TJ/TM-1 MICROWAVE RADIO
SYSTEMS TESTS
NOISE LOADING MEASUREMENTS

This section outlines a procedure for noise load testing of a transmitter-receiver link. The test is performed by supplying noise of a bandwidth which simulates the busy-hour multiplex load to the radio. The resultant noise is measured in a test slot at the receiver. A narrow slot in the noise is then cleared at the transmitter and the noise is again measured in the slot under test at the receiver. The noise performance is obtained directly from this signal-to-no-signal comparison for various radio input levels.

This section is reissued to correct, revise, and rearrange the steps and drawings involved in the noise load testing of TJ/TM radio systems. This reissue does not affect the Equipment Test List.

These tests are a critical analysis of the condition of not only the radio but also the waveguide/antenna system. Comparison of the noise-to-drive (V) curves obtained with the typical examples included in this section can pinpoint many problems. When the system under test is TJ, recourse to noise figure and impedance-matching tests may correct high thermal noise, while linearity adjustments may reduce high intermodulation noise. When the system under test is TM-1, high thermal noise may be cleared by changing units, while linearity adjustments may be used to reduce high intermodulation noise.

The V curves portray the signal-to-noise performance of the system with relation to deviation. The descending (left) part of the curve shows the signal "climbing out" of thermal noise and the ascending (right) portion shows the effects of intermodulation due to overdeviation. When these slopes are smooth and bottom near reference drive, conditions are normal (Fig. 4). Optimum performance at less than reference drive may be indicative of poor linearity, while optimum performance at more than reference drive indicates thermal problems. Irregularities in the curves (Fig. 5 or 6) may be due to delay and echo distortion and may be an engineering problem.

Many types and models of noise loading test equipment are available, each with its own measurement procedure. However, adherence to the method outlined in this section should prove satisfactory with any of the specified equipment. The test frequency slots may differ with various test sets, but this is immaterial as long as the low-medium-high relationship is preserved.

APPARATUS:

1—Noise Generator with flat output versus frequency over the 600-channel LMX spectrum (Marconi ▶2091◀ or Siemens & Halske ▶Rel 3W432A◀)

1—Selective Frequency Receiver (Marconi ▶2092◀ or Siemens & Halske ▶Rel 3D335◀ with Slot Filters)

1—Band Rejection Filter Set (part of Marconi or Siemens & Halske transmitting equipment)

APPARATUS (Cont):

1—26A Split Pad, 6 dB

1—J64070B (70B) Power Meter

1—Type 19 Pad, 4 dB

2—KS-13388, List 1, 75-Ohm Attenuators or J99262AA TL Test Sets Test Cords (supplied with IF Test Set and Noise Loading Set)

2—201B Repeat Coils or J68376C Impedance Matching Test Sets

STEP	PROCEDURE
	Caution: Do not perform this test when fading is occurring, as indicated by variations in the plate current of the main IF amplifier (see TJ Section 409-240-502 for further information if necessary), or AGC meter unit indications (see TM Section 409-406-503 for further information).
1	Remove the section from service in accordance with TJ Section 409-240-500 or TM Section 409-402-501.
2	Make the test connections in accordance with Fig. 1, option (A). ***Note:*** If necessary, install a band-defining filter at the noise generator output to limit the 600-channel LMX spectrum (this filter may be part of the noise generator).
3	Select and install the low-frequency bandpass filter at the receiver (usually 70 kHz).
4	Set the receiver detector sensitivity to obtain a convenient midscale meter reference. Note this value.
5	Insert the band-elimination filter, corresponding to that selected in Step 3, at the transmitter as shown in Fig. 1, option (B). ***Note:*** The power meter indication will decrease when the filter is inserted. It is not necessary to adjust the noise level unless the change is greater than 0.5 dB.
6	Adjust the receiving attenuator to obtain the same meter reference indication as in Step 4.

