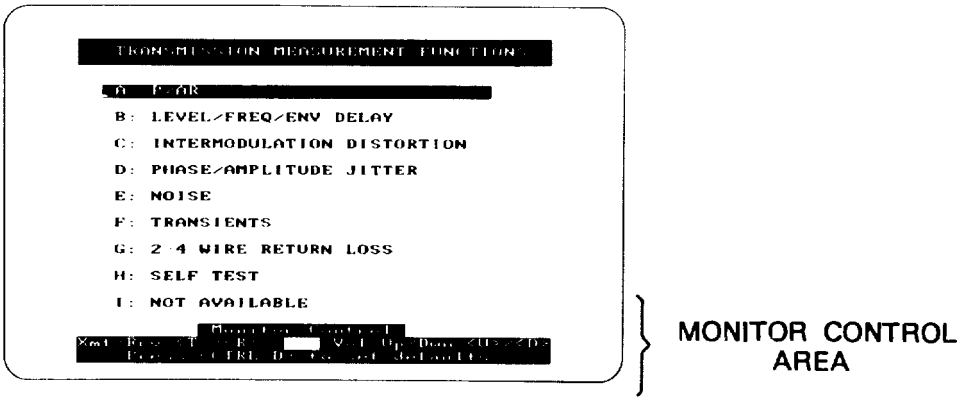


Selection	Name	Purpose
F1:	MAIN MENU/READY FOR POWER OFF	Pressing the ENTER key while the bar cursor is on this selection prepares the test set for turning off power. Pressing the F1 key does the same thing.
F2:	TIMS/RL	Pressing the ENTER key while the bar cursor is on this selection displays the TRANSMISSION MEASUREMENT FUNCTIONS menu.
F3:-F7:	--------	Not used.
F8:	COMMUNICATIONS	Pressing the ENTER key while the bar cursor is on this selection displays the COMMUNICATIONS/REMOTE menu.
F9:	ADMIN FUNCTIONS	Used only during maintenance.
F10:	COMPUTER	Not used. If you press ENTER while the bar cursor is on this selection, the test set will be inoperative. In this case, you must turn off power and then turn power on again to restore operation.

c. Transmission Measurement Functions Menu.

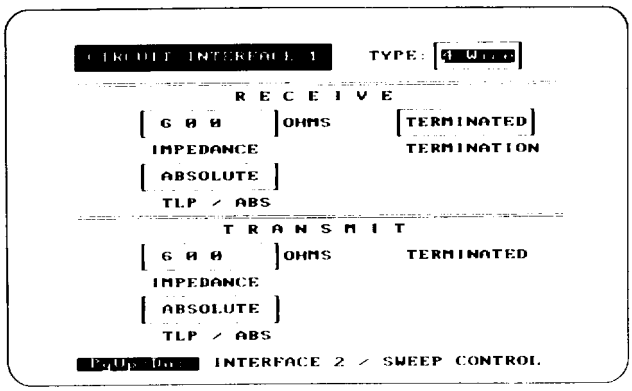


Selection	Name	Purpose
A:	P/AR	Pressing the ENTER key while the bar cursor is on this selection starts the P/AR measurement page series.
B:	LEVEL/FREQ/ENV DELAY	Pressing the ENTER key while the bar cursor is on this selection starts the LEVEL/FREQ/ENV DELAY measurement page series.
C:	INTERMODULATION DISTORTION	Pressing the ENTER key while the bar cursor is on this selection starts the INTERMODULATION DISTORTION measurement page series.
D:	PHASE/AMPLITUDE JITTER	Pressing the ENTER key while the bar cursor is on this selection starts the PHASE/AMPUTUDE JITTER measurement page series.
E:	NOISE	Pressing the ENTER key while the bar cursor is on this selection starts the NOISE measurement page series.
F:	TRANSIENTS	Pressing the ENTER key while the bar cursor is on this selection starts the TRANSIENTS measurement page series.
G:	2-4 WIRE RETURN LOSS	Pressing the ENTER key while the bar cursor is on this selection starts the 2-4 WIRE RETURN LOSS measurement page series.
H:	SELF TEST	Pressing the ENTER key while the bar cursor is on this selection displays the SELF TEST MENU.



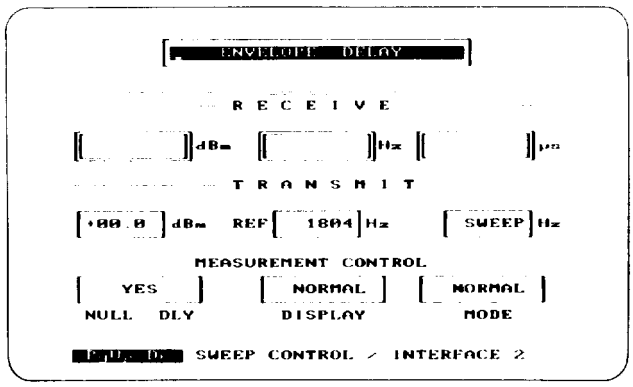
Displayed Text	Meaning
Xmt/Rcv = <T>/< R >	This text tells you to press the MON XMT key to connect the transmitted signal to the DIAL/MON connector and to press the MON RCV key to connect the received signal to the DIAL/MON connector. <T > means the MON XMT key. < R > means the MON RCV key.
Vol Up/Dwn = <U >/< D>	This text tells you to press the VOL ↑ key to increase the tone volume and the VOL↓key to decrease the tone volume. < U > means the VOL ↑ key. < D > means the VOL ↓ key.
Press < CTRL-D > to set defaults	This text tells you how to cause the test set to enter default selections for all circuit interface and measurement parameter values. The term < CTRL-D > means pressing the CTRL key and the VOL ↓ key at the same time.

1. Measurement Page Series.



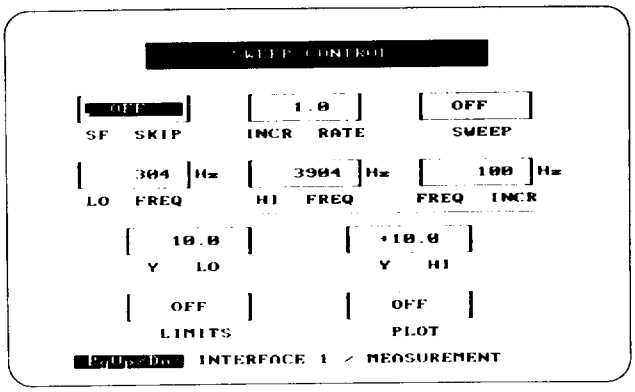
CIRCUIT INTERFACE 1 Page

- Used to select 2 or 4 wire test
- Used to select the termination value. For receive, either a termination or a bridge can be selected
- Used to select the way power levels are indicated. You can select either absolute power levels or power levels referenced to a value you can choose
-



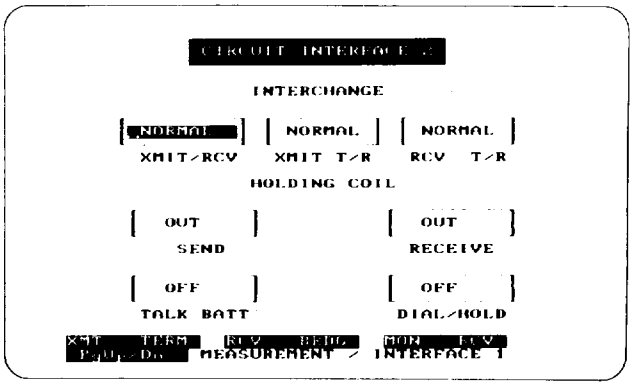
Measurement Page (ENVELOPE DELAY Shown as Example)

- This is where you enter parameters and view measurement results Single-line boxes are used to enter parameters
- Double-line boxes are result boxes where you view measurement results



SWEEP CONTROL Page

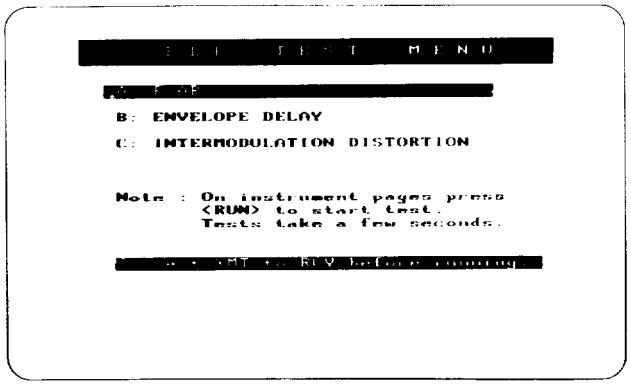
- Allows selection of sweeping parameters
- Used during level versus frequency, envelope delay and 2-4 wire return loss tests
- For the level versus frequency and envelope delay test, the display has a lower area separated by a line. This area is for plotting and is not used



CIRCUIT INTERFACE 2 Page

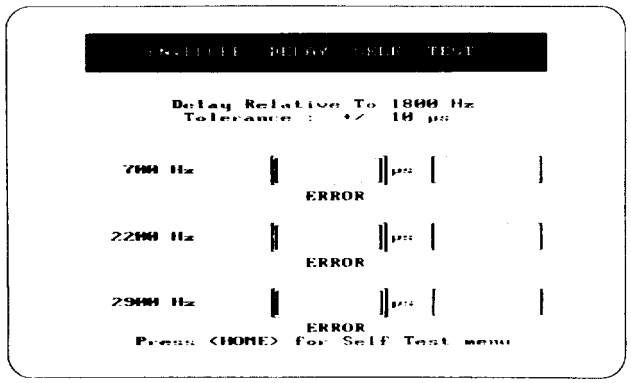
- Allows you to switch the signals at the RCV and XMT connectors (4-wire circuits only)
- Allows you to switch tip and ring at each connector
- Allows you to control the holding coil

2. Self Test Menu.



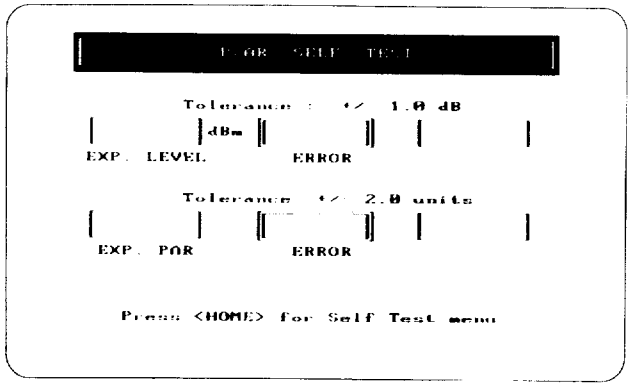
SELF TEST MENU Page

- Three tests check nearly all test set measurment functions
- The term "instrument pages" means a self test display
- Always connect the RCV and XMT jacks together with a jumper before self testing



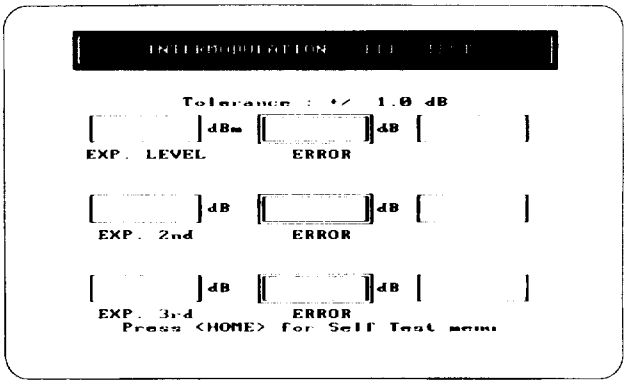
ENVELOPE DELAY SELF TEST Page

- Tests delay measurement abilities of receiver relative to a known delay for an 1800 Hz signal.
- Tests at 700, 2200 and 2900 Hz



P/AR SELF TEST Page

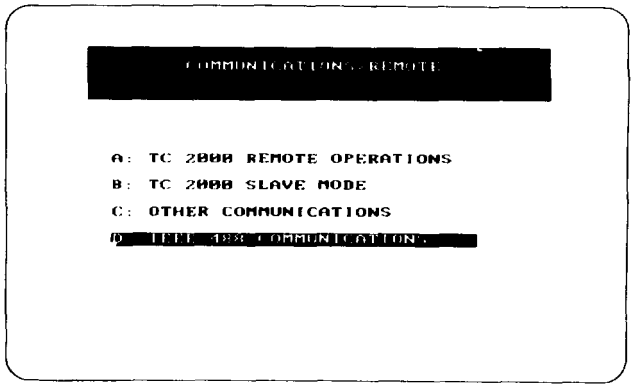
- Tests transmitted and received levels
- Tests peak-to-average ratio measurement function



INTERMODULATION SELF TEST Page

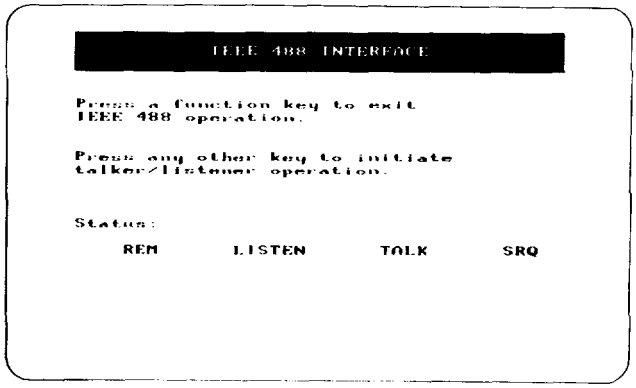
- Checks transmitted and received levels
- Checks second and third order harmonics
- Gives expected receive value and error

d. Communications/Remote Menu.



