HEWLETT PACKARD

4935A

TRANSMISSION TEST SET

OPERATING INSTRUCTIONS

3-7. OPERATING INSTRUCTIONS

3-8. Figure 3-2 lists the various measurement modes available. A brief Power On and Set Up procedure precedes the detailed explanation. Each measurement mode is explained with a drawing and accompanying text.

POWER ON and SET UP

A.C. POWER

1. Connect power cord to the rear line module on which the correct line voltage has been selected. See paragraph 2-9 of Installation section for procedure to select line voltages.

WARNING

Always connect power cord to a properly grounded 3-wire power outlet.

2. Press POWER button ON. The 4935A will automatically do a self check of the transmitter, the filters, and the LEDs.

BATTERY POWER (Optional)

WARNING

For operator protection during battery operation, connect the chassis terminal on the rear panel to earth ground.

1. Press POWER button ON with no power cord connected. When switching between battery and A C power cycle the POWER button from STBY to ON again.

   NOTE: Proper care in charging and discharging NiCad batteries can dramatically improve their lives. Consult Section I of this manual for recommended procedures.

SET UP

⚠ Connect circuit to 310 jacks. Do not connect more than 200VDC or 10 Vrms at 60 Hz to these jacks.

NOR-REV

1. Press in the NOR button to connect the left 310 jack to the transmitter and the right 310 jack to the receiver.

2. To reverse the direction of the test press the REV button IN.

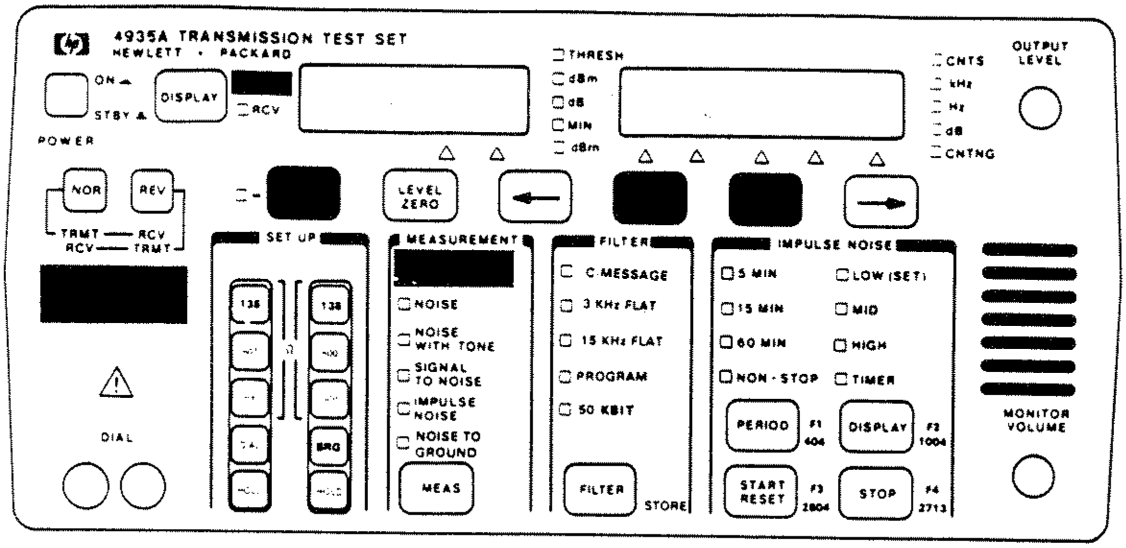
Impedance

1. Press the TRMT impedance button Ω that matches the impedance of the circuit on the TRMT side.

2. Press the RCV impedance button Ω that matches the impedance of the circuit on the RCV side. If the test set is to be used in the bridged mode press the BRG button also. This means that in the bridged mode two RCV Setup buttons will be pressed in — the correct circuit impedance and the BRG button. Note: Do not leave the BRG button IN while the instrument is actually terminating the circuit as it will cause a 6 dB error.