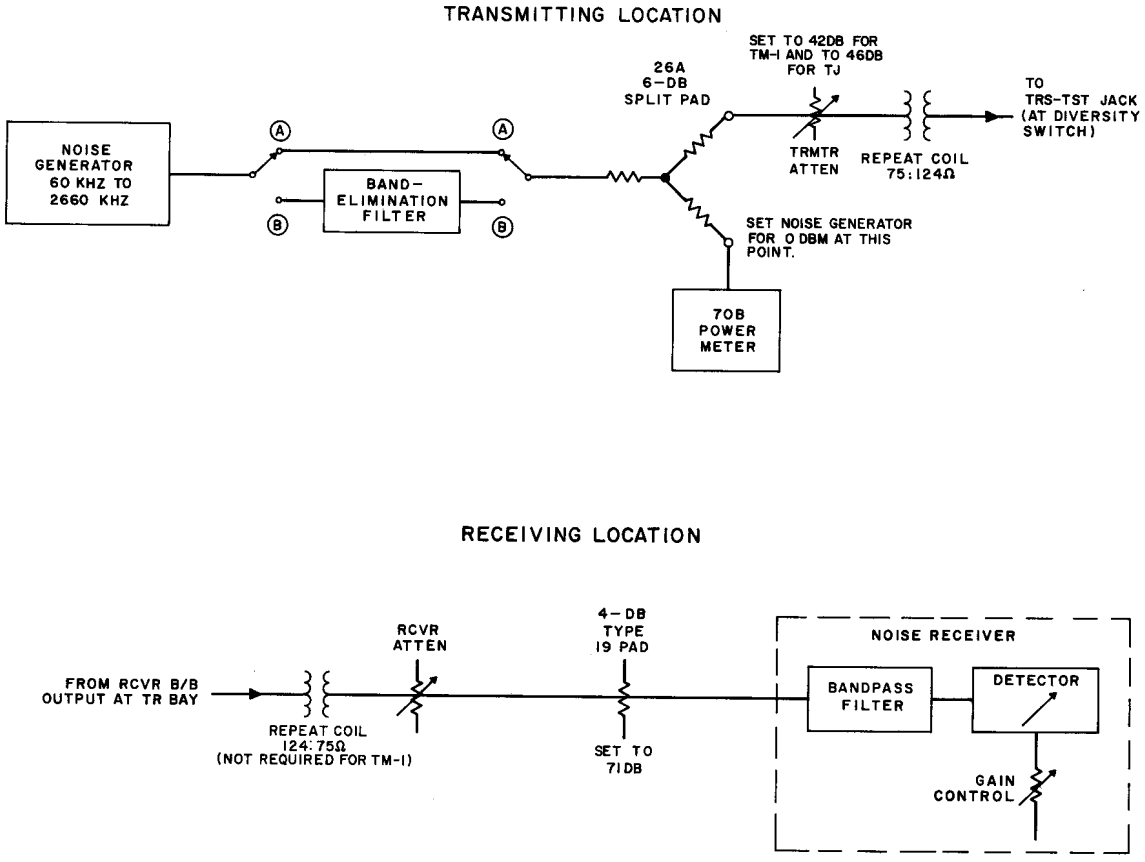

Fig. 1—TJ/TM-1 Noise Loading—Test Connections

STEP	PROCEDURE
7	Record the setting of the receiving attenuator on a chart similiar to that shown in Fig. 2. This is the noise in dBrnc0. ***Note:*** In addition to recording the information, it is desirable to plot the data as it is taken in Fig. 3. Any error or trouble that may be encountered would immediately be evident.
8	Decrease the attenuation in the transmitter attenuator by 4 dB and reset the receiving attenuator to 71 dB.
9	Repeat Steps 4 through 7.
10	Repeat Steps 3 through 7 for each of the transmitting drive levels shown in Fig. 2 for the frequency under test. ***Note:*** If additional sensitivity is required at the noise receiver, the receiving attenuator setting may be decreased to 61, and 10 dB added to the result obtained.

TJ/TM-1 RADIO 600-CHANNEL NOISE LOADING TESTS

DATE _____

SHEET _____

SYSTEM _____

SECTION _____

CHANNEL NUMBER _____

RECEIVED SIGNAL _____

FREQ UNDER TEST			70 KHZ (LOW)	290 KHZ	540 KHZ	1002 KHZ (MED)	2438 KHZ (HIGH)
TRMTR ATTEN SETTING		DB FROM REFERENCE					
TJ	TM-1						
46	42	-16					
42	38	-12					
38	34	-8					
34	30	-4					
32	28	-2					
30	26	0					
28	24	+2					
26	22	+4					
22	18	+8					
20	14	+12					