COMMUNICATIONS/REMOTE Menu

- D: IEEE-488 COMMUNICATIONS is the only communications function used
- A: TC-2000 REMOTE OPERATIONS is not used
- B: TC-2000 SLAVE MODE is not used
- C: OTHER COMMUNICATIONS is not used



IEEE-488 INTERFACE Page

- Displays the status of communications between other equipment and the test set during remote GPIB (IEEE-488) operation
- Once initiated, GPIB operation can be terminated by pressing the HOME or F1 keys
- Don't initiate operation with the RUN/HALT, HOME or F1 keys; they'll cause the MAIN MENU to be displayed

2-2 OPERATING PROCEDURES

Procedure Index

a. Turning on power
b. Moving the bar cursor
c. Displaying menus
d. Displaying circuit interface and measurement pages
e. Self Testing
f. Restoring default values
g. Volume control
h. DIAL/MON jack output connection
i. Selecting parameter selection box entries
j. CIRCUIT INTERFACE 1 selections
k. CIRCUIT INTERFACE 2 selections
I. Entering values in a parameter box
m. Sweep control and plot setup
n. P/AR measurements
o. Level versus frequency measurements
p. Envelop delay measurement setup
q. Envelop delay normal-mode operation
r. Envelop delay repeat-mode operation
s. Intermodulation distortion measurements
t. Phase and amplitude jitter measurements
u. Noise measurements
v. Transient measurements
w. Return loss measurements
x. Setting up and monitoring GPIB (remote) operation
y. Turning off power

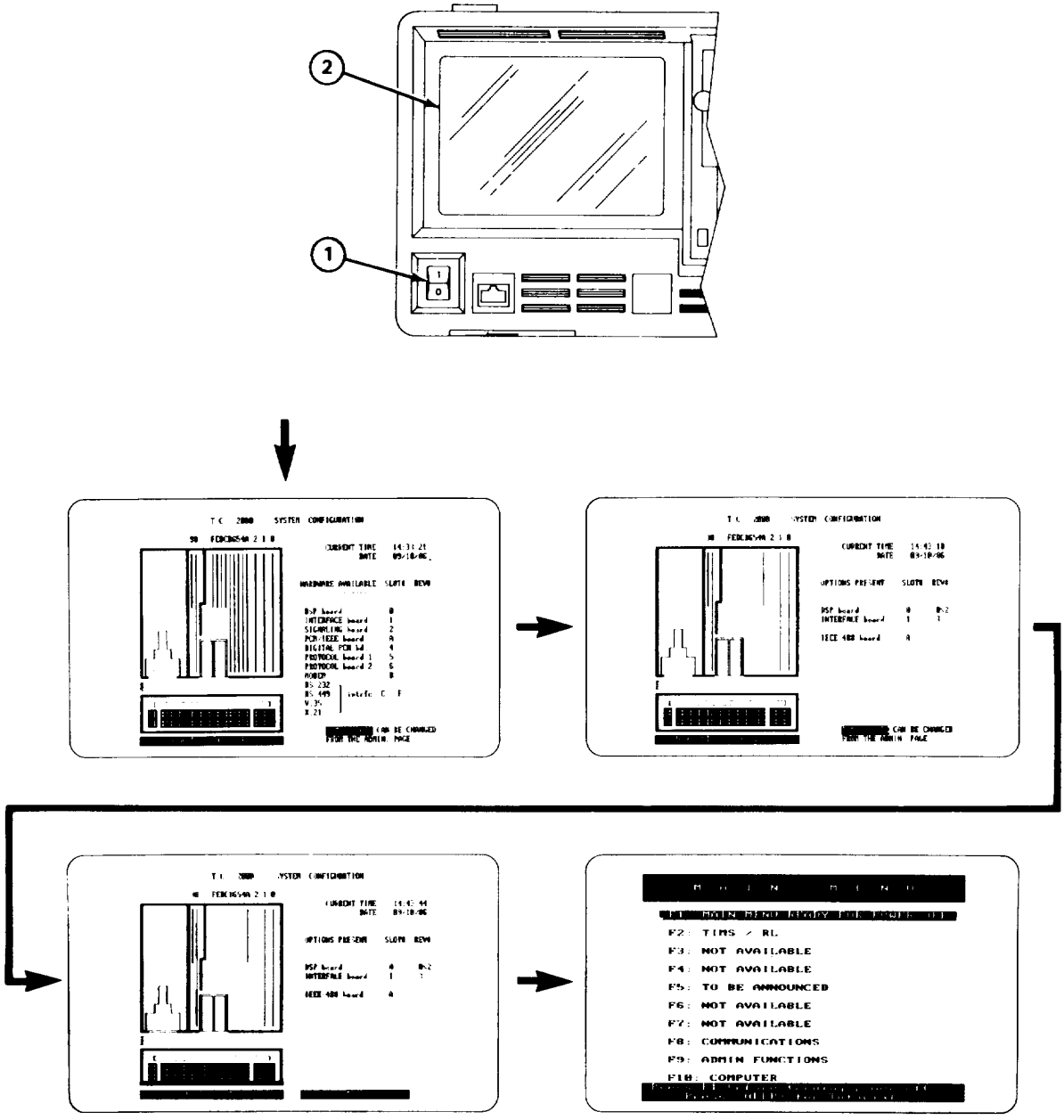
NOTES

- There is usually a 1 to 5 second delay between the time that you press a key and the time that an action occurs in the test set.
- An audio beep occurs when you press a key that does not function in the mode that you are in.
- The RCV connector is not used during 2-wire circuit measurements.
- If your measurements appear to be incorrect, check your connections and make sure that the phone plugs are dean.
- The test set will not let you enter a parameter that is beyond its range. An **audio beep** will alert you that your value is out of range and a RANGE: message will appear one line from the bottom of the CRT.

a. Turning On Power.

1. Push I part of Power switch in.

2. After a power-on self test, an audio beep will sound. A few moments later, the LP COM logo and a copyright notice will be displayed on the CRT. After that, watch the display and verify that the SYSTEM CONFIGURATION display appears, modifies itself to a version that indicates SYSTEM OK and is then replaced by the MAIN MENU, as shown below.



3. After the MAIN MENU is displayed, run self test (para 2-2e).

b. Moving The Bar Cursor.

1. In a menu, press the ↑ or ↓ key.

2. To move between parameter selection or entry boxes, press the → or ← key.

c. Displaying Menus.

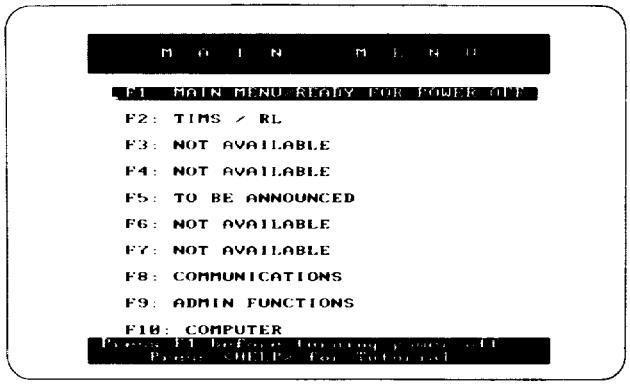
1. To display the MAIN MENU:

a) If a measurement is not in progress, display the MAIN MENU at any time by pressing Fl.

b) If a measurement is in progress, press RUN/HALT to stop the measurement; then press Fl.

c) If the TRANSMISSION MEASUREMENT FUNCTIONS menu is displayed, pressing HOME will display the MAIN MENU.

d) When power is applied, this menu is the first to be displayed.



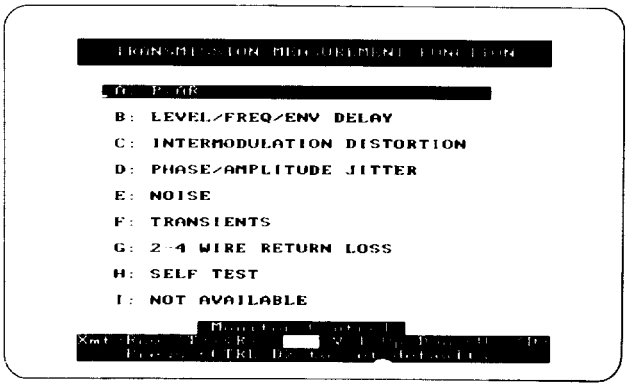
2. To display the TRANSMISSION MEASUREMENT FUNCTIONS Menu:

a) If a measurement is in progress, press RUN/HALT first.

b) If a CIRCUIT INTERFACE or measurement page is displayed, press HOME.

c) If the COMMUNICATIONS/ REMOTE or ADMINISTRATION menu is displayed, press F1 to display the MAIN MENU and do the next step.

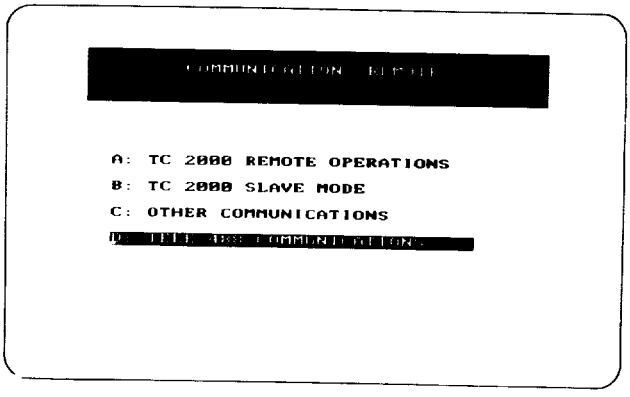
d) If the MAIN MENU is displayed, move the bar cursor to F2: TIMS/RL and then press ENTER.



3. To display the COMMUNICATIONS/ REMOTE Menu:

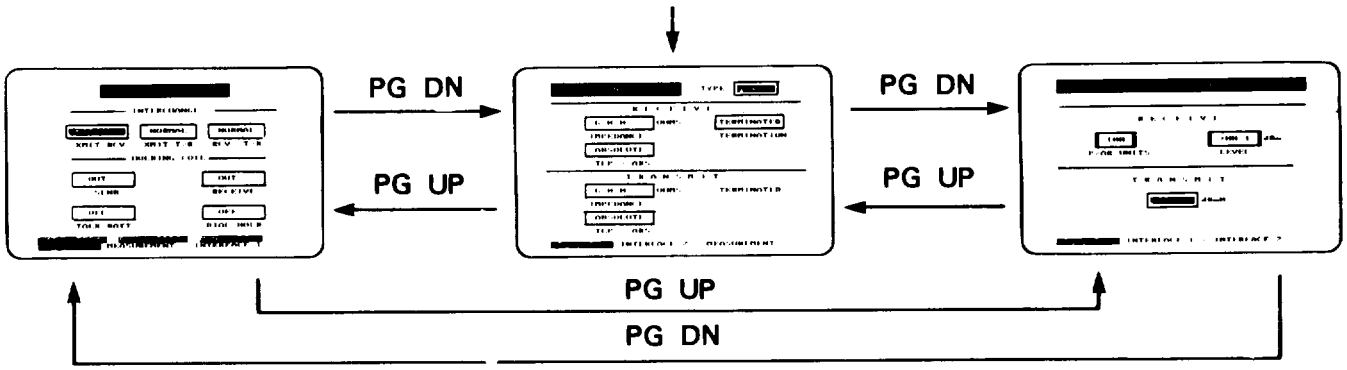
a) Display the MAIN MENU.

b) Move the bar cursor to F8: COMMUNICATIONS with the ↑ or ↓ key and then press ENTER.



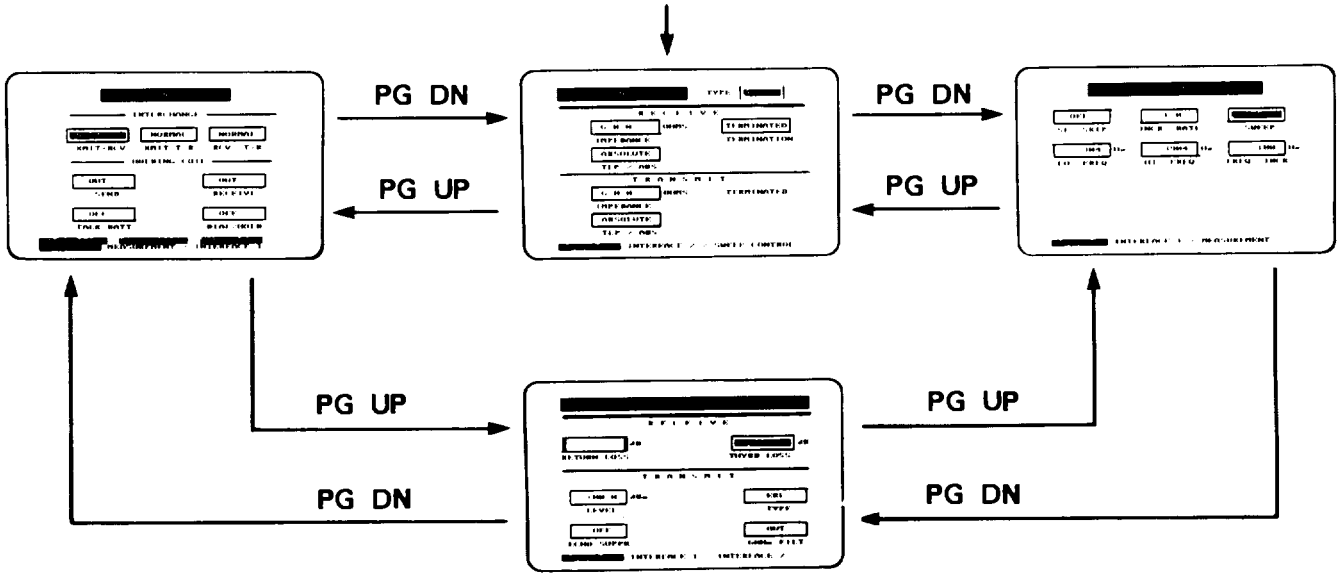
d. *Displaying Circuit Interface and Measurement Pages.* When you select a measurement from the TRANSMISSION MEASUREMENT FUNCTIONS menu, the measurement page series starts at the CIRCUIT INTERFACE 1 page. From this page, use the PG UP or PG DN keys to move through the series.