Figure 3-2. Measurements

3-9. MEASUREMENTS



LEVEL AND FREQUENCY—TRANSMITTER

a. Use MEAS key to select LEVEL FREQUENCY.

b. Press DISPLAY-TRMT key to display the transmitted signal. TRMT light is ON. Level can be read in the left display and frequency in the right.

c. If SF signalling units are used on the circuit under test, press SF SKIP key to turn on SF SKIP. When the light is on the transmitter is blanked from 2450 Hz to 2750 Hz or ±150 Hz around a stored SF SKIP frequency.

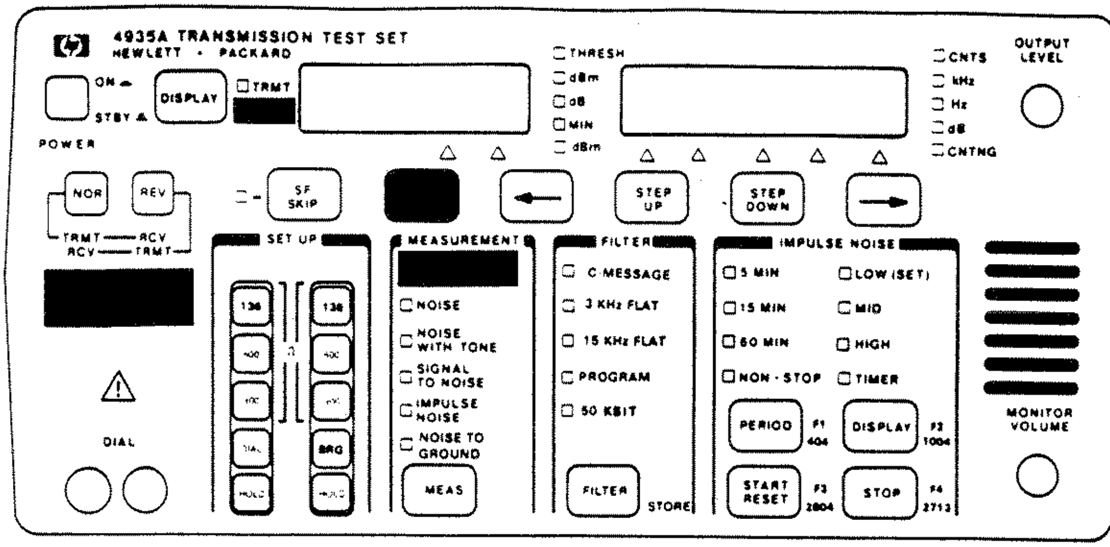
SF SKIP frequency is preset at 2600 Hz (Skip will be 2600 Hz ± 150 Hz). The SF SKIP center frequency can be changed by putting the desired skip frequency into the transmitted frequency display. Then press the STORE key and the SF SKIP key. Be sure to disconnect the transmit side of the line from the test set first to avoid dropping the circuit during the storage procedure.

d. Turn OUTPUT LEVEL knob to adjust the level of the transmitted signal to DATA LEVEL. DATA LEVEL is usually 13 dB below the transmission level point (TLP). A + sign indicates the level is > +13 dBm. A - sign indicates the level is < -40 dBm.

e. Use the STEP UP and STEP DOWN keys to set the desired frequency or press F1, F2, F3 or F4 to recall any stored frequency. Holding a finger on either the STEP UP or STEP DOWN keys causes the transmitter to sweep.

STORE and RECALL Frequencies. There are 4 frequencies stored in locations F1, F2, F3 and F4 when the 4935A is turned on. F1 is 404 Hz, F2 is 1004 Hz, F3 is 2804 Hz and F4 is 2713 Hz. To store other frequencies set the desired frequency in the transmitted frequency display, press the STORE key and press whichever location key, F1, F2, F3, or F4 that is desired as the storage location.

