

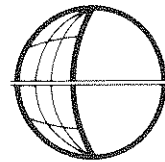
OPERATING PRACTICE

for the

HC-701A

TRANSMISSION TEST SET

Practice Number — OP 701A-01
Reorder Part Number — 4200-0017-00
Printed 3/78
Revision A



HALCYON

#1 Halcyon Plaza
2121 Zanker Rd.
San Jose, CA. 95131
(408) 293-9970

ADDENDUM

OPERATING PRACTICE for the HC-701A TRANSMISSION TEST SET

PART NUMBER: 4200-0017-00

Revision A

Printed 11/77 and 3/78

This addendum supersedes Addendum 1 dated 15 July 1980.

Description: The 701A also has the capability of performing noise-to-ground measurements using the optional noise-to-ground adapter (8220-0003-90). (See figure 1.)

This measurement determines the magnitude of longitudinal (common-mode) voltages existing between the tip-ring signal pair and ground. This measurement is useful for determining the presence and magnitude of power line induction. The measurement is expressed as an absolute dBrn value and can be made with either C-message or 3-kHz noise weighting.

To perform this procedure proceed as follows:

- (a) At the near-end 701A, place the DISPLAYS switch to the RCV position.
- (b) Place the FUNCTION switch to the NOISE position.
- (c) Set the 600/900 termination switch to match the impedance of the line under test.

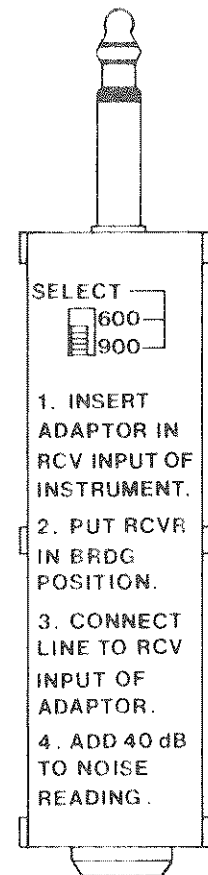


Figure 1. Noise-to-Ground Adapter



701A OP
ADDENDUM 1
Revision 1
27 October 1980

- (d) Set the TERM/BRDG switch to the BRDG position.
- (e) Place the DIAL/MEAS switch to the MEAS position.
- (f) The FLAT/WGTD switch can be in either position. The 3 kHz flat filter is useful in detecting low-frequency noise such as power line induction.
- (g) Request the far-end operator apply a quiet termination to his end of the line.
- (h) Plug the noise-to-ground adapter into the RECEIVE jack on the 701A.
- (i) Set the impedance switch on the adapter to agree with the setting selected in step (c).
- (j) Plug the line at the near-end into the input jack on the adapter.
- (k) Add 40 dB to the displayed reading to determine the noise-to-ground measurement in dBm.

TABLE OF CONTENTS

	Page
1.0 General Information	2
2.0 Performance Specifications	3
3.0 Options	3
4.0 Installation Instructions	3
5.0 Description of Controls	4
A. Toggle Switches	4
B. Controls	4
C. Jacks	5
D. Push Button Switches	5
6.0 Operating Procedures	5
A. Transmitting	5
B. Receiving	6
7.0 Inspection and Warranty	8
A. Standard Warranty	8
B. Certification	8
C. Inspection	8
D. Repair Service	8
E. Service Centers	9

1.0 GENERAL INFORMATION

- 1.1 The HC-701A is a voice-band transmission test set with level noise and frequency measurement capability reflecting compliance with Bell Technical Reference Publication 41009. It is compact (5" x 7" x 12"), lightweight (less than 10 lbs.) and comes with a battery (optional) to make the HC-701A a completely portable unit. Special features of the HC-701A include the following:
 - 1.2 *Dual Digital Displays.* Different colored (red and green) displays provide positive differentiation between Level/Noise and Frequency readouts.
 - 1.3 *Holding Tone Oscillator.* The HC-701A incorporates a crystal controlled 1004 Hz holding tone which may be used to measure loss, noise with tone, transient impairments or other tests which require a tone having precise frequency control and spectral purity.
 - 1.4 *Voice Frequency Channel.* The transmitter tunes to 4 kHz with both C-message and 3 kHz flat weighting networks provided, to measure noise on such circuits. A 1010 Hz

notch filter can be used to notch out the 1010 Hz tone. This notched noise measurement mode is recommended for all transmission facilities which contain compandered carrier links such as WECO Type N and Type T.

