

TD-3 MICROWAVE RADIO
J68386G AND J68386H TRANSMITTER-RECEIVER BAYS
COMMON EQUIPMENT TESTS
CROSS-POLARIZATION DISCRIMINATION TEST

1. GENERAL

1.01 The cross-polarization discrimination (XPD) test given in this section provides a method of measuring the XPD ratio of TD-3 antenna systems. This procedure, properly applied, will be useful in isolating XPD-related problems. For example, if a system failed the protection switching test of Section 411-502-512, indicating a possibility of adjacent channel interference, the test of this section is recommended. This section may be used, however, at any time when XPD-related problems are suspected. *These are out-of-service tests. Switch service to the protection channel.*

1.02 The basic theory of operation provides for the beat oscillator frequency of the receiver selected for test to be shifted by 10 MHz. This will cause both the regular *and* adjacent channels to fall within the 20-MHz passband of the receiver under test. Figure 1 gives a graphic illustration of this principle. The power of the adjacent channel is compared to the power of the regular channel as a measurement of XPD. By shifting the beat oscillator frequency, both the regular and adjacent channels are brought within the IF passband of the receiver under test. When both powers are measured, the difference is a direct indication of the XPD. This issue will affect the Equipment Test List.

1.03 Figure 2 shows, in schematic form, how the test apparatus is arranged when using the J68428A or J68392A test set. The receiver input waveguide is opened above the 19A isolator, and a 24A transducer is fastened to the output of the channel-dropping network from which an RF cable is run to a 1A hybrid junction and a 19A

isolator external to the bay. The receiver modulator/IF preamplifier is removed from the bay and attached to the 1A junction, and a test set RF oscillator is used to feed a shifted BO frequency into the modulator via the 1A junction. The output of the IF preamplifier is fed back to the 1042A BPF and the IF main amplifier through a variable attenuator adjusted to 40 dB. The IF OUT of this IF main amplifier is connected to an IF power meter through a pad. With the IF level (manual gain control) adjusted to -10 dBm on the signal from the preceding transmitter, the preceding transmitter signal is then removed and the attenuator adjusted until the -10 dBm level is again indicated. The value of IF attenuation removed from the attenuator is a direct indication of the XPD ratio between the regular and adjacent channel (after compensating for the selectivity of the receiver channel-dropping network). The XPD ratio should be 30 dB or greater for channels operating at the same transmitter output power. Transmission engineering should be notified of XPD ratios that are less than 30 dB. Chart 1 and Fig. 2 present the test in more detail. Some of the items in the test arrangements may not be provided in certain test sets. Arrangements must be made to procure the necessary items.

1.04 For convenience and uniformity of XPD-related measurements, an "XPD Measurement Record Form" is presented in Fig. 3. This form is designed to retain information which will be useful in present and future analyses of XPD-related problems. Four copies of the form are included in this section and are to be used when the tests are performed. Additional copies of the form can be reproduced locally if needed, or another copy of this section can be ordered.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

CHART 1

CROSS-POLARIZATION TEST

APPARATUS:

1—J68428A or J68392A Test Set

Arrange to borrow any of the following items that are not in the station.

1—Counter Plug-In for frequency measurement at 4 GHz

or

1—ED-59130-90 G1 Frequency Meter (Part of the J68345A Test Set)

1—500A, 520A, or 522A Termination

1—1A Hybrid Junction

1—19A Isolator

3—24A Transducers

1—P49Q685 Power Extender Cable (Part of the J68392A Test Set)

1—KS-19986 L4 RF Cable (Part of the J68392A Test Set)

STEP

PROCEDURE

Caution: *This is an out-of-service test. Arrange to switch channel service to protection.*

- 1 Arrange the test apparatus at the bay that has been removed from service for this test as shown in Fig. 2. Select the frequency for the test oscillator from Table A or Table B, as applicable.
- 2 With both channels regular at the transmitting end, adjust the IF amplifier manual gain control until a -10 dBm level is obtained on the power meter. Small level variations of less than 1 dBm, due to fading, may be expected.
- 3 Remove the drive from the distant transmitter that is associated with the receiver under test. The IF power level should drop noticeably, reflecting the loss of power.
- 4 Slowly decrease the value of the IF attenuator in the test set until the IF power meter once again indicates -10 dBm. This signal will be from the adjacent channel. The amount of IF attenuation removed from the initial 40 dB represents the sum of the XPD ratio between the regular and adjacent channel and the selectivity of the receiver's channel-dropping

CHART 1 (Cont)

STEP	PROCEDURE
	network. The XPD ratio is obtained by subtracting 0.5 dB from the amount of IF attenuation removed. Record the results on a form copied from Fig. 3, and file it with the station records.
	Requirement: An XPD of 30 dB or greater for channels operating at the same output power
	If this requirement is not met, a copy of the test results should be sent to transmission engineering (XPDs of <i>less</i> than 30 dB).
5	At the conclusion of testing, restore the channel to normal and return it to service.