TRANSMISSION MEASUREMENT FUNCTIONS MENU



Example of P/AR Measurement Page Series
MEASUREMENTS WITHOUT SWEEP CONTROL

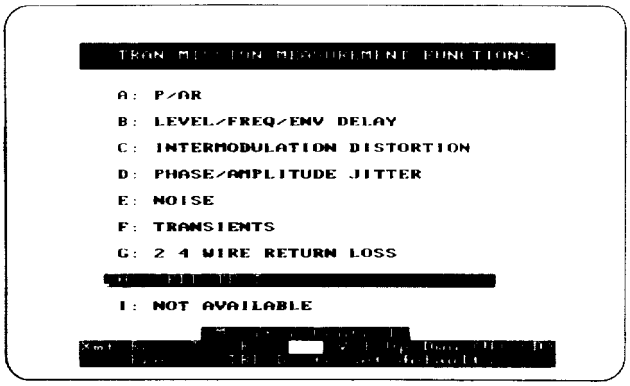
TRANSMISSION MEASUREMENT FUNCTIONS MENU



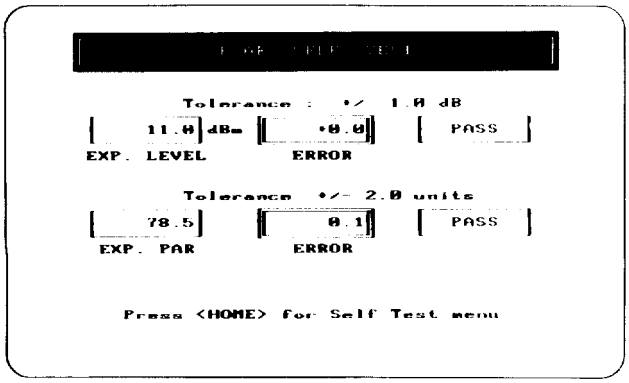
Example of 2-4 WIRE RETURN LOSS Measurement Page Series
MEASUREMENTS WITH SWEEP CONTROL

e. Self Testing.

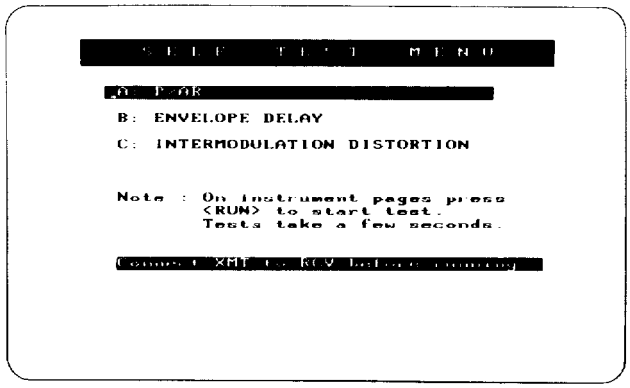
1. Connect the RCV jack to the XMT jack with a jumper (with 310 connectors).
2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.



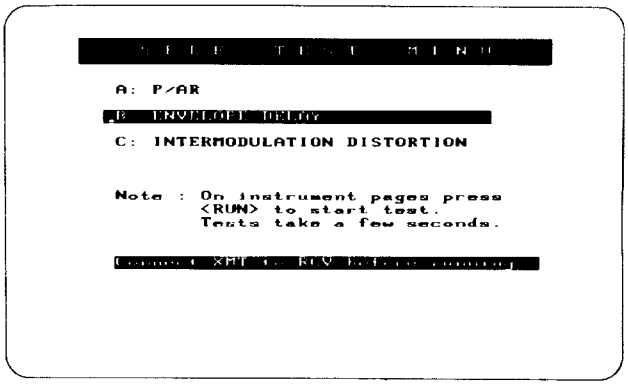
3. Move bar cursor to H: SELF TEST.
4. Press ENTER. The SELF TEST MENU will be displayed.



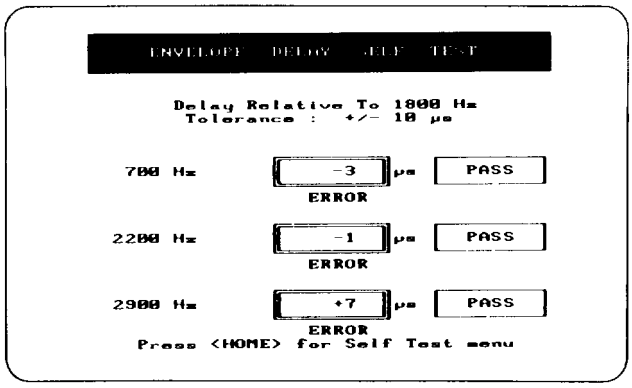
6. Press RUN/HALT. The P/AR self test will start.
7. Verify that PASS is displayed in the two boxes on the right side.
8. Press RUN/HALT to stop the test.
9. Press HOME.



5. Press ENTER. The P/AR SELF TEST page will be displayed.



10. Move the bar cursor to B: ENVELOPE DELAY.
11. Press ENTER. The ENVELOPE DELAY SELF TEST page will be displayed.

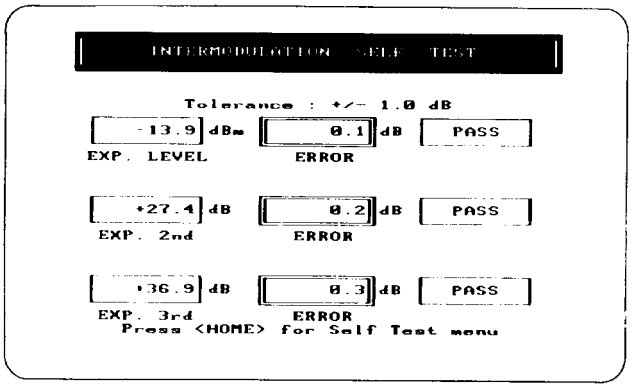


12. Press RUN/HALT. The envelope delay self test will start.

13. Verify that PASS is displayed in the three boxes on the right side.

14. Press RUN/HALT to stop the test.

15. Press HOME.

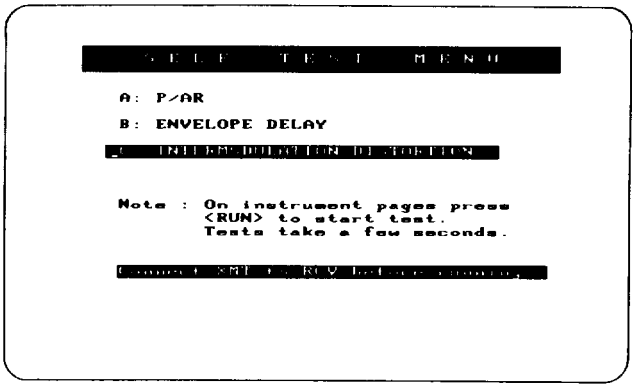


18. Press RUN/HALT. The intermodulation self test will start.

19. Verify that PASS is displayed in the three boxes on the right side.

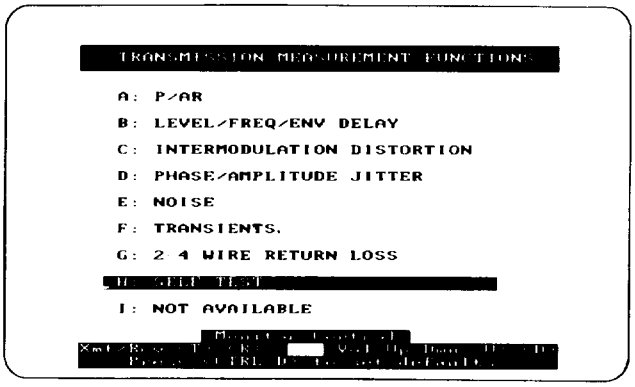
20. Press RUN/HALT to stop the test.

21. Press HOME twice.



16. Move the bar cursor to C: INTERMODULATION DISTORTION.

17. Press ENTER. The INTERMODULATION SELF TEST page will be displayed.



22. If all self tests passed, the test set measurement circuits are operable and ready to use.

END OF TEST

f. Restoring Default Values. The test set stores all of the selections that you make and the values that you enter during measurements. If you return to a page where you previously changed the entries, those entries will still be there. You can restore the test set's default selections and values for all measurements at one time as follows:

1. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.
2. Press CTRL and VOL 1 at the same time and then release both keys.
3. Press YES if you don't want to save previous selections and values.

g. Volume Control.

1. To lower the volume, press VOL ↓
2. To raise the volume, press VOL ↑.

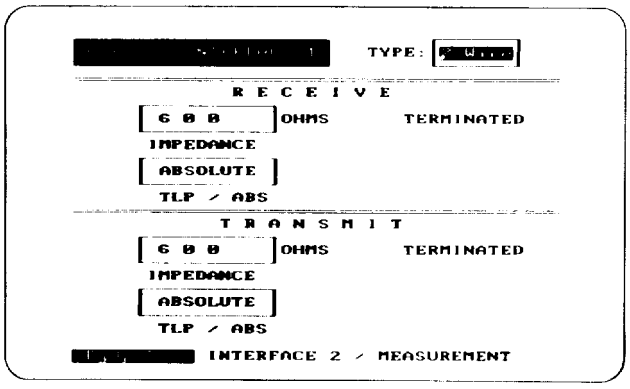
h. DIAL/MON Jack Output Connection.

1. To connect the transmit signal to the DIAL/MON jack, press MON XMT.
2. To connect the received signal to the DIAL/MON jack, press MON RCV.

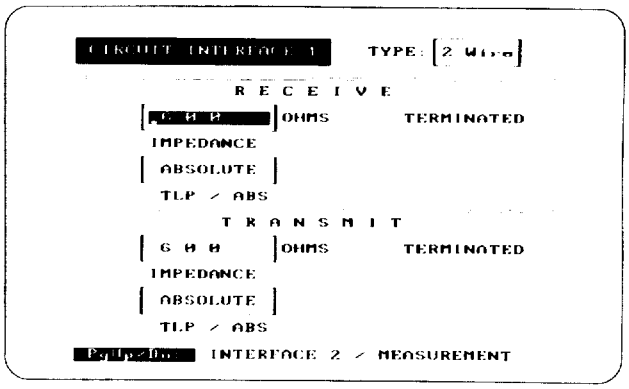
i. Selecting Parameter Selection Box Entries. When the bar cursor is in a parameter selection box, change the entry in the box using the ↑ or ↓ key.

j. CIRCUIT INTERFACE 1 Selections.

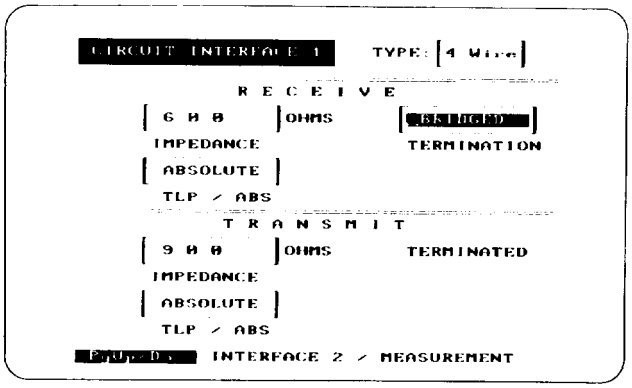
1. Display the CIRCUIT INTERFACE 1 page.



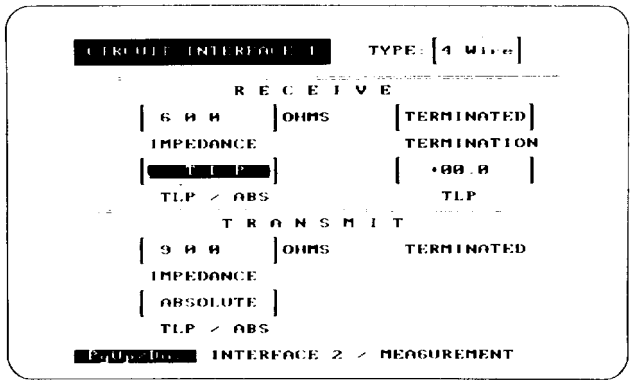
2. Move the bar cursor to the top box and select a 4- or 2-WIRE circuit.



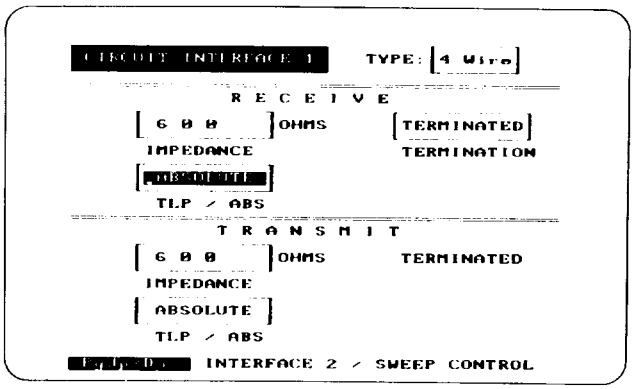
3. Move the bar cursor to the IMPEDANCE box in the RECEIVE area and select between 135, 600, 900 or 1200 Ohms (4-wire) or 600 and 900 Ohms (2-wire).



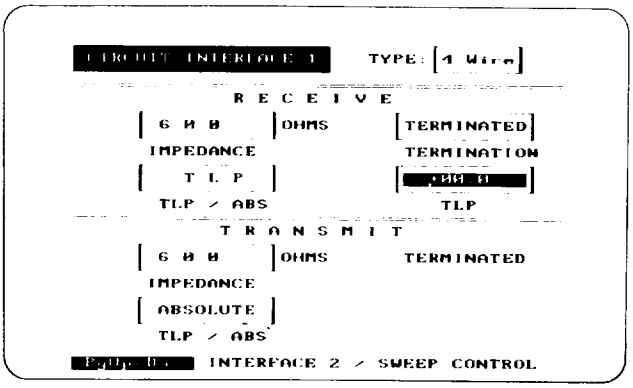
4. Move the bar cursor to the TERMINATION box in the RECEIVE area and select BRIDGE or TERMINATED.