Fig. 2—TJ/TM-1 Radio Noise Loading Data Sheet

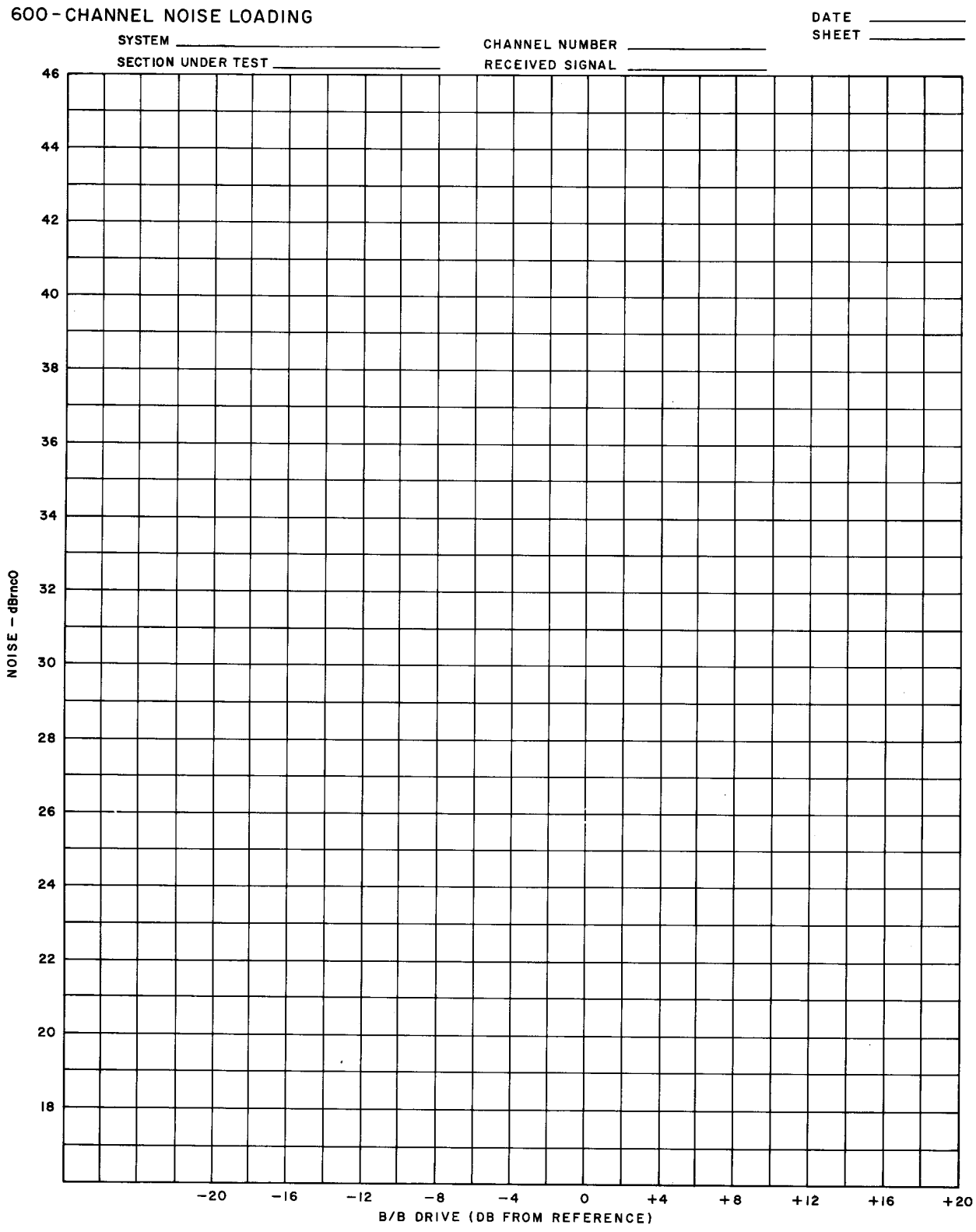

Fig. 3—Recommended Chart for Plotting Noise Loading Curves

STEP	PROCEDURE
11	Select the other frequencies to be tested (at least low, medium, and high) and repeat Steps 3 through 10.
12	From the recorded data, read the high-slot noise at reference drive (2438 kHz at −26 dB into the TRS-TST jacks). ***Note:*** The noise at reference drive should not be greater than the level shown in Table A for the measured received signal. Also, the shape of the noise curves should be similar to that shown in Fig. 4. ▶Typical unsatisfactory noise loading plots are shown in Fig. 5 and 6.◀ If these objectives are not met and the system linearity and deviation are correct, refer the matter for further assistance by way of line organization.