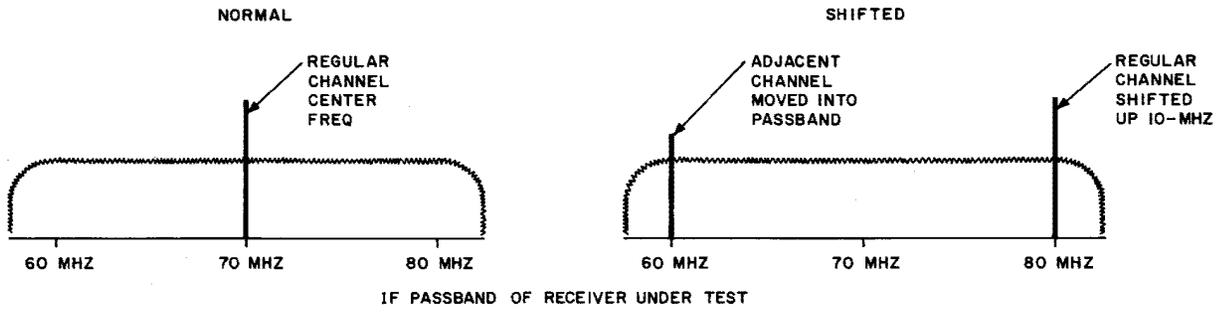
TABLE A

FOR LOW-HIGH (CH 1-6) AND HIGH-LOW (CH 1-6) FREQUENCY PLANS
 LOW-HIGH (CH 7-12) AND HIGH-LOW (CH 7-12)

REGULAR CHANNEL		ADJACENT CHANNEL		BO FREQUENCY
NUMBER	FREQUENCY	NUMBER	FREQUENCY	
1A 1B	3730 3770	7A 7B	3710 3750	3790 3830
2A 2B	3810 3850	8A 8B	3790 3830	3870 3910
3A 3B	3890 3930	9A 9B	3870 3910	3950 4000
4A 4B	3970 4010	10A 10B	3950 3990	4030 4070
5A 5B	4050 4090	11A 11B	4030 4070	4110 4150
6A 6B	4130 4170	12A 12B	4110 4150	4190 4110
7A 7B	3710 3750	1A 1B	3730 3770	3790 3830
8A 8B	3790 3830	2A 2B	3810 3850	3730 3770
9A 9B	3870 3910	3A 3B	3890 3930	3810 3850
10A 10B	3950 3990	4A 4B	3970 4010	3890 3930
11A 11B	4030 4070	5A 5B	4050 4090	3970 4010
12A 12B	4110 4150	6A 6B	4130 4170	4050 4090