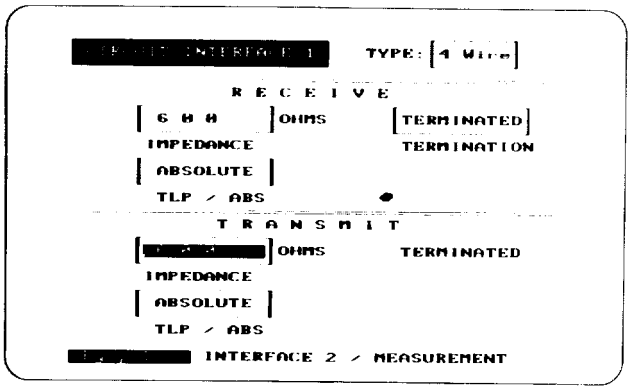
6. To select relative receive level measurements, move the bar cursor o the TLP/ABS box and select TLP. Values will be displayed in dBm0 (dBrnO or dBrnCO for noise measurements). The 0 means relative to a level that you set in the TLP box on the right.



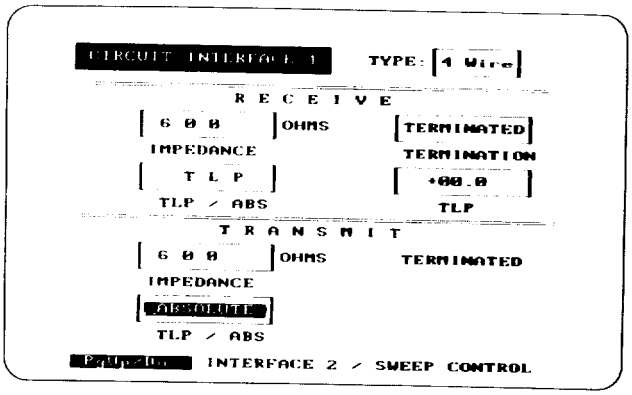
5. To select absolute receive level measurements, move the bar cursor to the TLP/ABS box and select ABSOLUTE. Values will be displayed in dBm (dBrn or dBmC for noise measurements).



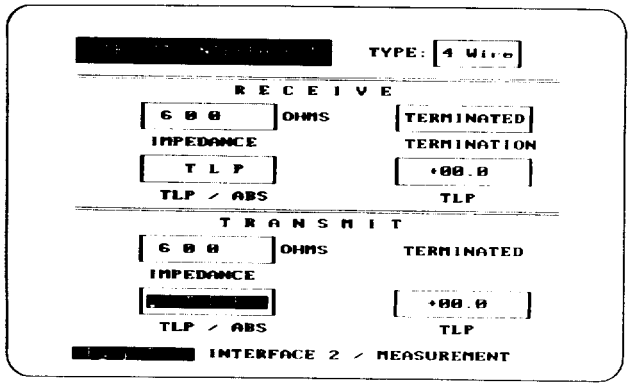
7. If relative receive level measurements was selected, move the bar cursor to the TLP - box and enter the desired reference level.



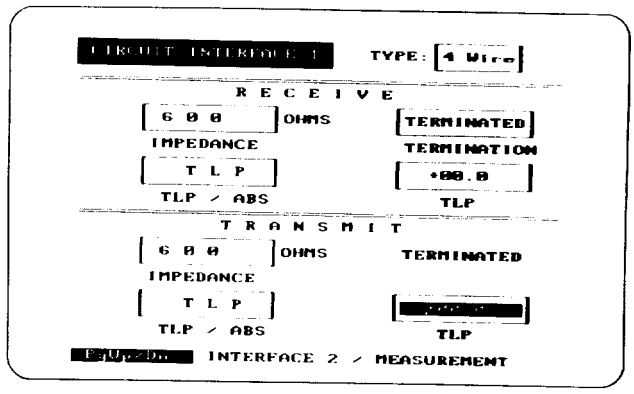
8. Move the bar cursor to the IMPEDANCE box in the TRANSMIT area and select between 135, 600, 900 or 1200 Ohms (4-wire) or 600 and 900 Ohms (2-wire).



9. To select absolute transmit level measurements, move the bar cursor to the TLP/ABS box and select ABSOLUTE. Values will be displayed in dBm (dBm or dBmC for noise measurements).



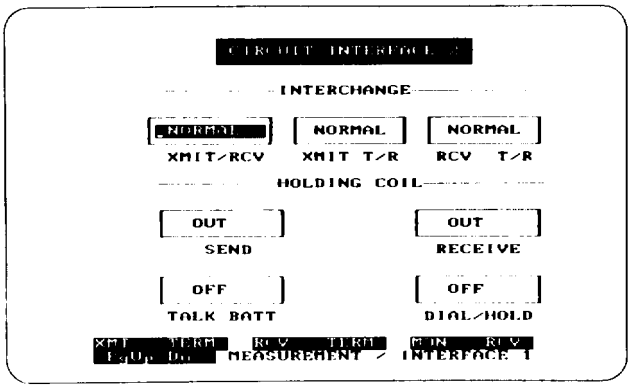
10. To select relative transmit level measurements, move the bar cursor to the TLP/ABS box and select TLP. Values will be displayed in dBm0 (dBm0 or dBmCO for noise measurements). The 0 means relative to a level that you set in the TLP box on the right.



11. If relative transmit level measurements was selected, move the bar cursor to the TLP box and enter the desired reference level.

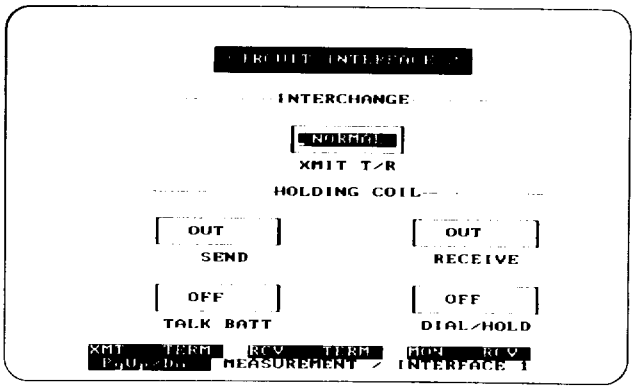
k. CIRCUIT INTERFACE 2 Selections.

1. Display the CIRCUIT INTERFACE 2 page.

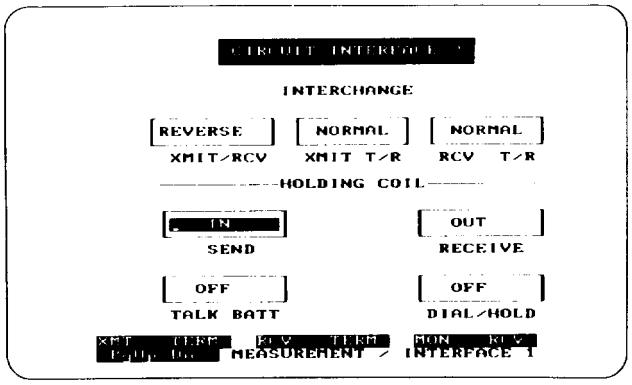


2. For 4-wire circuits, move the bar cursor to the XMIT/RCV box and select NORMAL or REVERSE connections.

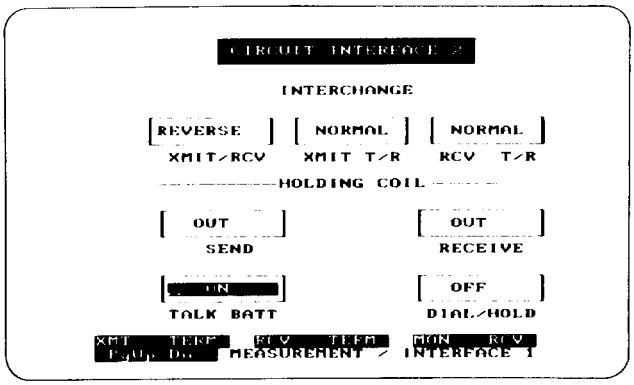
3. For 4-wire circuits, move the bar cursor to the RCV T/R box and select NORMAL or REVERSE connections.



4. For either 4or 2-wire circuits (2-wire shown above), move the bar cursor to the XMIT T/R box and select NORMAL or REVERSE connections.

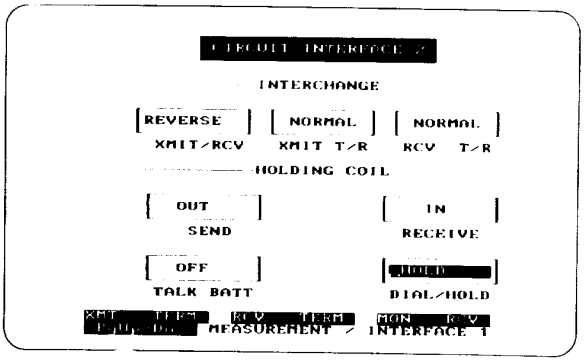


5. Move the bar cursor to the SEND or RECEIVE box and select holding coil IN or holding coil OUT.



6. Move the bar cursor to the TALK BATT box and select voltage ON or OFF.

7. Move the bar cursor to the DIAL-HOLD box and select DIAL, HOLD or OFF.

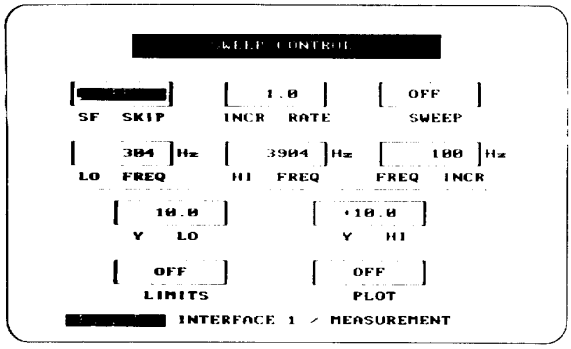


l. Entering Values in a Parameter Entry Box. Parameters are entered in parameter entry (single line) boxes on measurement pages.

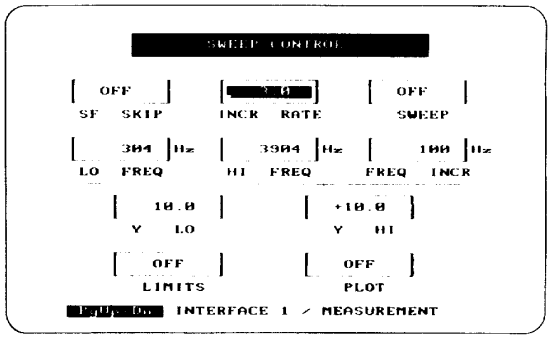
- **Scroll Method:** Use the CRT FREEZE/RESUME key and the < (backspace) key to position line cursor under the number or sign. Use the t key to increase the number. Use the I key to decrease the number. If the line cursor is under a polarity sign, either key will change the sign.
- **Entry Method:** Type the number using the keyboard and press ENTER. A positive number is assumed unless you type the (minus sign) before the number.

m. Sweep Control and Plot Setup. The sweep control page is available for level versus frequency, envelope delay, and 2-wire/4-wire return loss measurements. This page includes a plot setup section for level versus frequency and envelop delay measurements.

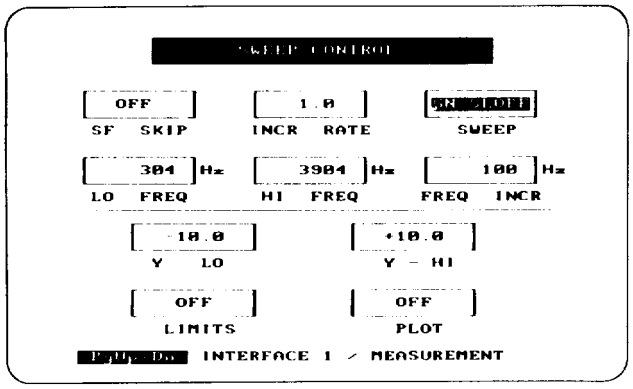
1. Display the SWEEP CONTROL page. To turn sweep off, go to step 6. To turn on plot, go to step 14.



2. To skip the band from 2450 Hz to 2750 Hz, set SF SKIP to ON.
3. Move bar cursor to INCR RATE box.

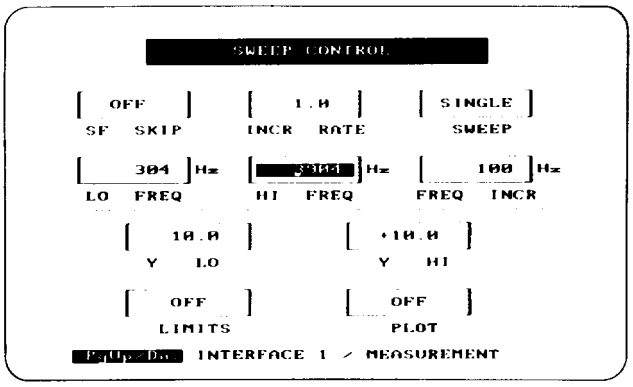


4. Select an incrementing rate (0.3, 1.0 or 3.0 increments/second).
5. Move bar cursor to SWEEP box.



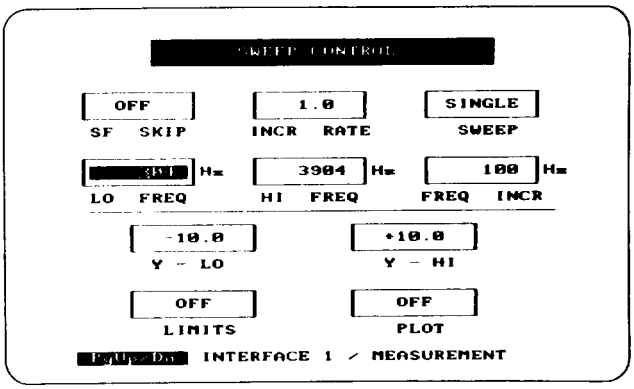
6. Select GN SLOPE, CONT or SINGLE or select sweep OFF. If you select off, your done.

7. Move the bar cursor to the LO FREQ box.



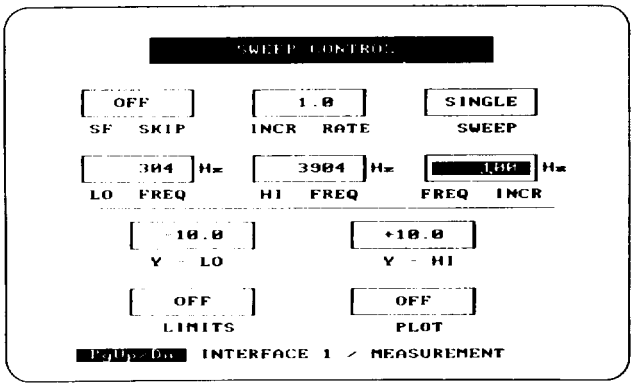
10. Enter the ending frequency.