- 1.5 *Program Channel.* The transmitter tunes to 20 kHz and a program channel weighting network is provided to measure noise on such circuits. This feature is useful in checking local loops for conformance with digital data transmission or wideband program channel requirements.
- 1.6 *Battery Change Status Indications.* The 701 battery supply has been configured so that the 5 volt display and associated logic supply will discharge prior to the 9 volt supply powering the basic measurement and signal generation circuitry. Consequently, the display operation will give advance visual indication of a marginal battery charge. This unit will show up as a random but continuous flickering of either the Level/Noise or the Frequency display. When this occurs, battery option should be discontinued and a recharge initiated prior to further use.

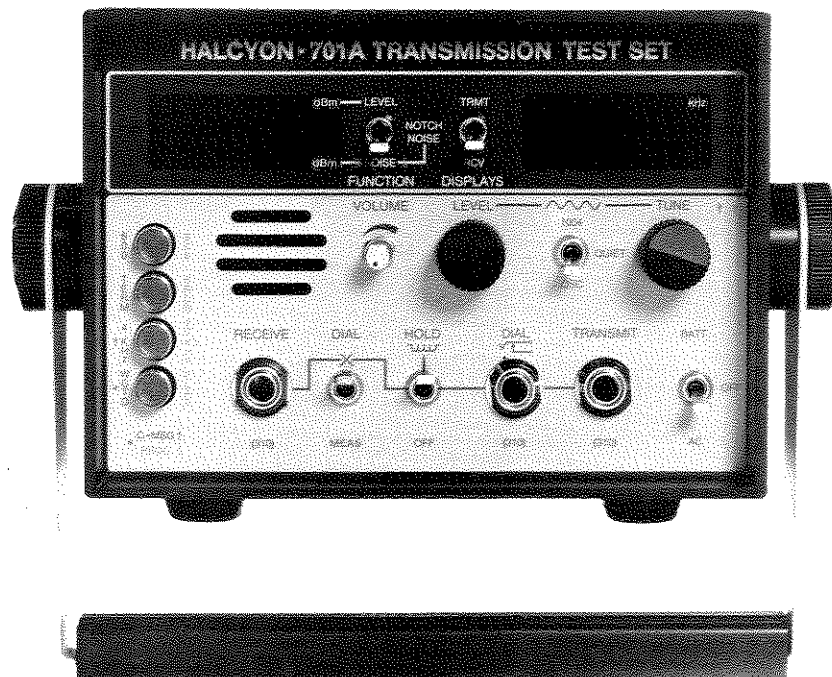


Figure 1 HC-701A Transmission Test Set

2.0 PERFORMANCE SPECIFICATIONS

2.1 Transmitter:

Holding Tone	1004 Hz
Oscillator Range	50 Hz to 20 kHz
Output Level Range	-40 dBm to +13 dBm
Tuning Control	Ten Turn Pot
Level Control	Ten Turn Pot
Distortion	-50 dB, 200 Hz to 4,000 Hz -40 dB, 50 Hz to 200 Hz and 4 kHz to 20 kHz

2.2 Receiver:

Frequency Range	50 Hz to 20 kHz
Frequency Response	± 0.1 dB 200 Hz to 1,000 Hz ± 0.2 dB 4 kHz to 15 kHz ± 0.5 dB 50 Hz to 20 kHz
Level Range Measurement	-50 dBm to +13 dBm
Resolution	0.1 dB
Measurement Accuracy @ 1 kHz	± 0.1 dB -30 dBm to +13 dBm ± 0.2 dB -30 dBm to -50 dBm