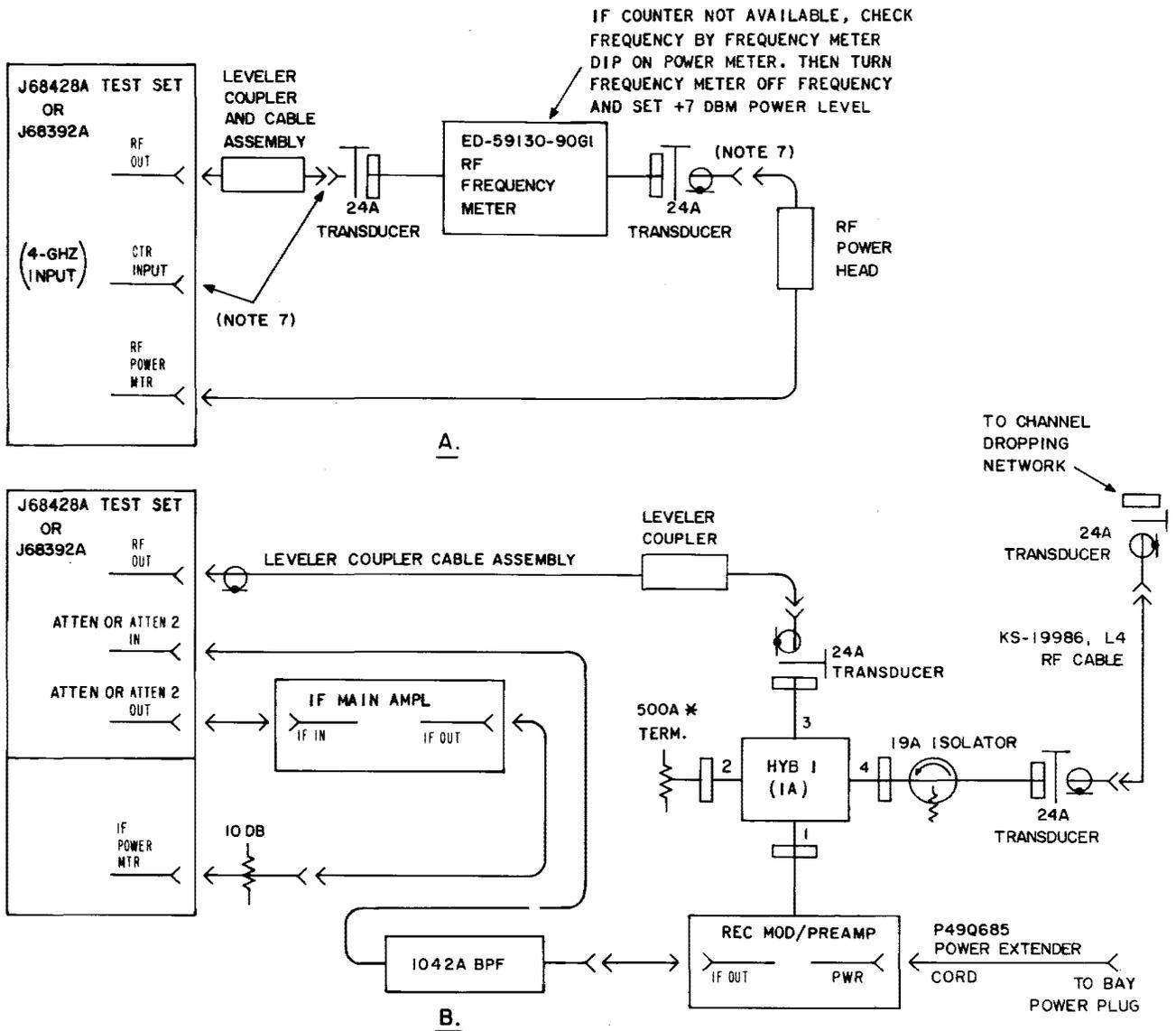
TABLE B
FOR LOW-HIGH (CH 1-6) AND HIGH-LOW (CH 1-6) FREQUENCY PLANS
HIGH-LOW (CH 7-12) AND LOW-HIGH (CH 7-12)

REGULAR CHANNEL		ADJACENT CHANNEL		BO FREQUENCY
NUMBER	FREQUENCY	NUMBER	FREQUENCY	
1A	3730	7B	3750	3810
1B	3770	8A	3790	3850
2A	3810	8B	3830	3890
2B	3850	9A	3870	3930
3A	3890	9B	3910	3830
3B	3930	10A	3950	3870
4A	3970	10B	3990	3910
4B	4010	11A	4030	3950
5A	4050	11B	4070	3990
5B	4090	12A	4110	4030
6A	4130	12B	4150	4070
6B	4170	—	—	—
7A	3710	—	—	—
7B	3750	1A	3730	3810
8A	3790	1B	3770	3850
8B	3830	2A	3810	3890
9A	3870	2B	3850	3790
9B	3910	3A	3890	3830
10A	3950	3B	3930	3870
10B	3990	4A	3970	3910
11A	4030	4B	4010	3950
11B	4070	5A	4050	3990
12A	4110	5B	4090	4030
12B	4150	6A	4130	4070



	<u>REGULAR CHANNEL</u>	<u>80 FREQUENCY</u>	<u>ADJACENT CHANNEL</u>
EXAMPLE: RF SPECTRUM -	3710-MHZ	- 3790-MHZ	- 3730-MHZ
IF SPECTRUM -	80-MHZ	-	60-MHZ

Fig. 1—Graphic Example of Normal and Shifted Signals in the IF Passband



IF COUNTER NOT AVAILABLE, CHECK
FREQUENCY BY FREQUENCY METER
DIP ON POWER METER. THEN TURN
FREQUENCY METER OFF FREQUENCY
AND SET +7 DBM POWER LEVEL

INSTRUCTIONS:

1. AT A REPEATER STATION, TURN OFF THE SHIFTER. AT A MAIN STATION, TURN OFF THE RECEIVER MICROWAVE GENERATOR.
2. SET UP THE FREQUENCY SELECTED FROM TABLE A BY THE INSTRUCTIONS OF A OF THIS FIGURE.
3. POSITION THE TEST SET ATTENUATOR TO 40 DB. SWITCH THE IF MAIN AMPLIFIER TO MANUAL GAIN, AND ADJUST THE GAIN CONTROL TO MINIMUM.
4. REMOVE THE RECEIVER MODULATOR/IF PREAMPLIFIER FROM THE BAY.
5. CONNECT THE TEST APPARATUS AS SHOWN IN B OF THIS FIGURE.
6. RETURN TO CHART.
7. USE COUNTER TO SET GENERATOR FREQUENCY IF AVAILABLE. THEN SET +7 DBM POWER LEVEL.