11. Move the bar cursor to the FREQ INCR box.



8. Enter the starting frequency.

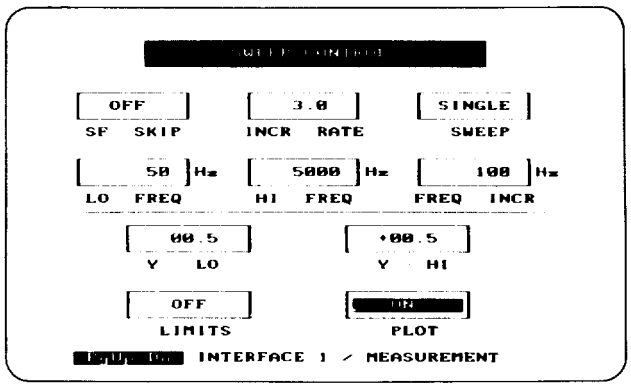
9. Move the bar cursor to the HI FREQ box.



12. Enter the frequency increment.

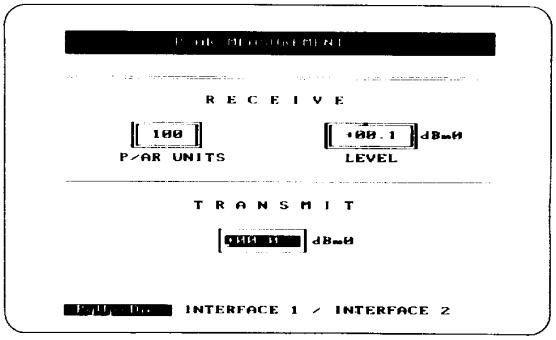
13. If you are doing a 2-wire/4-wire measurement, proceed to the measurement. Otherwise, go to the next step.

14. Move the bar cursor to the PLOT box and select ON or OFF.
15. Move the bar cursor to the Y LO box and select the lower limit of the Y axis. Then, move the bar cursor to the Y HI box and select the upper limit of the Y axis. If you are plotting a level/frequency measurement, then the value you enter will be in dB. The lower limit range is -50 to + 9 dB and the upper limit range is -9to + 10dB. If you are plotting an envelope delay measurement, then the value you enter will be in microseconds and will automatically be multiplied by 100.
16. Move the bar cursor to the LIMITS box and select C4, C2, C1, 3002 or OFF. The C4, C2, C1 and 3002 selections are predefined conditioning limits per Bell Publication 41009.



n. P/AR Measurement.

1. Connect equipment under test to the RCV jack (4-wire tests only) and the XMT jack and connect appropriate monitoring equipment to the DIAL/MON jack.
2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.
3. Move the bar cursor to A: P/AR and press ENTER.
4. Make CIRCUIT INTERFACE 1 selections (para 2-2j).
5. Make CIRCUIT INTERFACE 2 selections (para 2-2k).
6. Display the P/AR MEASUREMENT page.
7. Enter a transmit level.
8. To start the measurement, press RUN/HALT.
   To stop the measurement, press RUN/HALT again.



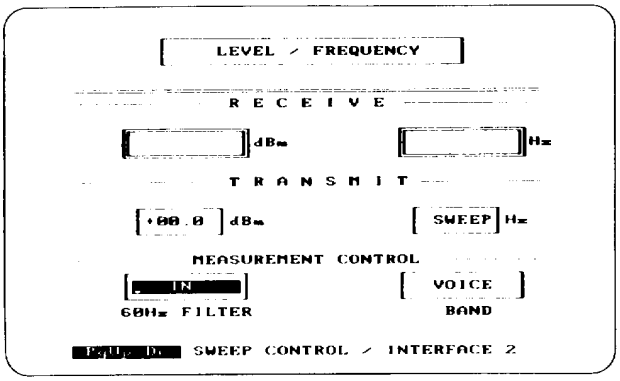
o. Level Versus Frequency Measurements.

NOTE

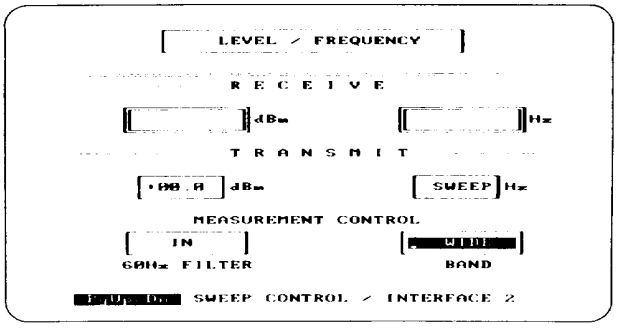
All generated frequencies that are sub-multiples of 8 kHz should be offset by 4 Hz to prevent interference with the sampling of digital T-carrier facilities.

1. Connect equipment under test to the RCV and/or XMT jacks and connect appropriate monitoring equipment to the DIAL/MON jack.
2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.

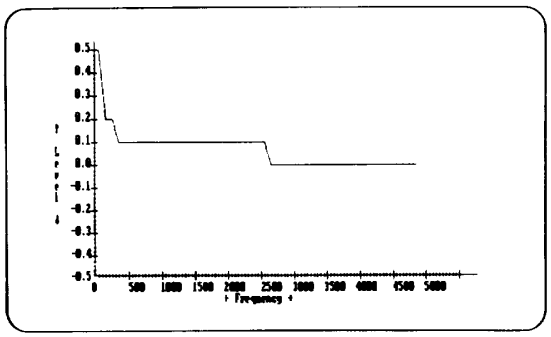
3. Move the bar cursor to B: LEVEL/FREQUENCY/ENV DELAY and press ENTER.
4. Make CIRCUIT INTERFACE 1 selections (para 2-2j).
5. Make CIRCUIT INTERFACE 2 selections (para 2-2k).
6. Set up SWEEP CONTROL and set up screen plot, if desired(para 2-2m).
7. Display the LEVEL/FREQUENCY MEASUREMENT page.



8. Move the bar cursor to 60Hz FILTER and select IN or OUT, as desired..

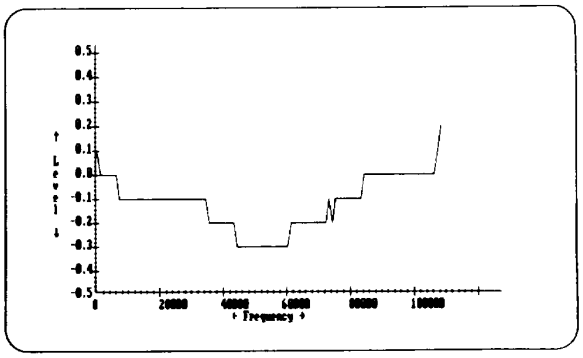


9. Move bar cursor to BAND box and select VOICE or WIDE band



Voice Band Plot

10. To start the measurement, press RUN/HALT. If you turned PLOT on, then a graphic plot of level versus frequency will be displayed.
11. If you did not select plot, you can change the transmit level during the measurement by moving the bar cursor to the dBm box and entering a value.



Wide Band Plot

12. If a sweep was not selected and you did not turn on plot, you can enter a frequency during the measurement by moving the bar cursor to the Hz box and entering a value.
13. To stop the measurement, press RUN/HALT.

p. Envelope Delay Measurement Setup. The envelope delay measurement can be made in two basic modes: NORMAL and REPEAT. In the NORMAL mode, the test set operates as the measurement set and another tester at the other end of the link is set up as a repeater. In the REPEAT mode, the test set operates as the repeater while the tester at the other end of the link operates as the measurement set. Do the following procedure to set up the tester for envelope delay measurements. Then, perform the envelope delay normal-mode procedures (para 2-2p) or the envelope delay repeater-mode procedures (para 2-2q).

1. Connect equipment under test to the RCV jack (4-wire circuits only) and the XMT jack and connect appropriate monitoring equipment to the DIAL/MON jack.

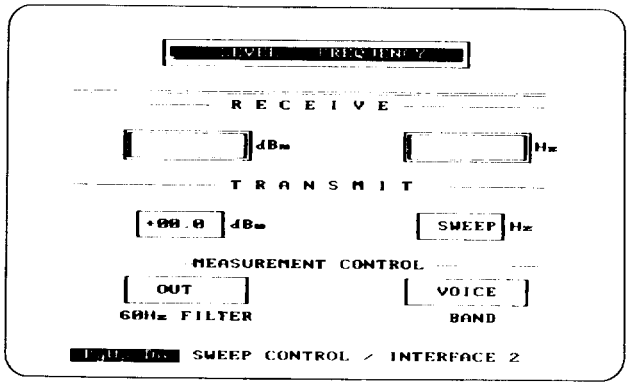
2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.

3. Move the bar cursor to B: LEVEL/FREQUENCY/ENV DELAY and press ENTER.

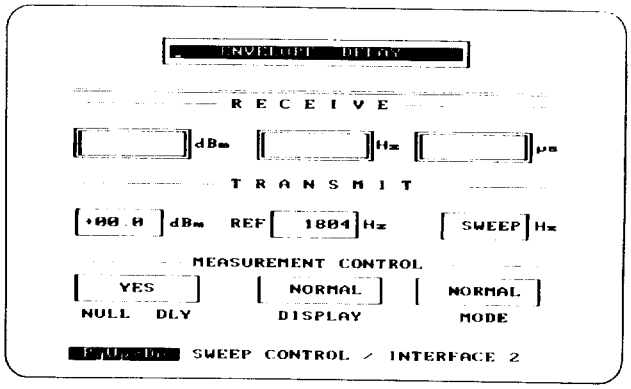
NOTE

You can not do an envelope delay measurement on a 2-wire circuit.

4. Make CIRCUIT INTERFACE 1 selections (para 2-2j).
5. Make CIRCUIT INTERFACE 2 selections (para 2-2k).
6. Display the LEVEL/FREQUENCY MEASUREMENT page.



7. If the ENVELOPE DELAY page is not displayed, move the bar cursor to the LEVEL/FREQUENCY box and select ENVELOPE DELAY.

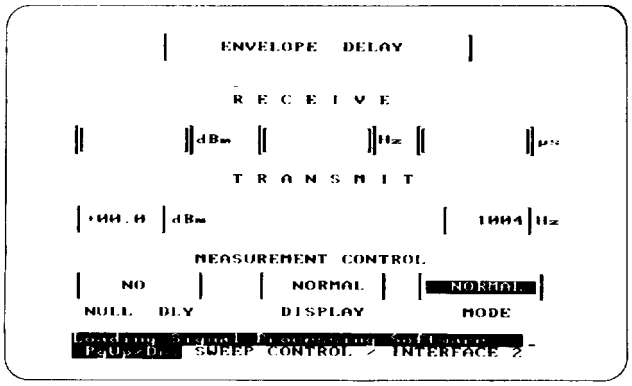


8. Do the envelope delay normal-mode procedures (para 2-2q) or the envelope delay repeater-mode procedures (para 2-2r).

q. Envelope Delay Normal-Mode Operation. Use this procedure when the test set is to operate as the measurement set.

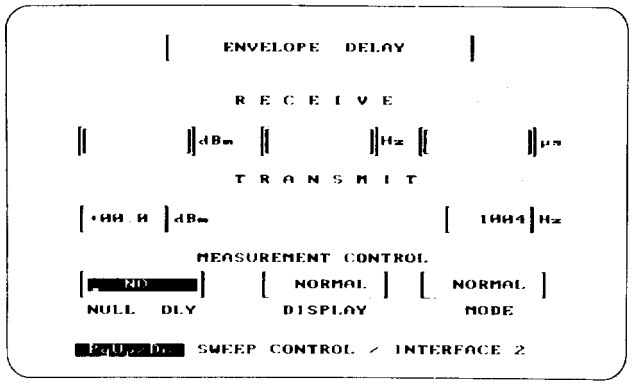
NOTE

All generated frequencies that are sub-multiples of 8 kHz should be offset by 4 Hz to prevent interference with the sampling of digital T-carrier facilities.



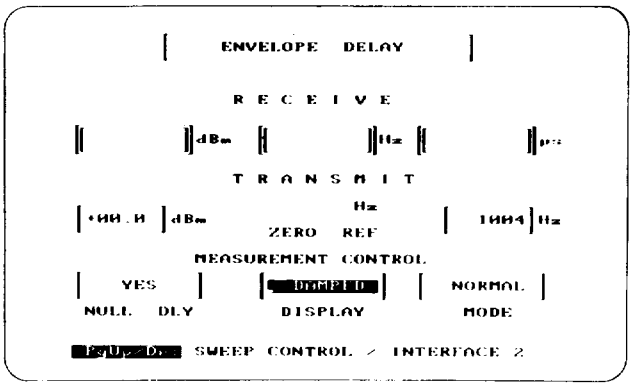
1. If you have not already done so, set up for envelope delay measurements (para 2-20).

2. Move the bar cursor to the MODE box and select either NORMAL or WB NORMAL.

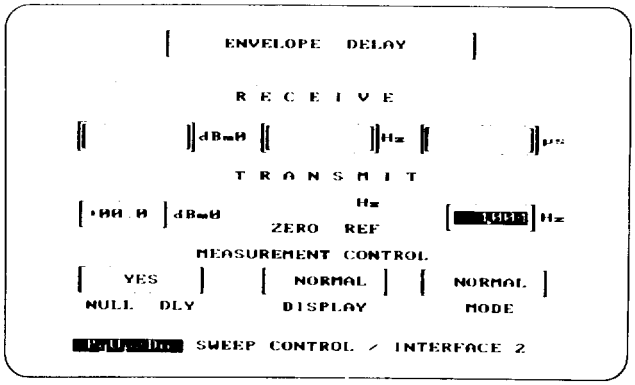


4. Move the bar cursor to the NULL DLY box and select either YES (to set up a reference frequency and null its delay) or NO (no reference frequency).