2.3 Frequency Counter:

Frequency Range	50 Hz to 20 kHz
Level Range	-50 dBm to +13 dBm
Measurement Resolution	1 Hz 50 Hz to 4 kHz 10 Hz 4 kHz to 20 kHz
Measurement Accuracy	± 1 Hz 50 Hz to 4 kHz ± 10 Hz 20 kHz

2.4 Noise Measurement:

Weighting Networks	C-Message, 3 kHz Flat, Program, 15 kHz Flat
Level Range	10 dBm to 99 dBm
Notch Attenuation	-50 dB, 995 to 1025 Hz
Measurement Resolution	1 dB

Measurement Accuracy	± 1 dB
----------------------	------------

2.5 General:

Input Impedance	600 ohms or 900 ohms 25K, Bridged
Output Impedance	600 ohms or 900 ohms
Power	NiCd Batteries or 117/230 VAC
Battery Capacity	5 Hours, Nominal
Charger	117/230 VAC
Charging Time	8 Hours, Nominal
Size	5" H x 7" W x 12" L
Weight	Approximately 10 lbs.
Environment	0° to 50° C 0 to 90% Relative Humidity

3.0 OPTIONS

3.1 *Battery Option.* Five and nine volt rechargeable battery packs. If you plan to use your HC-701A as a portable unit, it is recommended that you order the HC-701A-02 which has the Battery Option (8220-1135-05). This provides power via two rechargeable battery packs mounted internally. These packs will recharge in eight (8) hours and a charge will last up to five (5) hours. These packs will last 200 to 400 in/out charges.

3.2 *Rack Mount Option.* If you plan to use your HC-701A as a stationary unit, it is recommended that you order the rack mount option (8220-1136-04). This option comes with installation instructions.

3.3 These options require no special modifications and can be ordered at any time.

4.0 INSTALLATION INSTRUCTIONS

4.1 The HC-701A should be inspected carefully as soon as it is received. If any evidence of damage is seen, a claim should be filed with the carrier as per Warranty Instructions.

4.2 The HC-701A is designed as a lightweight portable-type unit and therefore no installation is required. If your unit does not come with the Battery Option, you must remove the rear dust cover and insert the AC power cord.

5.0 DESCRIPTION OF CONTROLS

A. Toggle Switches

- 5.1 *BATT/OFF/AC Toggle Switch.* Three-position switch which controls power to the unit. If your unit does not have the battery option, the BATT position should never be used since charging current is too low and is not highly filtered. Use only the AC position. If your unit has the battery option, the BATT position should be used only when AC power is unavailable. The battery will charge with the switch in either the AC or OFF position, but will discharge only when the unit is in the BATT position.

POWER SWITCH

SWITCH	INSTRUMENT	CHARGE
BATT	ON	-
OFF	OFF	+
AC	ON	+

IF UNIT DOES NOT HAVE THE BATTERY OPTION, THEN BATT POSITION SHOULD NOT BE USED

Figure 2

- 5.2 *TRMT/RCV (DISPLAYS) Toggle Switch.* This is a two position switch that selects whether the transmitted or received frequency is to be displayed. This switch operates in conjunction with other switches and that relationship will be explained in the following respective sections.
- 5.3 *LEVEL/NOTCH NOISE/NOISE (FUNCTION) Toggle Switch.* This is a three-position switch which controls the dBm/dBrn (Red) display. In the LEVEL position, the dBm level transmitted or received is displayed depending on the position of the DISPLAYS Switch. In the NOTCH NOISE or NOISE Position, the noise in dBrn is displayed. Note that when the FUNCTION switch is in the NOTCH NOISE or NOISE position and the DISPLAYS Switch is in the TRMT Position, the display will blank. See Figure 2.