Figure 3-2. Measurements (Continued)



LEVEL AND FREQUENCY—RECEIVER

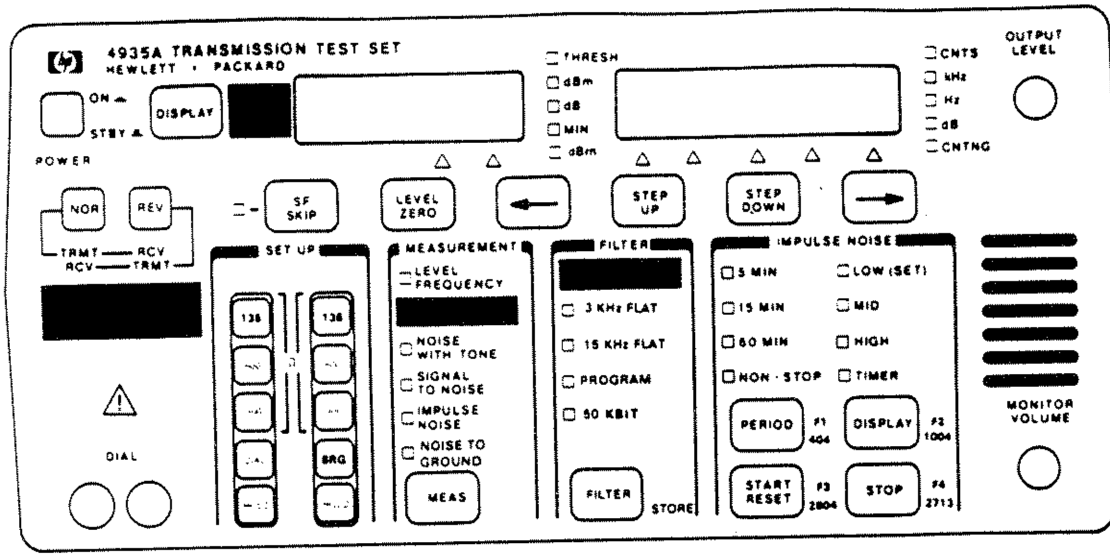
a. Use MEAS key to select LEVEL FREQUENCY.

b. Press DISPLAY key to display the received signal. The RCV light will come ON.

c. Read the RCV level in the left display. A + sign indicates the received signal is > +13 dBm. A - sign indicates received level is < -78 dBm.

d. LEVEL ZERO — For attenuation distortion measurements press LEVEL ZERO key to set the received level at 0 dB. All subsequent level measurements will be made relative to this point. Pressing the LEVEL ZERO key a second time reverts the level to absolute units (dBm) instead of relative units (dB). A negative reading indicates levels higher than the reference level per the telephone industry convention.

Figure 3-2. Measurements (Continued)



NOISE – TRANSMITTER

a. Press DISPLAY TRMT-RCV key to display the transmitted signal. TRMT light will be on.

b. Press MEAS key to select NOISE.

There will be no values displayed because in this configuration the transmitter is turned off and a quiet termination is supplied to the TRMT jack.

NOISE – RECEIVER

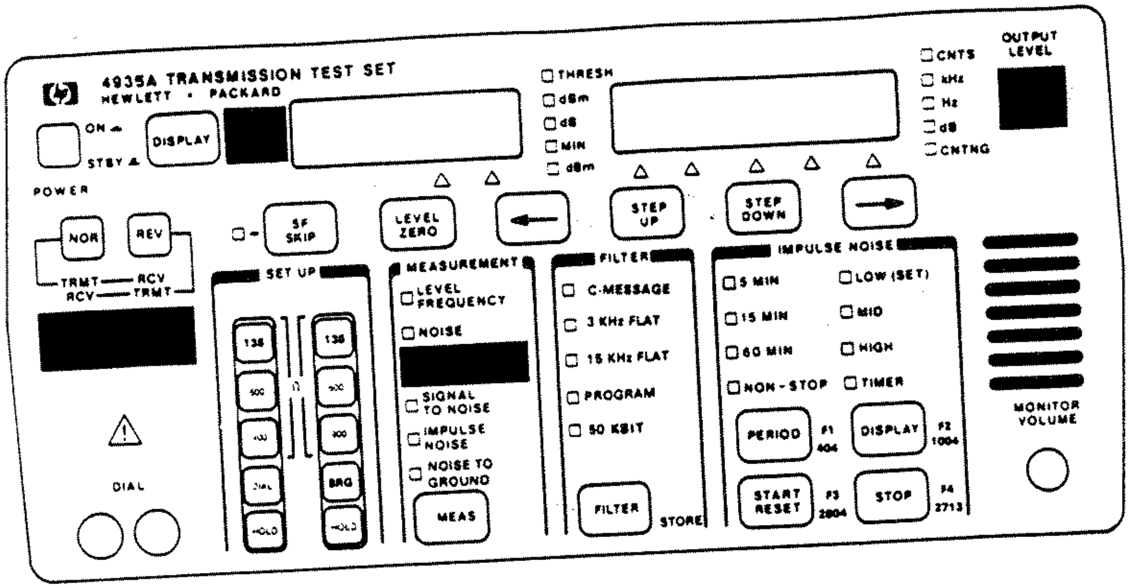
a. Press DISPLAY TRMT-RCV key to display the received signal. RCV light will be on.

