OVER-THE-HORIZON RADIO SYSTEMS
ITTL 2GC OVER-THE-HORIZON RADIO SYSTEM
NUS 4492-1 ORDER-WIRE AND PILOT TONE EQUIPMENT
TEST AND ADJUSTMENT

CHART **PAGE**

APPARATUS:

1—48A Sending Console

1—Hewlett-Packard 5245L Electronic Counter

1—21A Transmission Measuring Set

1—37B Transmission Measuring Set

1—KS-14510 Volt-Ohm-Milliammeter

1—11B Attenuator

1—5A Attenuator

1—368A Termination

1—3P7D Cord

1—3P17B Cord

CHART 1

ORDER-WIRE LEVEL ADJUSTMENTS

These tests can be performed with no effect on system performance other than the temporary disabling of the order-wire and 4-kHz pilot tones in both directions. Arrangements must be made with the distant terminal to accommodate this condition.

CHART 1 (Cont)

The order-wire should be in a quiet condition when these tests are made. If noise is received from the order-wire extension circuits, those circuits should be terminated at the W REC and SPUR REC jacks on the order-wire panel.

STEP	PROCEDURE
1	On the sending console Decalator, make the following control adjustments:

CONTROL	POSITION
POWER	REAR
KC	001.0
75 OHM TERMINATION	OUT

2	On the 21A transmission measuring set (TMS), operate the OC OUTPUT control to the OFF position.
3	Arrange the test equipment as shown in Fig. 1. Use option Ⓨ
4	Adjust the KS-13388 attenuator to 1 dB.
5	Adjust the Decalator OUTPUT COARSE and FINE controls to obtain a Decalator output meter indication of 10 dBm.
6	Using the 21A TMS, measure the level at the order-wire panel REC HDST jack. ***Requirement:*** The 21A TMS indication should be −2 dBm ±0.5 dB. If the requirement is not met, adjust the RECEIVE LEVEL control on the order-wire panel to obtain a TMS indication of −2 dBm. ***Note:*** Operation of the 21A TMS is described in Section 103-221-100.
7	On the 21A TMS, operate the OSC OUTPUT, FREQ, and FREQ MULT controls to transmit 1 kHz at a level of 0 dBm into the order-wire panel XMT HDST jack.
8	On the order-wire panel, using a 3P7D cord, patch from the E SEND jack to the REC 4W jack. ***Requirement:*** The 21A TMS indication should be −2 dBm ±0.5 dB. If the requirement is not met, adjust the RECEIVE LEVEL control on the order-wire panel to obtain a TMS indication of −2 dBm.