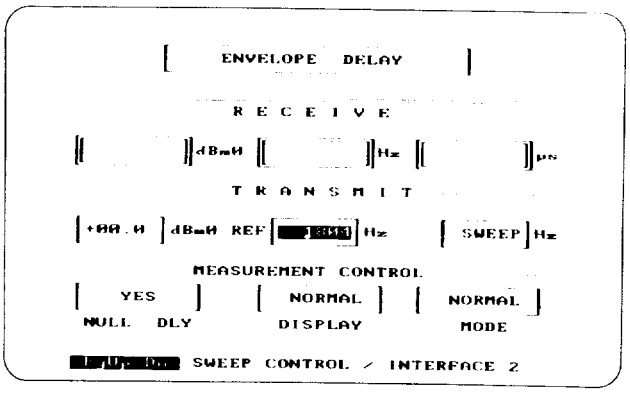
5. If this will be a swept return reference measurement, set up SWEEP CONTROL and the plot function (para 2-2m).



3. Move the bar cursor to the DISPLAY box and select either NORMAL or DAMPED. If DAMPED is selected, the values in the RECEIVE result boxes will be average values.

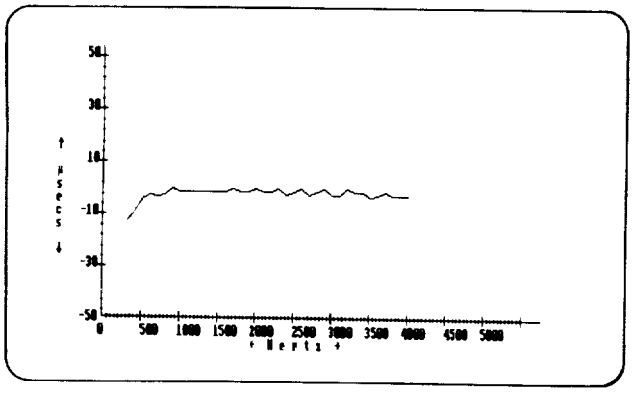


6. If you are not sweeping and you are using a reference frequency (YES in NULL DLY), move the bar cursor to the Hz box and enter the desired reference frequency. This frequency will appear above the ZERO REF entry when the measurement is started.



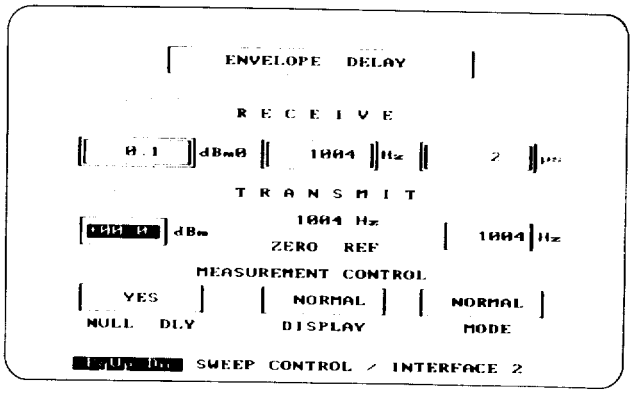
7. If you are sweeping and you are using a reference frequency (YES in NULL DLY box), move the bar cursor to the REF Hz box and enter the desired reference frequency.

8. To start the measurement, press RUN/HALT.



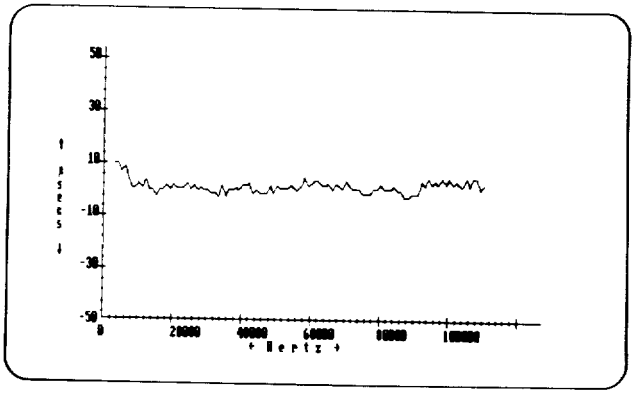
Voice Band Plot

11. To stop the measurement, press RUN/HALT.



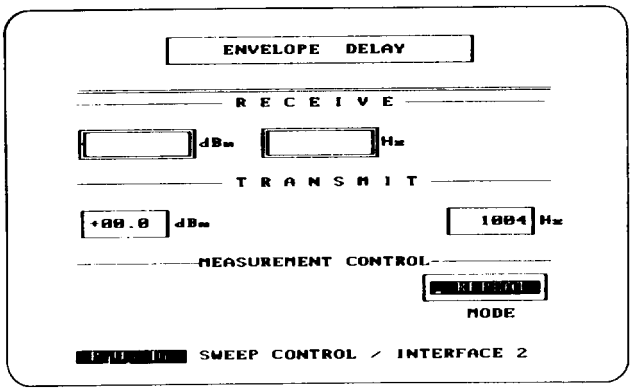
9. If the plot function is off, you can change the transmit level during the measurement by moving the bar cursor to the dBm box and entering a value.

10. If neither sweep or plot was selected, you can enter a frequency during the measurement by moving the bar cursor to the Hz box and entering a value.



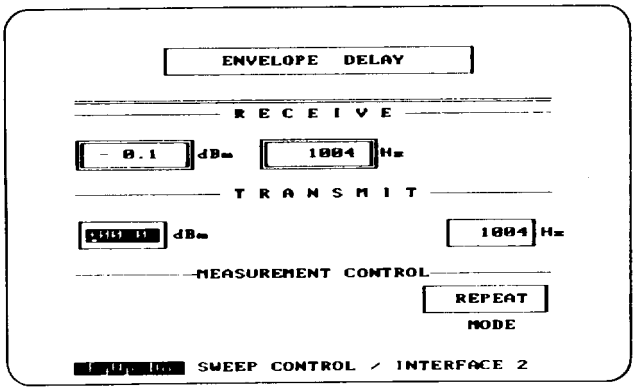
Wide Band Plot

r. Envelope Delay Repeat-Mode Operation. Use this procedure when the test set is to operate as the repeater.



1. If you have not already done so, set up for envelope delay measurements (para 2-20).

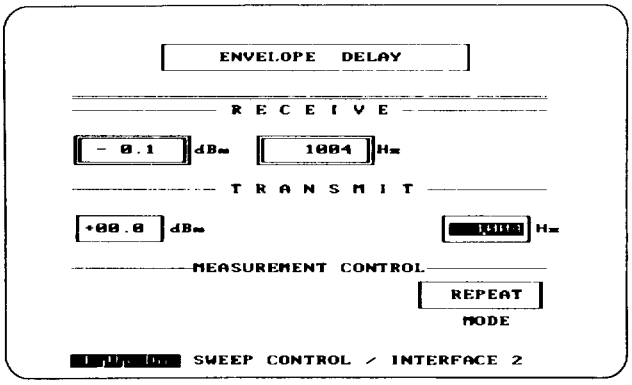
2. Move the bar cursor to the MODE box and select either REPEAT or WB REPEAT.



3. If this will be a swept forward reference measurement, set up SWEEP CONTROL (para 2-2m).

4. To start the measurement, press RUN/HALT.

5. To change the transmit level during the measurement, move the bar cursor to the dBm box and enter a value.

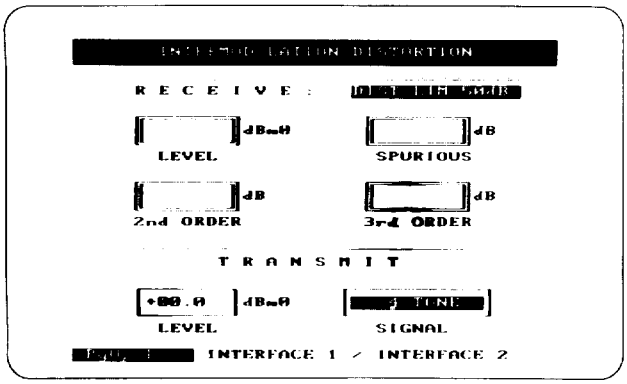


6. If a sweep was not selected, you can enter a frequency during the measurement by moving the bar cursor to the Hz box and entering a value.

7. To stop the measurement, press RUN/HALT.

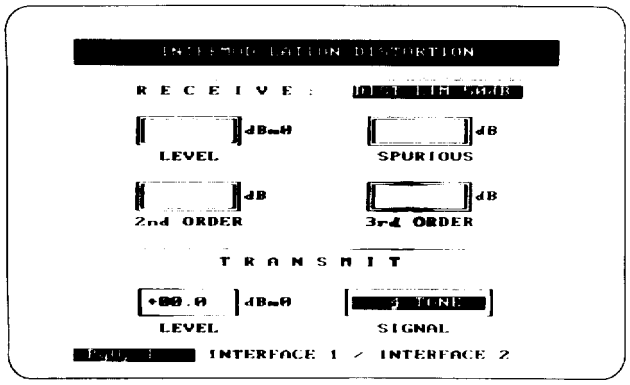
s. Intermodulation Distortion Measurement. During this measurement, the test set can be the measuring receiver, the 4-tone transmitter, or both at the same time.

1. Connect equipment under test to the RCV jack (4-wire circuits only) and the XMT jack and connect appropriate monitoring equipment to the DIAL/MON jack.
2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.
3. Move the bar cursor to C: INTERMODULATION DISTORTION and press ENTER.
4. Make CIRCUIT INTERFACE 1 selections (para 2-2j) and CIRCUIT INTERFACE 2 selections (para 2-2k).
5. Display the INTERMODULATION DISTORTION page.
6. If the test set is to be a measuring receiver only, select OFF in the SIGNAL box and press RUN/HALT. The message **Analysis in Progress, Wait** and a number telling you how long to wait will flash. The measurement is not valid until this is over.
7.



NOTE

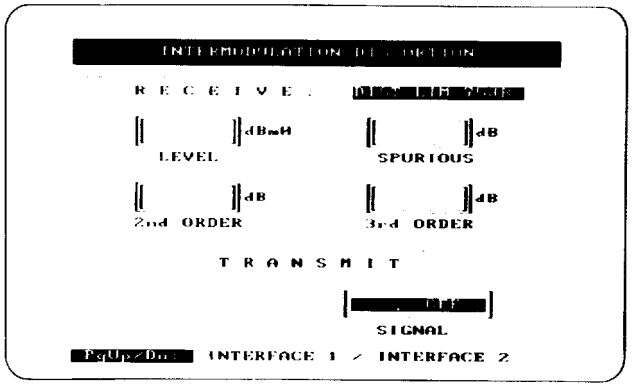
As a measuring receiver, the test set will automatically detect a 2-tone signal and begin a noise correction cycle. During this cycle, SNR CHECK IN PROGRESS will be displayed. When the cycle is over, NOISE CORRECTED will appear. If the 2-tone signal is removed before the cycle is complete, SNR CHECK ABORTED will appear and no correction will occur.



7. If the test set is to be a transmitter, select 4TONE in the SIGNAL box.

8. To start the transmission, press RUN/HALT.

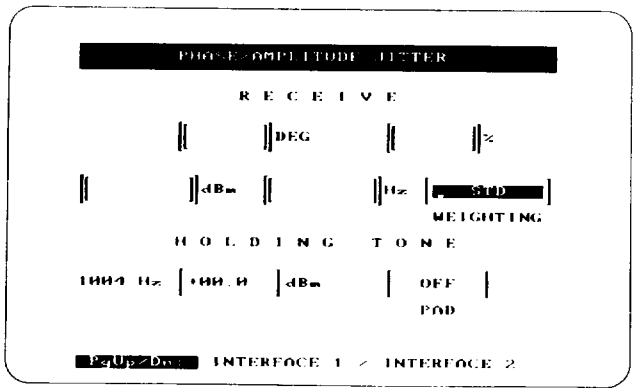
9. To change the transmit level, move the bar cursor to the LEVEL box and enter a value.



10. To transmit a 2-tone signal for a noise correction cycle at the receiving end, press the ↑ or ↓ key. The SIGNAL box will indicate 2-TONE for about 13 seconds. After that, 4-TONE will reappear in the SIGNAL box. If you press the ↑ or ↓ key during the 2-tone transmission, it will stop and the 4-tone transmission will resume before the time is up.

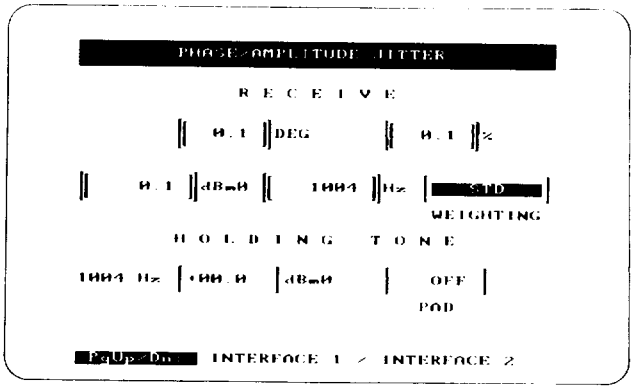
t. Phase And Amplitude Jitter Measurements. You can transmit a tone for the receiving end to measure, measure a tone transmitted to you or both.

1. Connect equipment under test to the RCV jack (4-wire circuits only) and the XMT jack and connect appropriate monitoring equipment to the DIAL/MON jack.
2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.
3. Move the bar cursor to D: PHASE/AMPLITUDE JITTER and press ENTER.
4. Make CIRCUIT INTERFACE 1 selections (para 2-2j).
5. Make CIRCUIT INTERFACE 2 selections (para 2-2k).
6. Display the PHASE/AMPLITUDE JITTER page.
7. Move the bar cursor to the WEIGHTING and select STD (20 Hz to 300 Hz), STD + LF (4 Hz to 300 Hz) or LF (4 Hz to 20 Hz).



NOTE
The PAD box is not used and will always indicate OFF.