b. Press MEAS key to select NOISE.

c. Press FILTER key to select the desired filter.

d. Read the dBrn noise level in the left display. A "–" in the left display indicates underrange (<0 dBrn).

Figure 3-2. Measurements (Continued)



NOISE WITH TONE — TRANSMITTER

a. Press MEAS key to select NOISE WITH TONE.

b. Press DISPLAY TRMT-RCV key to display the transmitted signal. TRMT light will be on and 1004 Hz should be in right display.

c. Turn OUTPUT LEVEL knob to adjust 1004 Hz signal to data level in left display (usually 13 dB below the transmission level point).

NOISE WITH TONE — RECEIVER

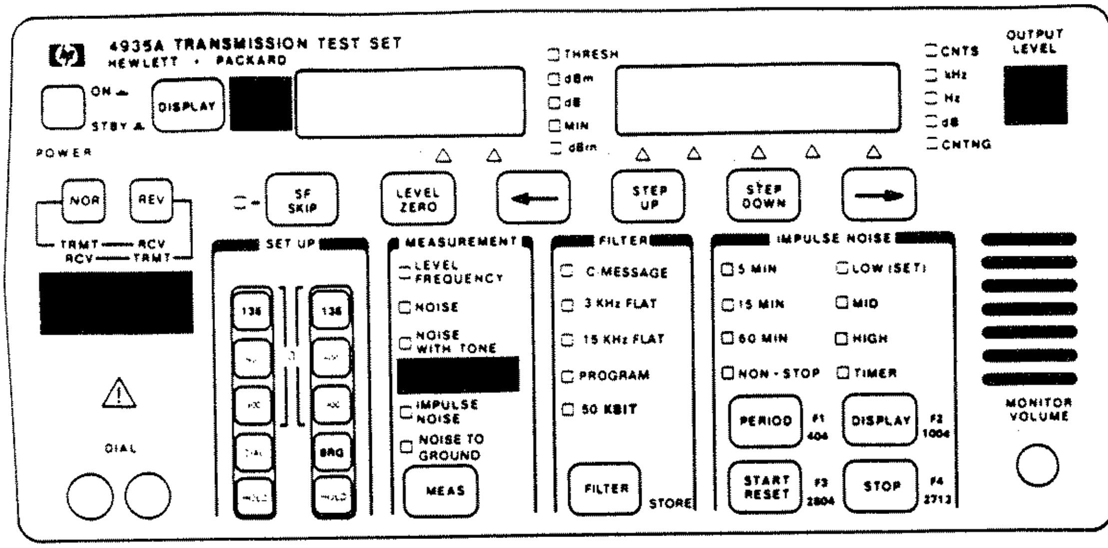
a. Press MEAS key to select NOISE WITH TONE.

b. Press DISPLAY TRMT-RCV key to display the received signal. RCV light will be on.

c. Read dBrn in left display.

Note: Err 7 in the right display indicates the received 1004 Hz tone has dropped below −46 dBm or exceeded +13 dBm.