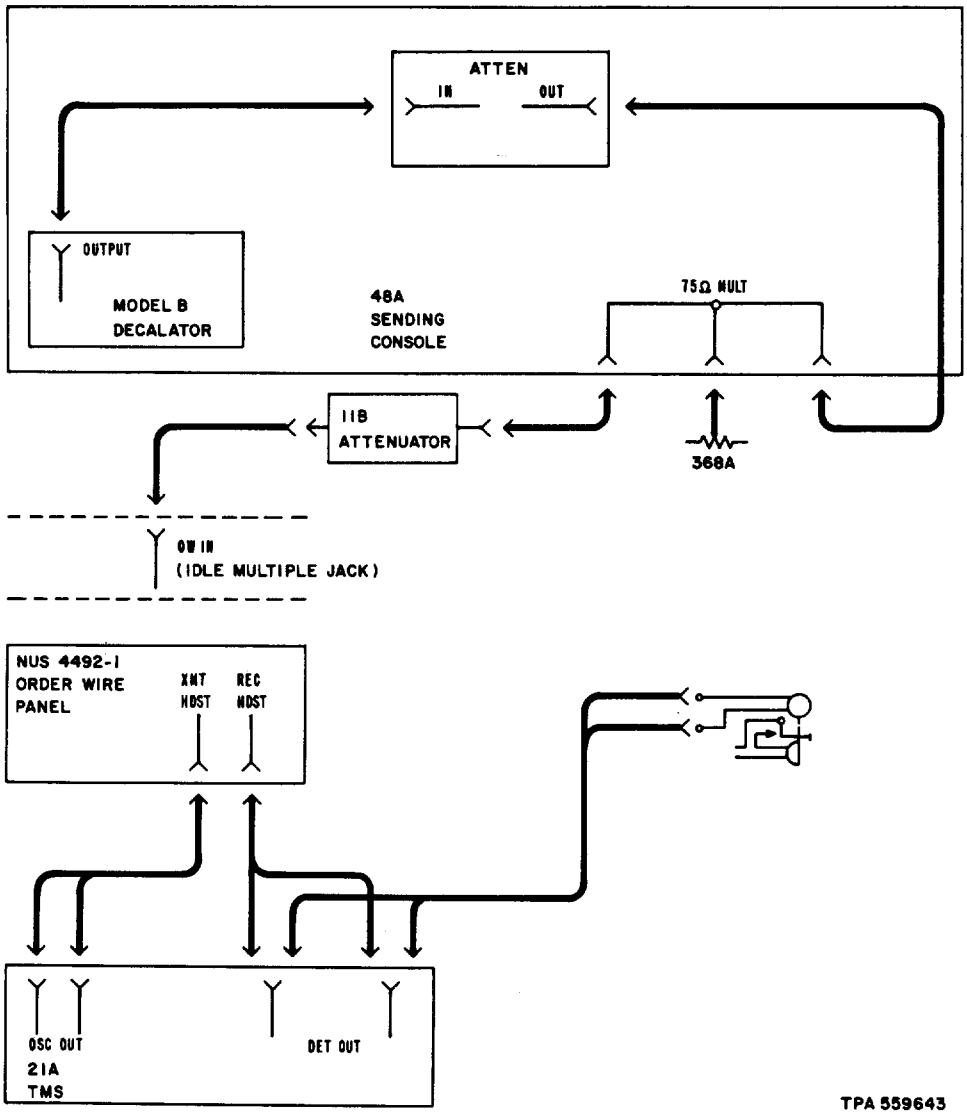

Fig. 1—Order-Wire Level Tests—Test Setup Diagram

CHART 1 (Cont)	
STEP	**PROCEDURE**
9	On the 21A TMS, operate the OSC OUTPUT control to the OFF position.
10	Depress the signaling button on the telephone handset and note the level on the 21A TMS meter. ***Requirement:*** The 21A TMS indication should be −2 dBm ±0.5 dB.

CHART 1 (Cont)

STEP	PROCEDURE
	If the requirement is not met, adjust the OUTPUT ADJ control on the 1500-Hz tone generator (part of the NUS 4417 tone generator unit on the order-wire panel) to obtain a TMS indication of −2 dBm.
11	Remove the receiver unit from the order-wire telephone handset and connect the DET IN jacks of the 21A TMS to the handset receiver contact springs as shown in Fig. 1, option Ⓩ.
12	Depress the handset signaling button and note the level on the 21A TMS meter. ***Requirement:*** The 21A TMS indication should be −15 dBm ±1 dB. If the requirement if not met, adjust the HDST LEVEL ADJ control on the order-wire panel to obtain a TMS meter indication of −15 dBm.
13	Reassemble the telephone handset. Dismantle the test arrangement.

CHART 2

PILOT TONE AND PILOT TONE ALARM ADJUSTMENTS

These tests can be performed with no effect on system performance other than the temporary disabling of the order-wire and 4-kHz pilot tones in both directions. Arrangements must be made with the distant terminal to accommodate this condition.

STEP	PROCEDURE
1	On the electronic counter, set the following controls to the indicated positions.