8. To start the measurement, press RUN/HALT. Read phase jitter in the DEG box. Read amplitude jitter in the % box. Read the holding tone frequency in the Hz box. Read the received level in the dBm (or dBm0) box.
9. To change the weighting during the measurement, move the bar cursor to the WEIGHTING box and make a selection.
10. To change the transmit level during the measurement, move the bar cursor to the 1004 Hz dBm box and enter a value.
11. To stop the measurement, press RUN/HALT.



u. Noise Measurements. The test set will measure:

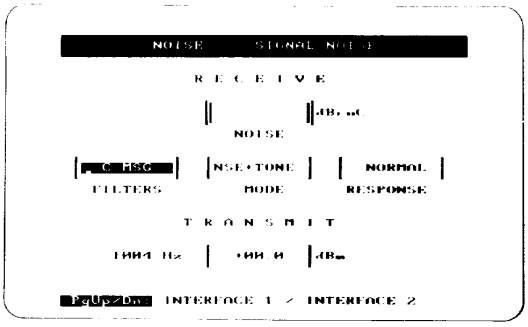
- Idle (C-message) noise (NOISE)
- Signal-to-Noise (S/N)
- Noise to ground (N-G)
- C-notched noise (NSE+TONE)

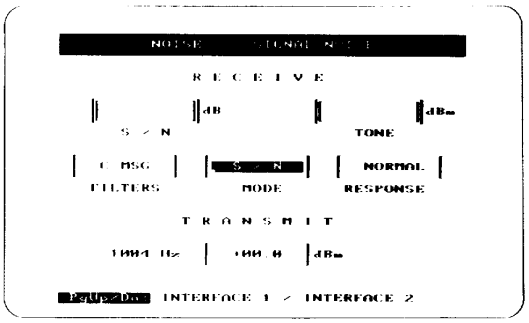
1. Connect equipment under test to the RCV jack (4-wire circuits only) and the XMT jack and connect appropriate monitoring equipment to the DIAL/MON jack.
2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.
3. Move the bar cursor to E: NOISE and press ENTER.
4. Make CIRCUIT INTERFACE 1 selections (para 2-2j).
5. Make CIRCUIT INTERFACE 2 selections (para 2-2k).

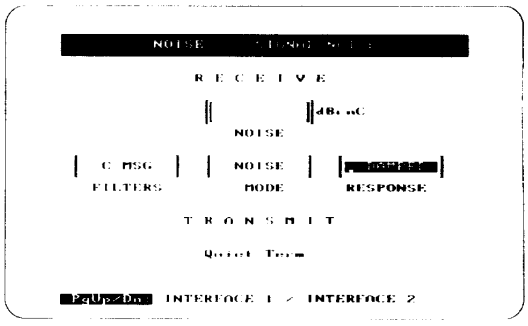
6. Display the NOISE SIGNALNOISE page.
7. Move the bar cursor to the FILTER box and select a filter.
8. Move the bar cursor to the MODE box and select the measurement mode according to the filter selection, as follows:

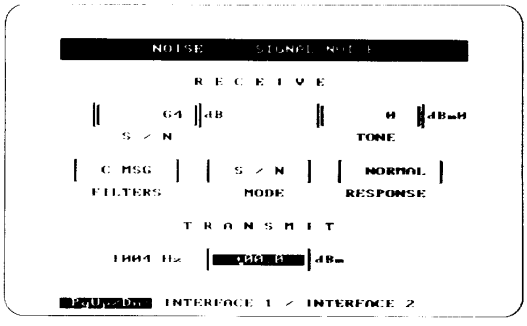
FILTER	MODE	Tone
C MSG	NOISE	No
	S/N	Yes
	N-G	No
	NSE + TONE	Yes
50KB	NOISE	No
	N-G	No
PRGM	NOISE	No
	N-G	No
15KHZ	NOISE	No
	N-G	No
3KHZ	NOISE	No
	S/N	Yes
	N-G	Yes
	NSE+TONE	Yes

9. Move the bar cursor to the RESPONSE box and select NORMAL or DAMPED. If damped is selected, the noise level indications will be averaged.
10. To start the measurement, press RUN/HALT.
11. The level of the holding tone produced during S/N or NSE + TONE measurements may be changed by moving the bar cursor to the 1004 Hz dBm box and entering a level.
12. The FILTER and MODE settings may be changed during any measurement by moving the bar cursor to the appropriate box and making your selection.
13. To stop the measurement, press RUN/HALT.





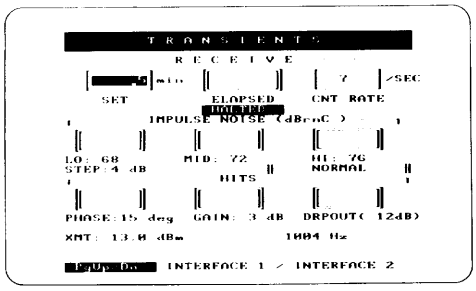




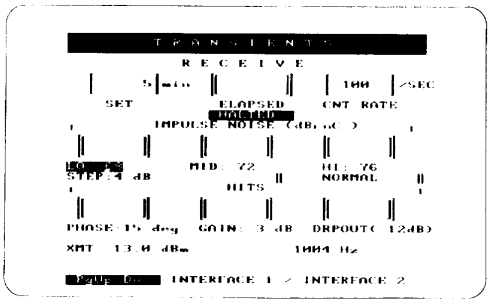
v. Transients Measurement. There are three types of transient measurements that can be performed. Thus, the test set operates in one of three transient measurement modes:

- NORMAL - In this mode, a holding tone at a level of -13 dBm0 is produced at the transmit end of the line. A measuring set at the receive end counts events. Events include impulse noise occurrences as well as phase hits, gain hits and dropout occurrences in the holding tone. These events are counted and accumulated for a length of time specified by the operator. The maximum number of events that the test set will count in one second is called count rate. The count rate can be selected by the operator between 7, 8 or 100 counts per second.
- NSE TO GND - The noise-to-ground mode is similar to the normal mode except that events are measured with respect to station ground (connected to GND lug on the rear panel of the test set). The holding tone is used only as a reference to measure impulse noise events; events involving the holding tone are not counted.
- COUNT W/O TONE - The noise without tone mode is similar to the normal mode except that the holding tone is used only as a reference to measure impulse noise events; events involving the holding tone are not counted.

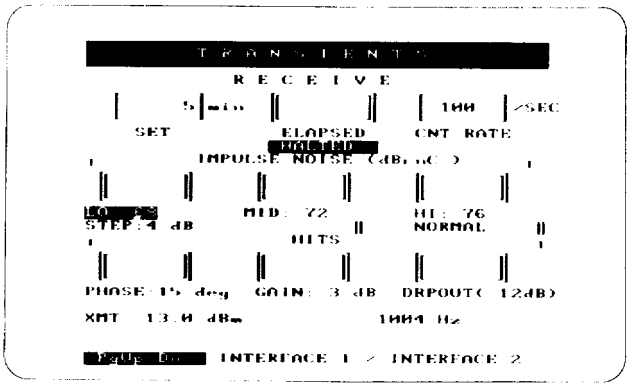
1. Connect equipment under test to the RCV jack (4-wire circuits only) and the XMT jack and connect appropriate monitoring equipment to the DIAL/MON jack.
2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.
3. Move the bar cursor to F: TRANSIENTS and press ENTER.
4. Make CIRCUIT INTERFACE 1 selections (para 2-2j).
5. Make CIRCUIT INTERFACE 2 selections (para 2-2k).
6. Display the TRANSIENTS page.



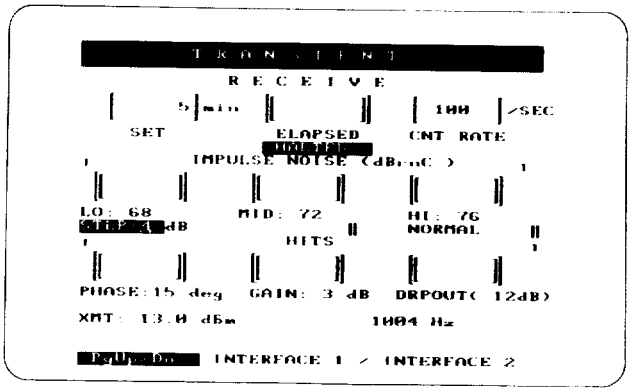
7. Enter the duration of the transients measurement in the SET box



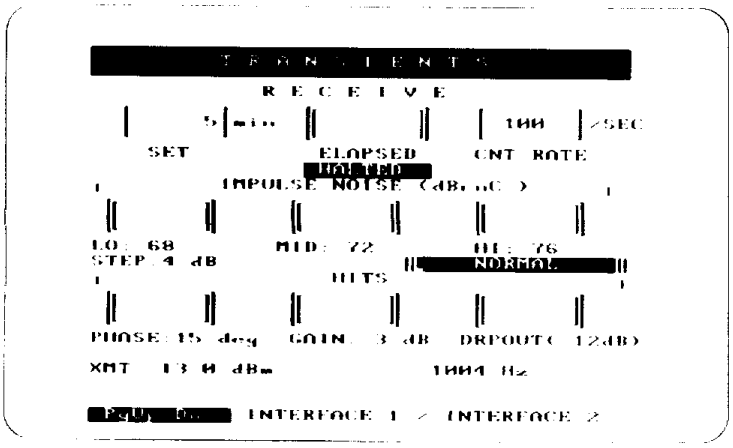
8. Move the bar cursor to the CNT/RATE box and select between 7, 8 and 100.



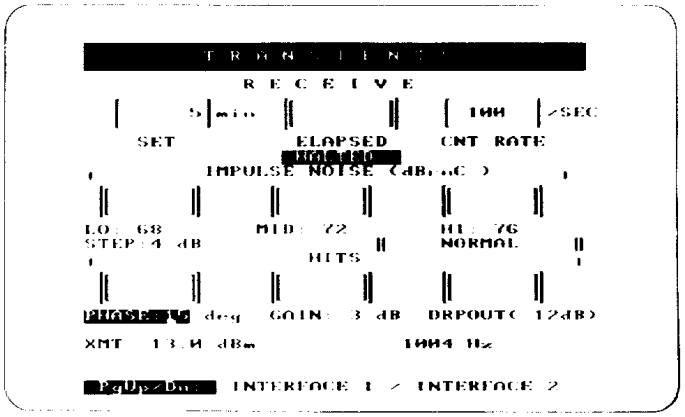
9. Move the bar cursor to the LO: entry point (left-hand box in the IMPULSE NOISE (dBmC) area and enter the lower noise threshold. Impulse noise events with peak levels between this value and the MID: value will be counted in the box above.



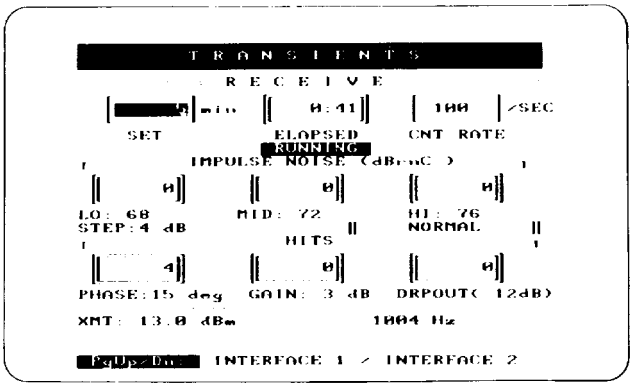
10. Move the bar cursor down to the STEP: entry point (beneath the LO: entry) and enter the dB difference that you want between LO: and MID: values and between MID: and HI: values. The MID: and HI: values will change automatically. Impulse noise events with peak levels between the MID: value and the HI: value will be counted in the box above the MID: value. The impulse noise events with peak levels above the HI: level will be counted in the box above the HI: value.



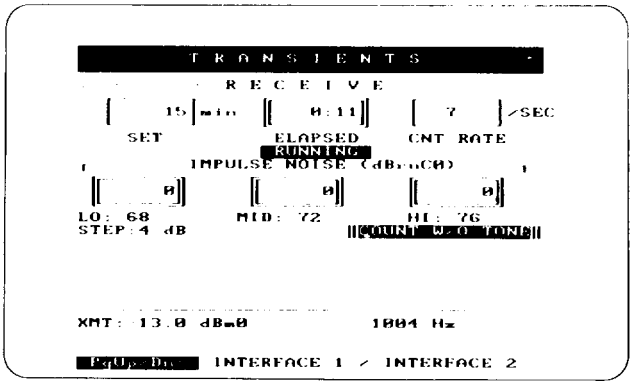
11. Move the bar cursor to the area beneath the HI: value (bracketed by double lines) and select the desired mode (NORMAL, NSE TO GND or COUNT W/O TONE). If NSE TO GND or COUNT W/O TONE is selected, go to step 14.



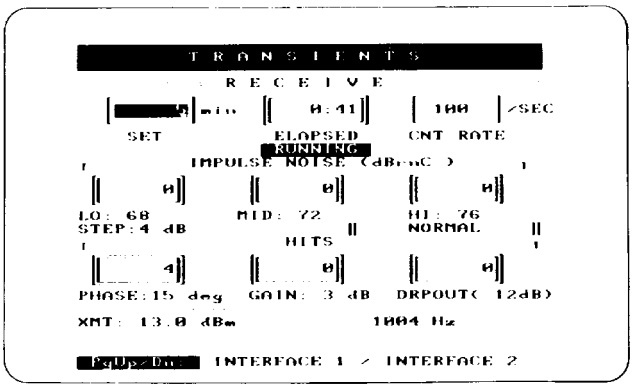
12. Move the bar cursor to the PHASE: entry in the HITS area and enter the phase shift limit, in degrees. Momentary phase shifts beyond this limit will be counted as a phase hit in the box above.