Figure 3-2. Measurements (Continued)



SIGNAL TO NOISE — TRANSMITTER

a. Press MEAS key to select SIGNAL TO NOISE.

b. Press DISPLAY TRMT-RCV key to display the transmitted signal. TRMT light will be on.

c. Turn OUTPUT LEVEL knob to adjust 1004 Hz signal to data level (usually 13 dB below the transmission level point).

SIGNAL TO NOISE — RECEIVER

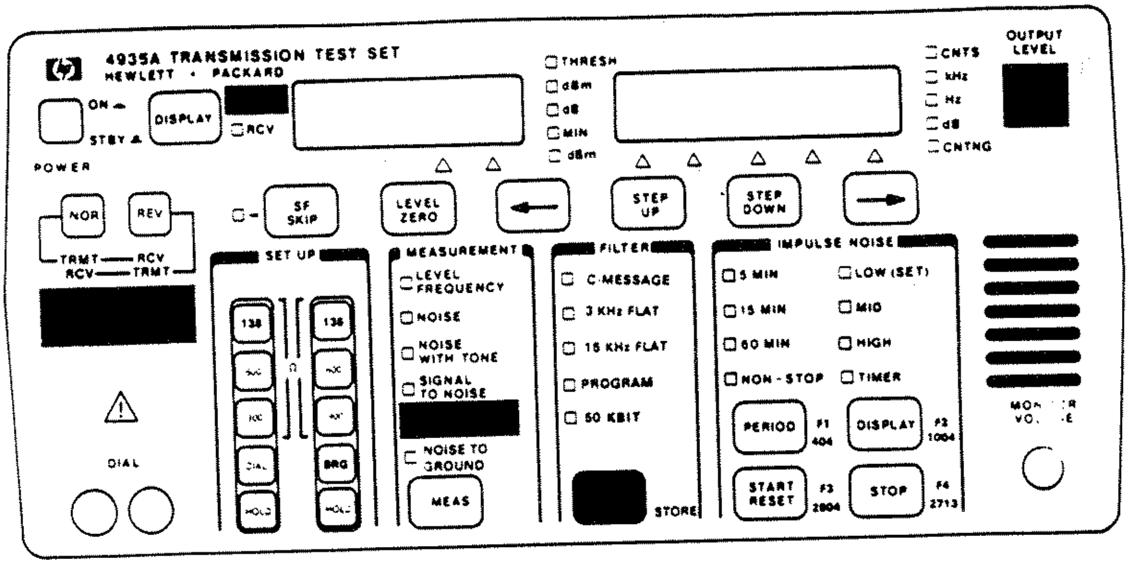
a. Press MEAS key to select SIGNAL TO NOISE.

b. Press DISPLAY TRMT-RCV key to display the received signal. RCV light will be on.

c. Read the Signal to Noise ratio as dB in the right display. The received level is displayed in the left display.

Note: Err 7 indicates the received 1004 Hz tone has dropped below –46 dBm or exceeded +13 dBm.

Figure 3-2. Measurements (Continued)