DISPLAY BLANKING CONDITION

CONDITION	DBM	kHz
dBm Level +13 dBm	+BLANK	ON
TRMT + QUIET	-BLANK	BLANK
TRMT + NOTCH NOISE	BLANK	ON
TRMT + NOISE	BLANK	ON
ALL OTHER SETTING	ON	ON

Figure 3

- 5.4 *1004/QUIET/OSC Toggle Switch.* This is a three-position switch that selects the operational mode of the oscillator. In the 1004 Position, the oscillator transmits 1004 Hz at the selected dBm level. In the QUIET Position, the oscillator output is disabled. In the OSC position, the oscillator is placed in the variable frequency mode and can be tuned to the desired frequency by means of the TUNE control while monitoring the green kHz display.
- 5.5 *DIAL/MEAS Toggle Switch.* In the MEAS position, the RECEIVE jack is connected directly to the measuring section input circuitry. When switched to the DIAL position, the RECEIVE jack is disconnected from the measuring section and connected to the DIAL jack and, via associated DIAL jack contacts, to the TRANSMIT jack and associated output circuitry. With a mating plug inserted in the DIAL jack, the connections to the TRANSMIT jack are broken.
- 5.6 *HOLD/OFF Toggle Switch.* This is a two-position switch which when put in the HOLD position applies an electronic holding coil circuit across the RECEIVE jack terminals.
- ### B. Controls
- 5.7 *Level Control.* With the FUNCTION Toggle Switch in the LEVEL position, and the DISPLAYS Switch in the TRMT Position, the LEVEL control can be used to adjust the level of the oscillator output. The equivalent dBm output level into a 600Ω or 900Ω load, as selected, will be displayed on the red dBm display.

- 5.8 *Tune Control.* With the 1004/QUIET/OSC Toggle Switch in the OSC position, the Tune Control will adjust the frequency of the variable frequency oscillator. The oscillator frequency may be monitored on the kHz display with the DISPLAYS Switch in the TRMT position.
- 5.9 *Volume Control and Speaker.* The Volume Control allows the operator to adjust the volume of the speaker monitor circuit. The DISPLAYS Switch also controls whether the RECEIVE signal or the TRANSMIT signal is applied to the speaker monitor circuit.
- C. Jacks**
- 5.10 *Receive Jack.* This is a 310 jack that the operator uses to introduce the received signal to the HC-701A.
- 5.11 *Dial Jack.* This is a 310 jack that the operator uses for interconnecting a hand set (Butt in) and dialing a dial-up circuit to be tested.
- 5.12 *Transmit Jack.* This is a 310 jack that the operator uses to interconnect the test set output to the circuit under test.
- D. Push Button Switches**
- 5.13 *900/600 Push Button Switch.* This switch provides a selection of either 600 or 900 ohm terminating impedance for both transmit output and receive input.
- 5.14 *BRDG/TERM Push Button Switch.* This switch either terminates or bridges the receiver.
- 5.15 *4 kHz/20 Push Button Switch.* This switch selects either the voice frequency 4 kHz range or program 20 kHz range. Selection of 4 kHz permits engagement of CMSG or 3 kHz flat noise weighting networks. The program or 15 kHz noise weighting networks are made available when the 20 kHz range is selected. The selection of the oscillator tuning range is also controlled by this switch.

- 5.16 *FLAT/WGTD Push Button Switch.* This switch activates either the FLAT or WGTD noise network. The switch works in conjunction with PROG/VF switch discussed in Section 6B.

NOTE: The depressed condition of push-button switches is indicated by a green color and the non-depressed condition is indicated by a dark color.

6.0 OPERATING PROCEDURES

- 6.1 This section provides instructions for operating the HC-701A.
- 6.2 A fuse and fuse card in the fuse box on the rear panel have been factory-set to operate at 120 volts. If the power source is other than 120 volts, the fuse and card must be changed. Sliding the fuse-box window to the left exposes the fuse and card. The FUSE PULL lever releases the fuse. Pull out the card either with needle-nose pliers or with a pointed tool inserted into the small hole near the edge of the card. The card has settings for 100, 120, 220 and 240 volts. Of these, only 120 and 220 volts are applicable to the HC-701A. Orient the card so the 220-volt setting appears right side up. Return the card and an appropriate fuse to the fuse box.

A. Transmitting

- 6.3 Set the FUNCTION Switch to the LEVEL position. Set the DISPLAYS Switch to the TRMT position. Set the 1004/QUIET/OSC Switch to the QUIET position. Set the DIAL/MEAS Switch to the MEAS position. Set the HOLD/OFF Switch to the OFF position.