TABLE A

TJ/TM-1 RADIO — L600 CARRIER MAXIMUM ALLOWABLE NOISE PER HOP AT REFERENCE DRIVE (WITHOUT PREEMPHASIS)

RECEIVED SIGNAL (DBM)		WORST CIRCUIT NOISE (TOP CHANNEL) AT REFERENCE
		DBRNC0
TM-1*	−33 to −36	27.0
	−36 to −40	27.5
	−40 to −42	28.5
	−42 to −45	29.0
TJ	−30 to −33	25.0
	−33 to −36	26.5
	−36 to −38	27.5
	−38 to −40	29.0

* Typical results may be found in Section 940-383-111.

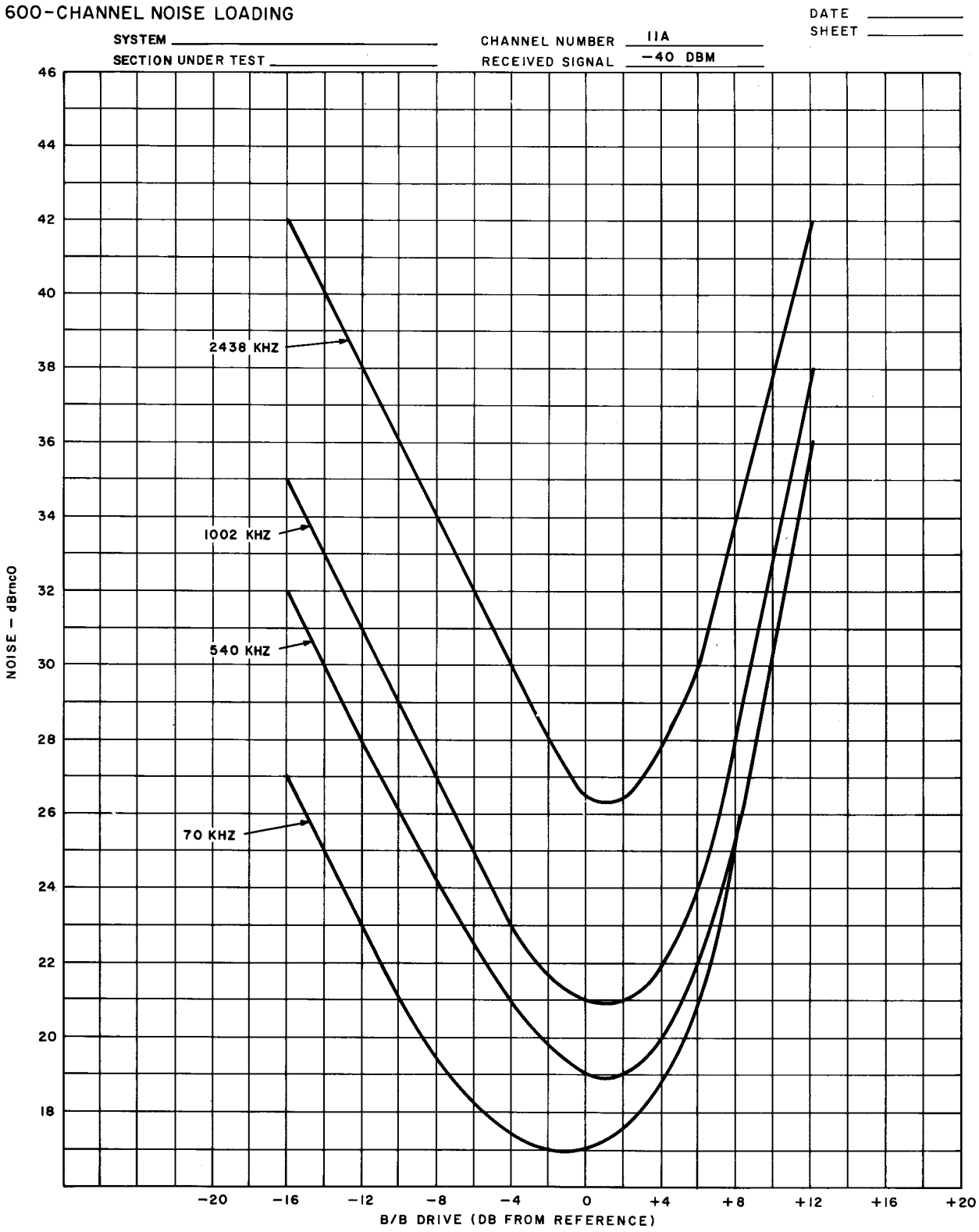