IMPULSE NOISE – TRANSMITTER

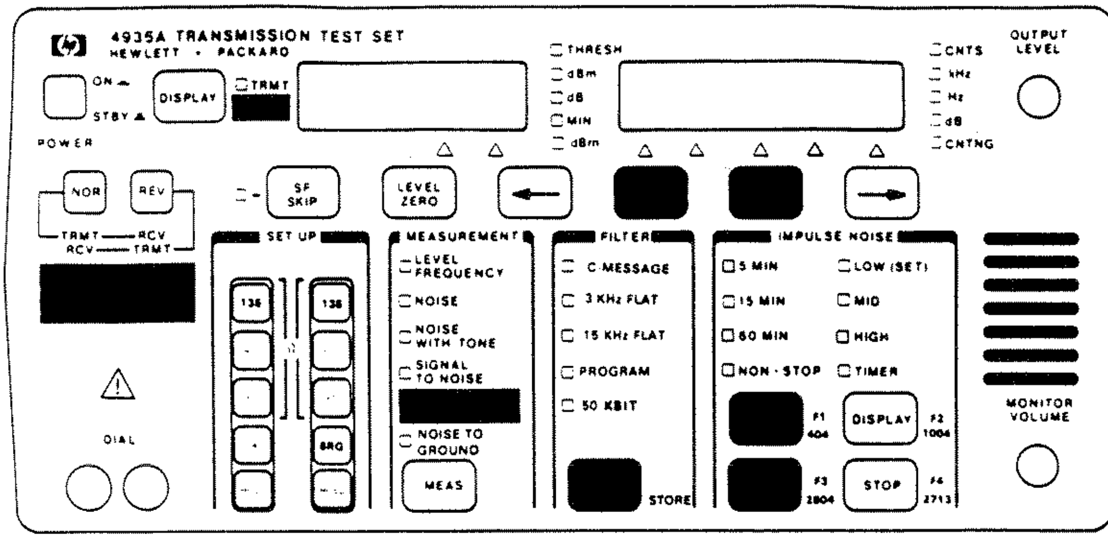
a. Press MEAS key to select IMPULSE NOISE.

b. Press DISPLAY TRMT-RCV key to display the transmitted signal. TRMT light will be on.

c. Press FILTER key to select the same filter as the receiver will use. Although the transmitted signal is not affected by the filter, selecting either the 15 kHz FLAT, PROGRAM or 50 kBit filter will quiet terminate the transmitter instead of sending a hold tone.

d. Turn OUTPUT LEVEL knob to adjust the level to data level (usually 13 dB below transmission level point).

Figure 3-2. Measurements (Continued)



IMPULSE NOISE — RECEIVER

a. Press MEAS key to select IMPULSE NOISE.

b. Press DISPLAY TRMT-RCV key to display the received signal. RCV light will be on.

c. Press FILTER key to select the appropriate filter.

d. Use STEP UP, STEP DOWN and ← → keys to adjust the level of the LOW threshold shown in the left display. The LOW threshold may be set at any value between 30 and 109 dBrn @ 600Ω.

Note: Err 8 indicates the threshold is set out of limits. See paragraph 3-6 for limits.

e. Press PERIOD key to set the time of the test to 5 MIN, 15 MIN, 60 MIN or NON-STOP.

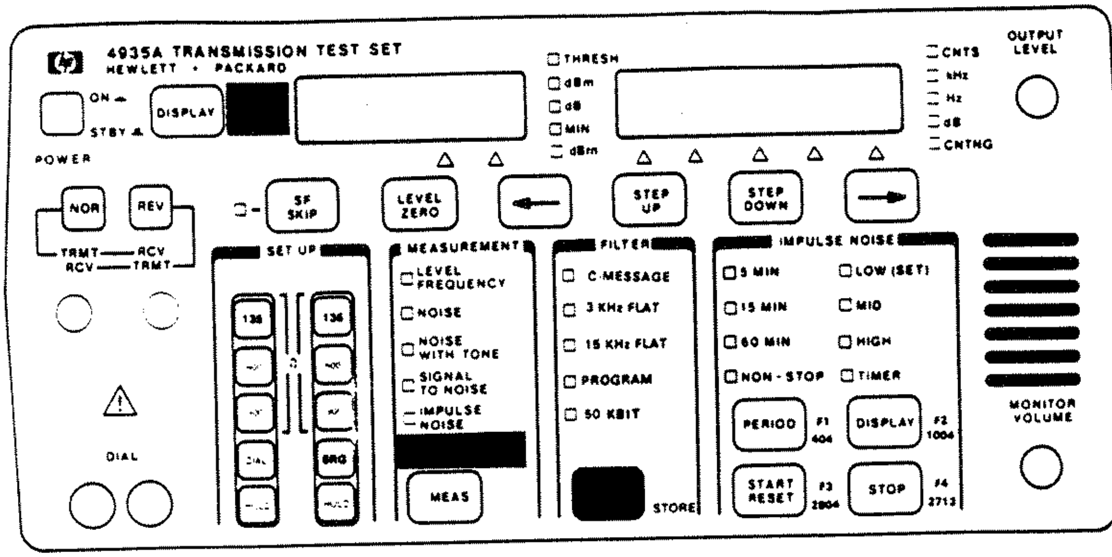
f. Press START-RESET key to start the test. The CNTNG LED by the right display will go on to indicate that the test is in progress. Note that you can see how many counts have been accumulated at each threshold by pressing DISPLAY key. When NON-STOP is selected, STOP must be pressed to stop counting.

g. The left display shows threshold or minutes; the right display shows the number of counts for the threshold selected.