NOTE: The displays will be blanked with the exception of the red minus (-) sign. This indicates the absence of any TRANSMIT signal output.

- 6.4 Connect the line to which the transmit signal is to be applied to the TRANSMIT jack. If the circuit is a dial-up line, connect it to the RECEIVE jack instead of the TRANSMIT jack. To dial, plug a dial/set into the DIAL jack, set the DIAL/MEAS switch to DIAL, and dial the number. When dialing has been completed and the connection made, set the HOLD/OFF switch to HOLD. Remove the dial/set.
- 6.5 Select terminating impedance of 600 or 900 ohms by using the 600/900 pushbutton. Now you are ready to start transmitting. For a transmit source of 1004 Hz, set the 1004/QUIET/OSC Switch to the 1004 position and using the level control, adjust the output level until the LEVEL display shows the desired dBm level. The 4 kHz/20 kHz pushbutton will not affect the 1004 Hz transmit tone; however, it will change the resolution of the kHz display from 1 Hz to 10 Hz. The BRDG/TERM and FLAT/WGTD pushbuttons have no effect on the transmitter.
- 6.6 For generating test tones at frequencies other than 1004 Hz, the 1004/QUIET/OSC Switch should be set to the OSC position. With the 4 kHz/20 kHz switch in the 4 kHz position, the oscillator tuning range is 50 Hz to 4 kHz. With the 4 kHz/20 kHz switch in the 20 kHz position, the oscillator tuning range is 300 Hz to 20 kHz making the total range from 50 Hz to 20 kHz. For frequencies less than 4 kHz, it is advisable to use the 4 kHz setting.
- B. Receiving**
- 6.7 Set the FUNCTION Switch to the LEVEL position. Set the DISPLAYS Switch to the RVC position. Set the DIAL/MEASURE Switch to the MEASURE position.
- 6.8 Select the proper termination impedance using the 600/900 pushbutton switch. For terminated measurements, the TERM/BRDG switch should be set to the TERM position.
- 6.9 Interconnect the line you wish to test to the RECEIVE jack.
- 6.10 Connect the line to the RECEIVE jack. If the circuit is a dial-up line, plug the dial set into the DIAL jack, set the DIAL/MEAS switch to dial and dial the number. When dialing has been completed and the connection made, set the HOLD/OFF switch to hold. The line is now held. Set the DIAL/MEAS switch now to measure and the received level and frequency will be displayed. To measure noise, move the FUNCTION switch to the NOISE (or NOTCH NOISE if 1004 Hz holding tone is present) and make the following measurements.
- 6.11 *Idle Noise, 4 kHz Range.* An idle noise measurement is based upon a quiet termination being provided at the far end of the circuit under test. Either 3 kHz flat or C-message weighting may be selected. The 3 kHz flat filter is useful in detecting low frequency noise. Noise typically originating from power supplies and/or power line induction is not readily detectable utilizing the C-Message curve. The idle noise measurement mode can result in erroneous results on telephone circuits which may consist of compandered facilities and, therefore, the noise with tone technique (Section 6.15) should be utilized. For idle noise measurements, the FUNCTION switch should be in the NOISE position. It may be desirable to convert the results to dB_{rno} to determine the degree of conformance with circuit requirement specifications. The formula for conversion from dB_{rtn} to dB_{rno} is as follows: dB_{rno} equals dB_{rtn} minus TLP. Example, dB_{rtn} equals 50 and TLP equals -3. dB_{rno} equals 50 minus (-3) equals 50 plus 3 equals 53 dB_{rno}.
- 6.12 *Noise with Tone, 4 kHz Range.* For noise with tone measurements, a 1004 Hz tone must be applied at the far end at the proper level. Note, noise with tone measurements are typically made with the holding tone applied 13 dB below the prevailing TLP or -13 dB_{mo}. Also, the tone source

should have a total harmonic distortion of better than -50 dB. At the receive end, the FUNCTION switch should be set to NOTCH NOISE. The measurement will be displayed in dBrn. The 3 kHz flat curve detects low frequency noise not normally detectable using the C-message filter.