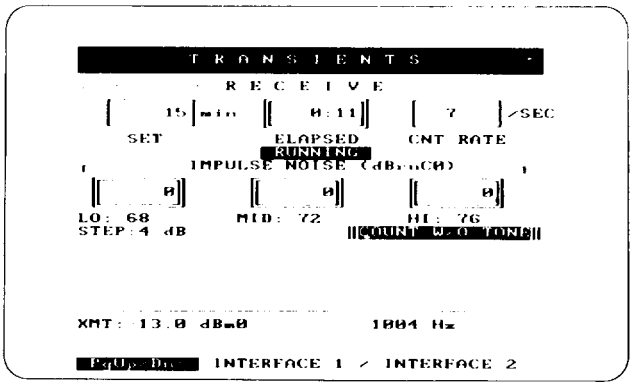
13. Move the bar cursor to the GAIN: entry and enter the gain increase limit, in dB above the holding tone level. Momentary gain increases that exceed this limit will be counted as a gain hit in the box above.



14. To start the measurement, press the RUN/HALT key. Do not attempt to change the parameters during the measurement. If you must change them, press the RUN/HALT key to stop the measurement, move the bar cursor and make changes, and then start the measurement again.



NSE TO GND Test in Progress

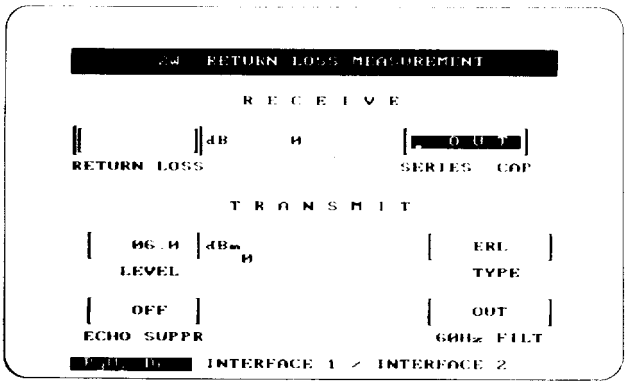


COUNT W/O TONE Test in Progress

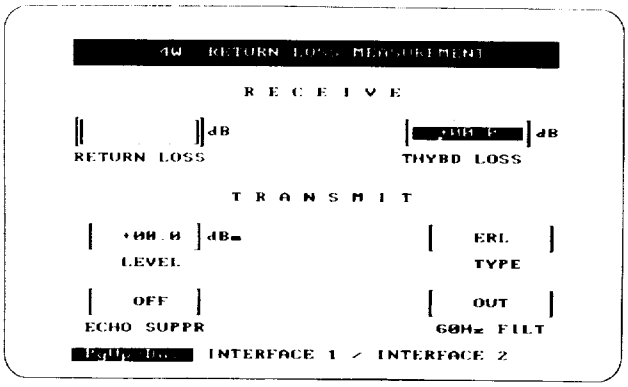
w. *Return Loss Measurements*. Return loss measurements can be made on 2-wire or 4-wire circuits. For 2-wire measurements, you can insert or remove a 2.16 microfarad capacitor in series with the load. For 4-wire measurements, you can select a value to compensate for the transhybrid losses. The test set provides a means to turn off any echo suppressors in the line. For either type of circuit, there are four types of measurements that can be made:

- SRL LO (Singing return loss, low band) - The test set transmits a noise signal produced by passing a wide band noise signal through an SRL low band filter (100 Hz to 1200 Hz) and measures the return loss. @BULLET = SRL HI (Singing return loss, high band) - The test set transmits a noise signal produced by passing a wide band noise signal through an SRL high band filter (1000 Hz to 6000 Hz) and measures the return loss.

- ERL (Echo return loss) - The test set transmits a noise signal produced by passing a wide band noise signal through an ERL filter (500 Hz to 2000 Hz) and measures the return loss.
- SINE WV (Sine wave signal return loss) - The test set transmits a selected tone (from 20 Hz to 5000 Hz) or a sweep and measures the return loss.
    1. Connect equipment under test to the RCV and/or XMT jacks and connect appropriate monitoring equipment to the DIAL/MON jack.
    2. Display the TRANSMISSION MEASUREMENT FUNCTIONS menu.
    3. Move the bar cursor to 2-4 WIRE RETURN LOSS and press ENTER.
    4. Select a 2-wire or 4-wire circuit on the CIRCUIT INTERFACE 1 page (para 2-2j).
    5. Make CIRCUIT INTERFACE 2 selections (para 2-2k).
    6. For a swept sine wave measurement, set up SWEEP CONTROL (para 2-2m).
    7. Display the 2W or 4W RETURN LOSS MEASUREMENT page. The title of the page depends on the 2-Wire/4-Wire selection made on the CIRCUIT INTERFACE 1 page.

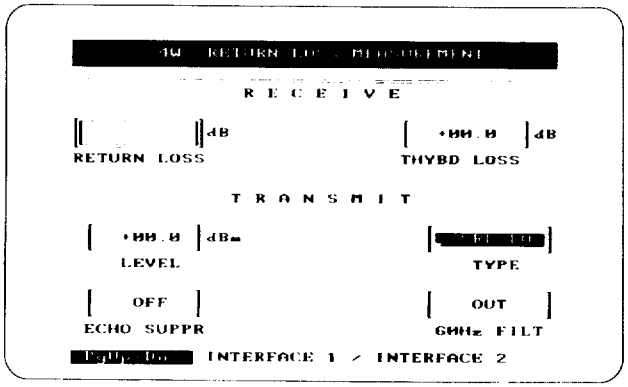


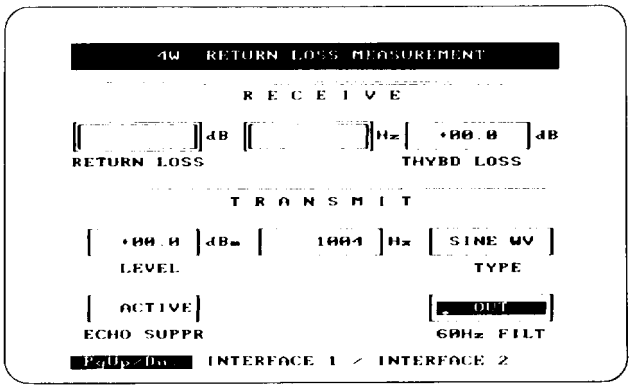
8. For a 2-wire circuit, move the bar cursor to the SERIES CAP box and elect IN or OUT.



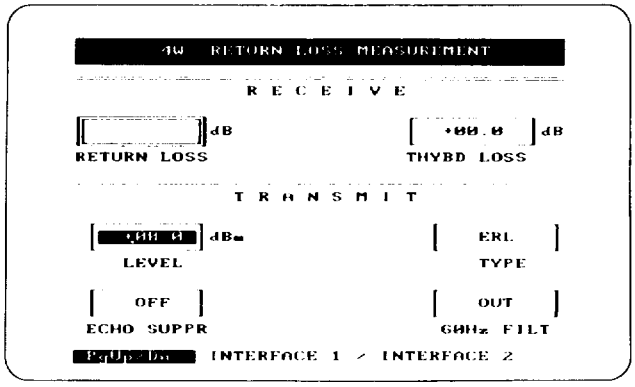
9. For a 4-wire circuit, move the bar cursor to the THYBD LOSS box and enter a transhybrid compensation value.

10. Move the bar cursor to the TYPE box and select the type of measurement (SRL LO, SRL HI, ERL or SINE WV).

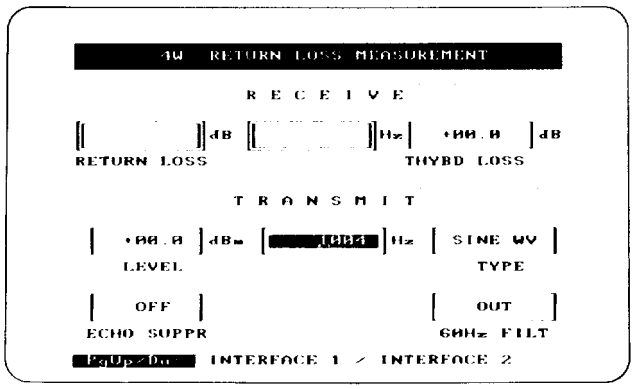




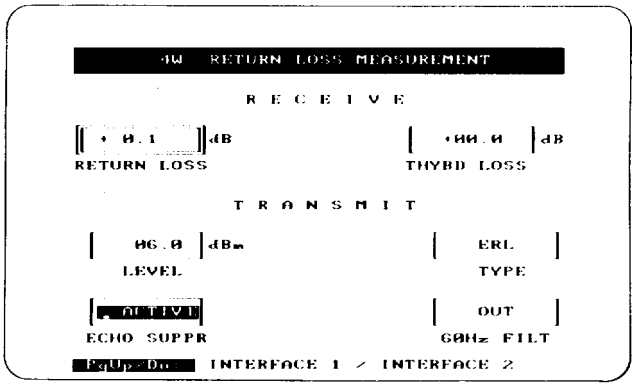
11 Move the bar cursor to the 60Hz FILT box and select IN or OUT.



12. Move the bar cursor to the LEVEL box and enter a transmission level.



13. If a SINE WV type was selected and sweep control is off, move the bar cursor to the Hz box in the TRANSMIT area and enter a frequency between 20 and 5000 Hz.
14. To start the measurement, press RUN/HALT.



15. To turn off an echo suppressor in the line, move the bar cursor to the ECHO SUPPR box and press the ↑ or ↓ key. A tone will replace the noise signal for a short time to turn off the echo suppressor.

16. To change any of the initial parameter settings, refer to steps 8 through 13 as necessary.

x. Setting Up And Monitoring GPIB (Remote) Operation. When the test set is placed under remote control, you can normally regain control of the test set. However, the remote controller can send commands to the test set to lock the keyboard completely. This is usually done during the time that an automatic measurement is underway.

1. Display the MAIN MENU.
2. Move the bar cursor to F8: COMMUNICATIONS and press ENTER.
3. Move the bar cursor to D: IEEE-488 COMMUNICATIONS and press ENTER.

4. To start remote operation, press any key except F1 or HOME.

5. To stop remote operation, press Fl or HOME.

y. *Turning Off Power.*

1. Press the F1 key.

2. Press the 0 part of the Power switch.

APPENDIX A
REFERENCES

A-1. SCOPE

This appendix lists all forms, field manuals, technical manuals, and miscellaneous publication references 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 SF 361

A-3. TECHNICAL MANUALS

Unit, Intermediate Direct Support, and General Support Maintenance Manual for Transmission Test Set, AN/USM-608, (NSN 6625-01-246-8206).....TM 11-6625-3187-24

Unit, Intermediate Direct Support, and General Support Maintenance Repair Parts and Special Tools List for Transmission Test Set, AN/USM-608, (NSN 6625-01-246-8206)..... TM 11-6625-3187-24P

A-4. MISCELLANEOUS PUBLICATIONS

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

First Aid..... FM 4-25.11

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

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

APPENDIX B
COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

B-1. SCOPE

This appendix lists Components of End Item and Basic Issue Items for the test set to help you inventory items required for safe and efficient operation.

B-2. GENERAL

The Components of End Item and Basic Issue Items lists are 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 items are part of the end item, but are removed and 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. There are no Basic Issue Items required to place the test set into operation.

B-3. EXPLANATION OF COLUMNS

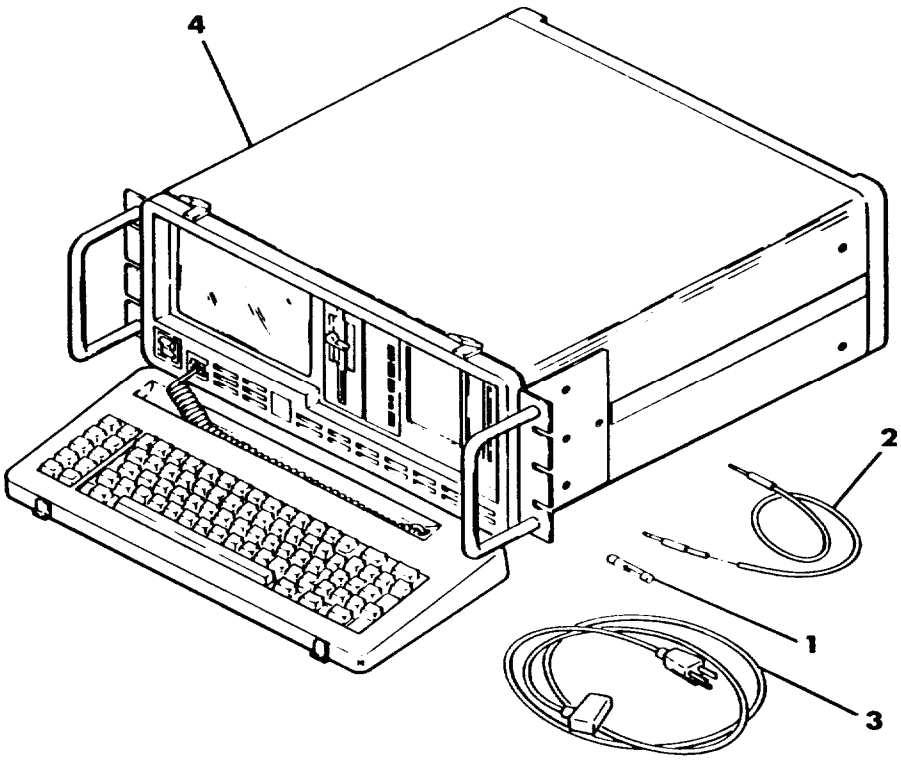
a. Column (1) - Illustration Number (Illus Number). This number indicates the number of the illustration in which the item is found.

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

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

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

e. Column (5) - Quantity required (Qty Rqr). 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	5920-00-228-7882	Fuse, Cartridge (81349) F02B250V2A	ea	1
2		Patch Cord ADC 4-23643-0080	ea	1
3		Power Cable Assembly (80126) C-3122-02M-MGY	ea	1
4	6625-01-246-8206	Transmission Test Set (80058) AN/USM-608	ea	1

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By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

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

DISTRIBUTION:
To be distributed in accordance with DA Form 12-36 literature requirements for AN/USMI-608.

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*T*hese 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)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM–MMC–MA–NP Redstone Arsenal, 35898	FROM: (*Activity and location)(Include ZIP Code)* 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, 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.)*

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

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
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