

TD-3 MICROWAVE RADIO
J68386A AND J68386B 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 411-402-512, 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 measure 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 broken after the channel-dropping network and is terminated with a 24A transducer from which an RF cable runs to an isolator and a 1A junction 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 IF filters, equalizers, and the IF main amplifier through a variable attenuator adjusted for 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 indicated again. 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's 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 which are less than 30 dB. Chart 1 and Fig. 2 present the test in detail. Some of the items in the test arrangements may not be 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 procure the following items if not all in test set.

1—Counter Plug-In for measuring 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 which 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 manual gain control until a -10 dBm level is obtained on the power meter. Small level variations of less than 1 dB, due to fading, may be expected.
- 3 Remove the drive from the distant transmitter which 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 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 network. The XPD ratio is obtained by subtracting the selectivity found in Tables A and

CHART 1 (Cont)

STEP	PROCEDURE
	B 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.

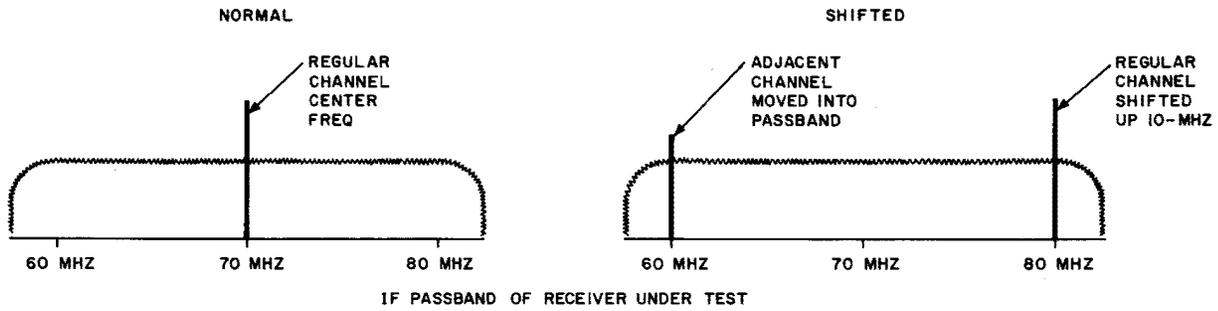
TABLE A
FOR LOW-HIGH (CH 1-6) AND HIGH-LOW (CH 1-6) FREQUENCY PLANS
LOW-HIGH (CH 7-12) AND HIGH-LOW (CH 7-12)

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

TABLE B

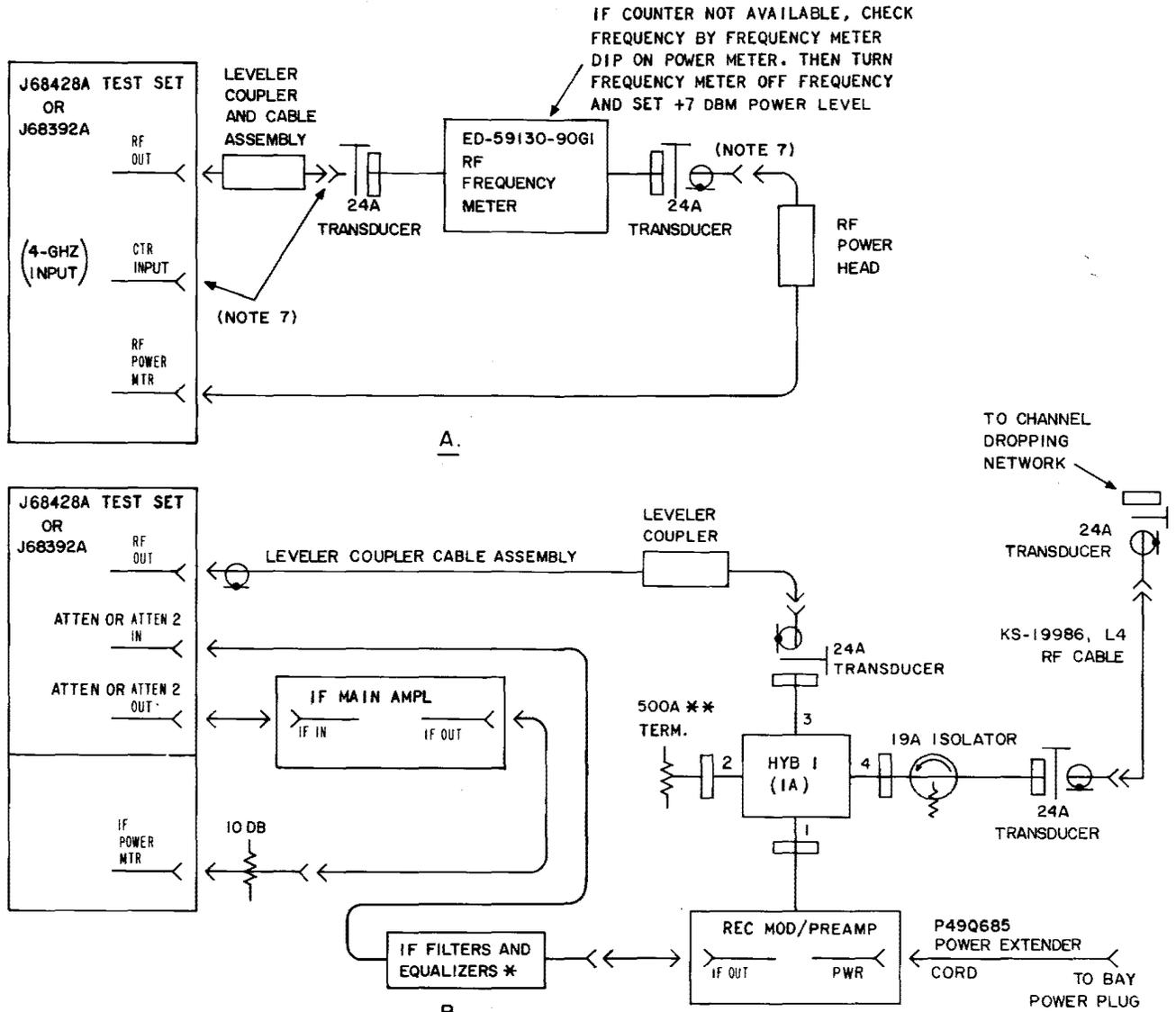
FOR LOW-HIGH (CH 1-6) AND HIGH-LOW (CH 1-6) FREQUENCY PLANS
HIGH-LOW (CH 7-12) AND LOW-HIGH (CH 7-12)

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



	<u>REGULAR</u> <u>CHANNEL</u>	<u>BO</u> <u>FREQUENCY</u>	<u>ADJACENT</u> <u>CHANNEL</u>
EXAMPLE: RF SPECTRUM -	3710-MHZ	-	3790-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.

* IF FILTERS AND EQUALIZERS NORMALLY LOCATED IN THE BAY BETWEEN THE IF PREAMPLIFIER AND THE IF MAIN AMPLIFIER.
 ** 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