- 6.13 *Signal to Noise Measurement, Voice Range.* Signal to noise may be measured directly as a difference between the NOTCH NOISE reading and the NOISE reading. To measure signal to noise, first record the NOTCH NOISE reading with 1004 Hz tone applied at the distant end. Next, perform the same measurement with the FUNCTION Toggle Switch in the NOISE position. Placing the toggle switch in the NOISE position removes the notch filter and provides a measurement of tone level in dBrn. The difference between the two readings will be the signal to noise. This measurement is normally made using CMSG noise weighting but may also be made for comparison purposes using the 3 kHz flat noise filter.

- 6.14 *Program Range Noise Measurements.* Program channel noise measurements are specified as idle noise measurements. Accordingly, the far end must be terminated using a quiet termination. At the receiving end, the FUNCTION Switch should be placed in the NOISE position. The program pushbutton switch must be depressed. Either a flat 15 kHz weighting or program weighting is provided by operating the FLAT/WGTD switch. Once again, the program noise measurements will be in terms of dBrn and may be converted to dBrno, as required.

- 6.15 The PROG/VF and FLAT/WGTD switch work together to provide four filters. See Figure 3 as a guide to these settings.

VF + WGTD = C-Msg WGTD
VF + FLAT = 3 kHz
PROG + WGTD = PROG
PROG + FLAT = 15 kHz

7.0 INSPECTION AND WARRANTY

A. Standard Warranty

7.1 Products manufactured by HALCYON COMMUNICATIONS, INC., are guaranteed to be free of defects in materials and workmanship for a period of one year from the date of shipment. HALCYON will accept returned items, transportation prepaid to the nearest Service Center, for repair during the warranty period at no cost to the customer, provided that the products have not been subjected to improper installation, accident, misuse, neglect or unauthorized alterations.

B. Certification

7.2 Halcyon Communications, Inc., certifies that all instruments are thoroughly tested and inspected and found to meet published specifications when shipped from the factory.

C. Inspection

7.3 All Halcyon manufactured equipment is carefully inspected and thoroughly tested prior to shipment. Modern packaging techniques are used to prevent damage in shipment.

7.4 If goods are received in a damaged condi-

tion, A CLAIM SHOULD BE FILED WITH THE CARRIER IMMEDIATELY. Normally, the carrier will want to inspect the shipping carton and packing materials. A copy of this claim should be forwarded to Halcyon.

7.5 If equipment which has no apparent damage does not operate properly when tested in accordance with the instructions, it should be returned to one of the addresses shown for repair or replacement. Unauthorized field repairs or modifications may invalidate the warranty.

D. Repair Service

7.6 When returning equipment for repair, utmost care in packing should be taken to avoid shipping damage. If available, use the original cartons and packing material. Shipping charges should be prepaid.

7.7 Returned equipment which is covered by the warranty will be repaired as expeditiously as possible and shipped prepaid.

7.8 If the equipment is not covered by warranty, a quotation for repair charges will be made first. Repairs will be made after authorization (purchase order) to proceed is received.

Service Centers

Halcyon Service Centers are located at the listed addresses. Instruments should be returned to Halcyon, Inc., Customer Service, at the nearest location.

32 Perimeter Center East, N.E.
Suite 120
Atlanta, GA 30346
(404) 394-3730

4545 Bellaire Dr. S. #6
Fort Worth, TX 76109
(817) 244-0591 or 732-1851

Domestic

985 University Avenue
Los Gatos, CA 95030
(408) 356-6136

77 Milltown Road
East Brunswick, NJ 08816
(201) 238-0206

2021 Spring Road, Suite 380
Oak Brook, IL 60521
(312) 325-8171

European

Rosenheimerstrasse 34
8000 Munich 80 West Germany
TLX 841-523915 HALCN D
(089) 483400

Division Headquarters

#1 Halcyon Plaza
2121 Zanker Rd.
San Jose, CA. 95131
(408) 293-9970