CONTROL	POSITION
SAMPLE RATE	MIDRANGE
SIGNAL INPUT	AC
SENSITIVITY	1 VOLT
STORAGE	STORAGE
FUNCTION	FREQUENCY
TIME BASE	10 s

CHART 2 (Cont)

STEP	PROCEDURE
2	Connect the input jack of the electronic counter to the 4KC pin jacks located on the front of the order-wire panel. ***Requirement:*** The electronic counter indication should be 4000 Hz $\pm$2 Hz. If the requirement is not met, remove the NUS 4417 tone generator unit from the order-wire panel and adjust capacitor C1 to obtain an indication of 4000 Hz $\pm$2 Hz when the tone generator unit is reinserted. Several trials may be necessary.
3	Move the counter test leads to the 1500 ~ pin jacks located on the front of the order-wire panel.
4	Depress the telephone handset signaling button. ***Requirement:*** The electronic counter indication should be 1500 Hz $\pm$5 Hz. If the requirement is not met, remove the NUS 4417 tone generator unit from the order-wire panel and adjust capacitor C9 to obtain an indication of 1500 Hz $\pm$5 Hz when the tone generator unit is reinserted and the signaling button depressed. Several trials may be necessary.
5	Using the calibrated 37B TMS with the 11B attenuator, measure the level of the 4-kHz pilot tone at an idle multiple OW OUT jack on the order-wire jack panel. ***Note:*** This measurement involves the use of the 37B transmission measuring set at a frequency outside its normal range. The transmission measuring set should be calibrated at a frequency of 4 kHz using the 48A sending console as a calibrated-signal source. The external calibration procedure described in Section 103-414-100 should be followed. ***Requirement:*** The level of the 4-kHz pilot tone should be $-$35 dBm $\pm$0.5 dB. If the requirement is not met, adjust the 4-kHz OUTPUT ADJUST control on the NUS 4417 tone generator to obtain a 37B TMS indication of $-$35.0 dBm.
6	On each of the radio system modulator-exciters, operate the metering switch to positon R and check that the meter indication is 100 $\pm$2. ***Note:*** This is a measure of each modulator-exciter deviation developed by the 4-kHz pilot tone.
7	On one of the two NUS 4419 4-kHz pilot tone receivers connected to the modulator-exciter pilot tone monitor circuits, adjust the SENSITIVITY ADJUST control counterclockwise to a point where a pilot tone failure alarm on the external alarm circuits is activated.
8	Adjust the same SENSITIVITY ADJUST control clockwise, slowly, to a point where the alarm condition clears.
9	Perform Steps 7 and 8 on the second 4-kHz pilot tone receiver connected to the modulator-exciter pilot tone monitor circuits.

CHART 2 (Cont)	
STEP	**PROCEDURE**
10	Insert the 3P17B cords in the INPUT and OUTPUT jacks of the 5A attenuator. Insert the free ends of the cords into the E SEND and REC 4W jacks on the order-wire panel.
11	On the NUS 4419 4-kHz pilot tone receiver connected to the system receiver line, adjust the SENSITIVITY ADJUST control to a point where the external pilot tone failure alarm is activated and deactivated when the 10-dB control on the 5A attenuator is alternately placed in and out of the circuit.
11	Dismantle the test setup.

CHART 3

VOLTAGE CHECK

A voltage check is useful as a trouble locating procedure on the NUS 4492-1 order-wire and pilot tone equipment.

STEP	PROCEDURE
1	Energize the order-wire panel components. Use power-type extension cords.
2	Use voltmeter to check transistor terminals. See Table A.

TABLE A

TRANSISTOR TERMINAL VOLTAGES

COMPONENT	TRANSISTOR TERMINAL					
	Q1 BASE	Q1 EMIT	Q1 COLL	Q2 BASE	Q2 EMIT	Q2 COLL
	VOLTAGE TO GROUND					
NUS 4416 Audio Amplifier	−24.0	−24.5	−46	−24.0	−24.5	−46
NUS 4417 Tone Generators (See Note 1)	−20.0	−20.0	−36	−20.0	−20.0	−48
NUS 4418 1500-Hz Receiver	−11.5	−12.0	−20.5	−32.0	−32.0	−48
NUS 4419 4-kHz Receiver	−12.5	−12.5	−21.0	−33.5	−33.5	−48

Note 1: On the NUS 4417 tone generators unit, the dc voltages at Q3 and Q4 terminals are identical to those at Q1 and Q2, respectively.