* A 520A OR 522A TERMINATION MAY ALSO BE USED.

Fig. 2—Test Arrangement Using the J68428A or J68392A Test Set

RECORD OF "XPD" MEASUREMENTS

I. GENERAL INFORMATION

- A. Stations Involved _____ Toward _____
- B. Date _____ Time _____^{AM} _____^{PM} General Atmospheric Conditions
in Path (Rain, Snow, etc.) _____
- C. Approximate Outside Temperature _____
- D. Approximate Circular Waveguide Length Station _____ Length _____
Station _____ Length _____

II. SPECIFIC TEST INFORMATION

- A. Channel Number (used as reference) to be Measured _____ Rec. Freq. _____
- B. Adjacent Channel No. (20 MHz removed) _____ Rec. Freq. _____
- C. Beat Frequency (BO) Signal Used to Beat Above Frequencies _____
(special BO frequency listed in practice)
- D. Polarization of II (A) Above _____ and II (B) Above _____
- E. "XPD" Ratio for Above V-H _____ dB or H-V _____ dB
(limits: 30 dB or greater for all channels)
- F. Action Taken _____

- G. Referred to _____ Date _____

Fig. 3a—Example of XPD Measurement Record Form

RECORD OF "XPD" MEASUREMENTS

I. GENERAL INFORMATION

- A. Stations Involved _____ Toward _____
- B. Date _____ Time _____ ^{AM} _{PM} General Atmospheric Conditions
in Path (Rain, Snow, etc.) _____
- C. Approximate Outside Temperature _____
- D. Approximate Circular Waveguide Length Station _____ Length _____
Station _____ Length _____

II. SPECIFIC TEST INFORMATION

- A. Channel Number (used as reference) to be Measured _____ Rec. Freq. _____
- B. Adjacent Channel No. (20 MHz removed) _____ Rec. Freq. _____
- C. Beat Frequency (BO) Signal Used to Beat Above Frequencies _____
(special BO frequency listed in practice)
- D. Polarization of II (A) Above _____ and II (B) Above _____
- E. "XPD" Ratio for Above V-H _____ dB or H-V _____ dB
(limits: 30 dB or greater for all channels)
- F. Action Taken _____

- G. Referred to _____ Date _____

Fig. 3b—Example of XPD Measurement Record Form

RECORD OF "XPD" MEASUREMENTS

I. GENERAL INFORMATION

- A. Stations Involved _____ Toward _____
- B. Date _____ Time _____ ^{AM} _{PM} General Atmospheric Conditions
in Path (Rain, Snow, etc.) _____
- C. Approximate Outside Temperature _____
- D. Approximate Circular Waveguide Length Station _____ Length _____
Station _____ Length _____

II. SPECIFIC TEST INFORMATION

- A. Channel Number (used as reference) to be Measured _____ Rec. Freq. _____
- B. Adjacent Channel No. (20 MHz removed) _____ Rec. Freq. _____
- C. Beat Frequency (BO) Signal Used to Beat Above Frequencies _____
(special BO frequency listed in practice)
- D. Polarization of II (A) Above _____ and II (B) Above _____
- E. "XPD" Ratio for Above V-H _____ dB or H-V _____ dB
(limits: 30 dB or greater for all channels)
- F. Action Taken _____

- G. Referred to _____ Date _____

Fig. 3c—Example of XPD Measurement Record Form

RECORD OF "XPD" MEASUREMENTS

I. GENERAL INFORMATION

- A. Stations Involved _____ Toward _____
- B. Date _____ Time _____ AM
 _____ PM General Atmospheric Conditions
 in Path (Rain, Snow, etc.) _____
- C. Approximate Outside Temperature _____
- D. Approximate Circular Waveguide Length Station _____ Length _____
 Station _____ Length _____

II. SPECIFIC TEST INFORMATION

- A. Channel Number (used as reference) to be Measured _____ Rec. Freq. _____
- B. Adjacent Channel No. (20 MHz removed) _____ Rec. Freq. _____
- C. Beat Frequency (BO) Signal Used to Beat Above Frequencies _____
 (special BO frequency listed in practice)
- D. Polarization of II (A) Above _____ and II (B) Above _____
- E. "XPD" Ratio for Above V-H _____ dB or H-V _____ dB
 (limits: 30 dB or greater for all channels)
- F. Action Taken _____

- G. Referred to _____ Date _____

Fig. 3d—Example of XPD Measurement Record Form