Fig. 4—Typical Satisfactory Noise Loading Plot

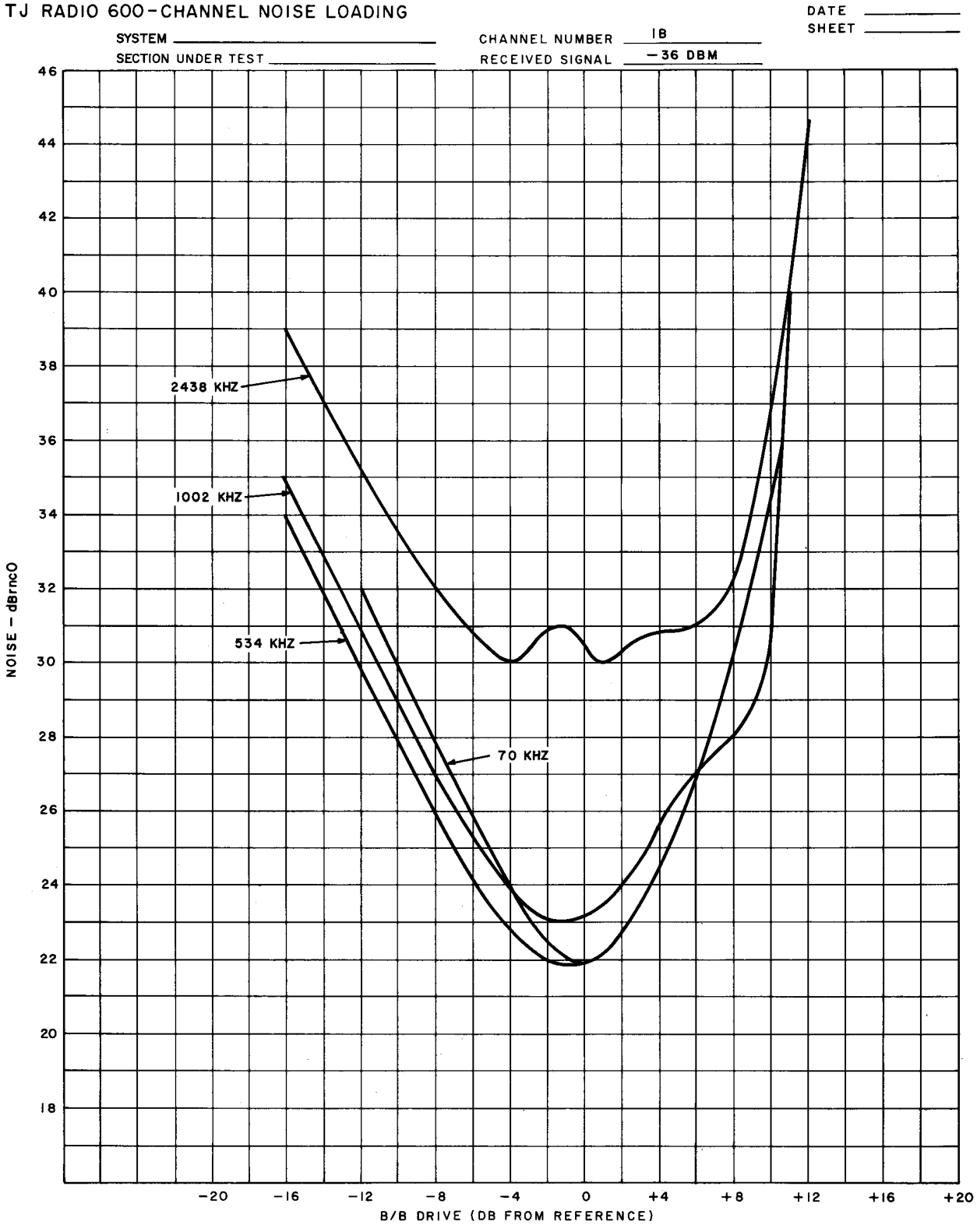

Fig. 5—TJ Noise Loading Plot—Unsatisfactory

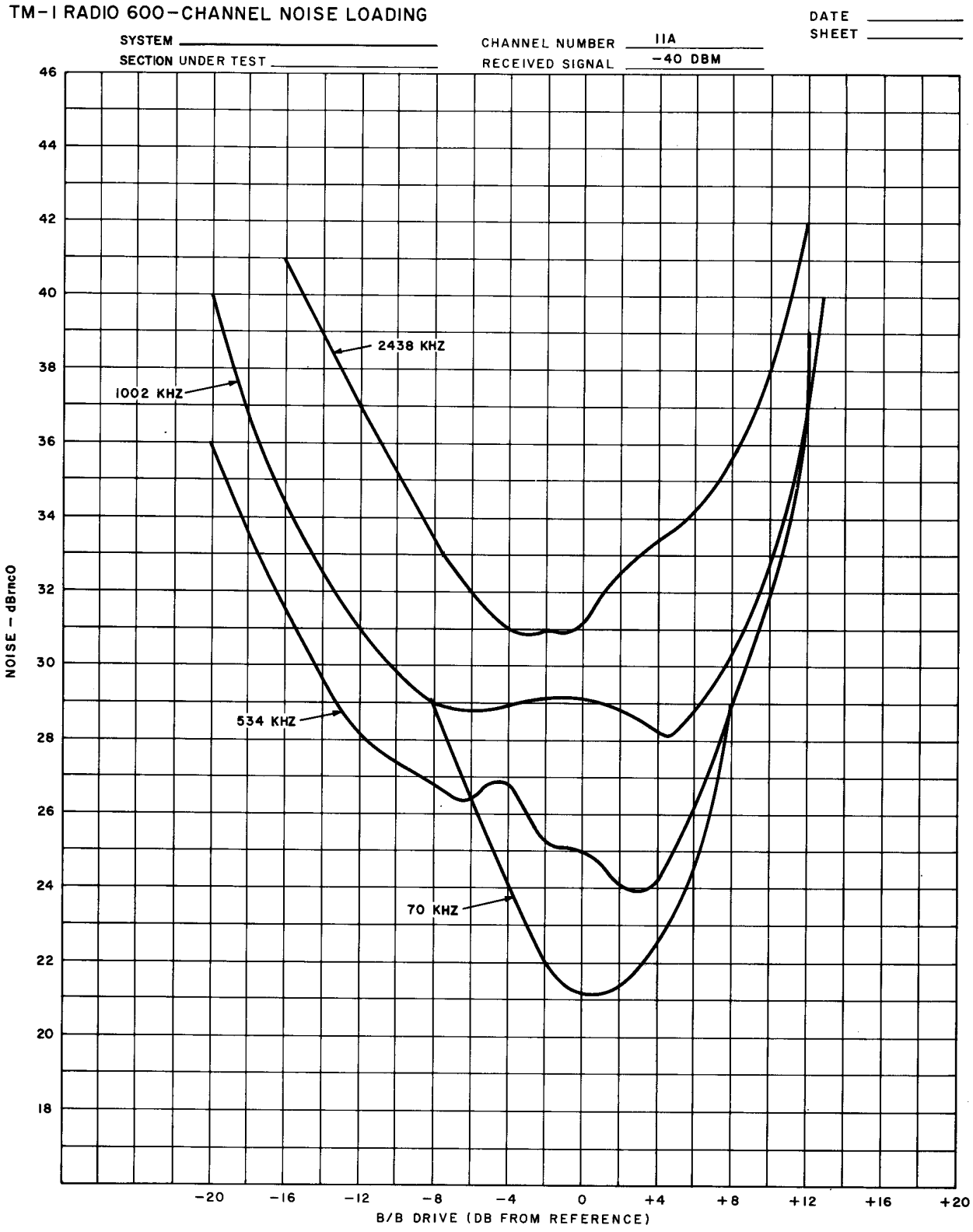

Fig. 6—TM-1 Noise Loading Plot—Unsatisfactory