Note: The 1010 Hz notch filter is automatically used when the C Message or 3 kHz flat filter is selected, it is not used for the other filters.

Note: A minus sign in the counts display indicates that the tone has dropped below −46 dBm for more than 1 sec during the test. Tone dropout could cause invalid count totals.

Figure 3-2. Measurements (Continued)



NOISE TO GROUND — TRANSMITTER (STANDARD UNIT and Option 001)

a. Press DISPLAY TRMT-RCV key to display the transmitted signal. TRMT light will be on.

b. Press MEAS key to select NOISE-TO-GROUND which provides a quiet termination to the TRMT jack.

NOISE TO GROUND — RECEIVER (STANDARD UNIT and Option 001)

For valid NOISE-TO-GROUND measurements the test set must be properly grounded. Connect the rear panel chassis ground post to a known good ground.

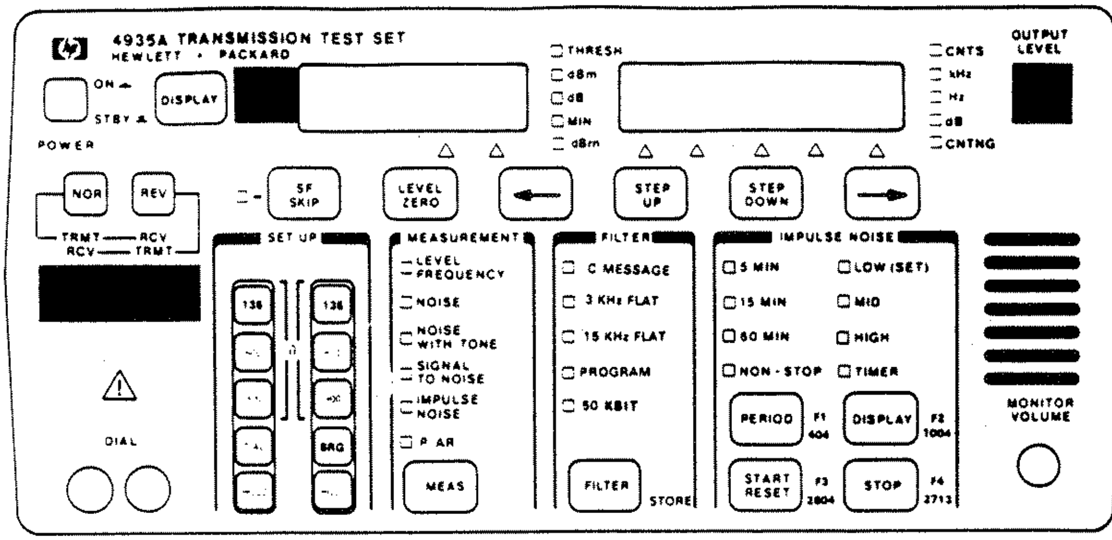
a. Press DISPLAY TRMT-RCV KEY to display the received signal. RCV light will be on.

b. Press MEAS key to select NOISE-TO-GROUND.

c. Use FILTER key to select the desired filter.

d. Read dBm noise level in the left display.

Figure 3-2. Measurements (Continued)



P/AR — TRANSMITTER (Option 002 and 003)

a. Press DISPLAY TRMT-RCV key to display the transmitted signal. TRMT light will be on.

b. Press MEAS key to select P/AR.

c. Use OUTPUT LEVEL knob to adjust signal level to data level. Maximum output for P/AR is +3 dBm.

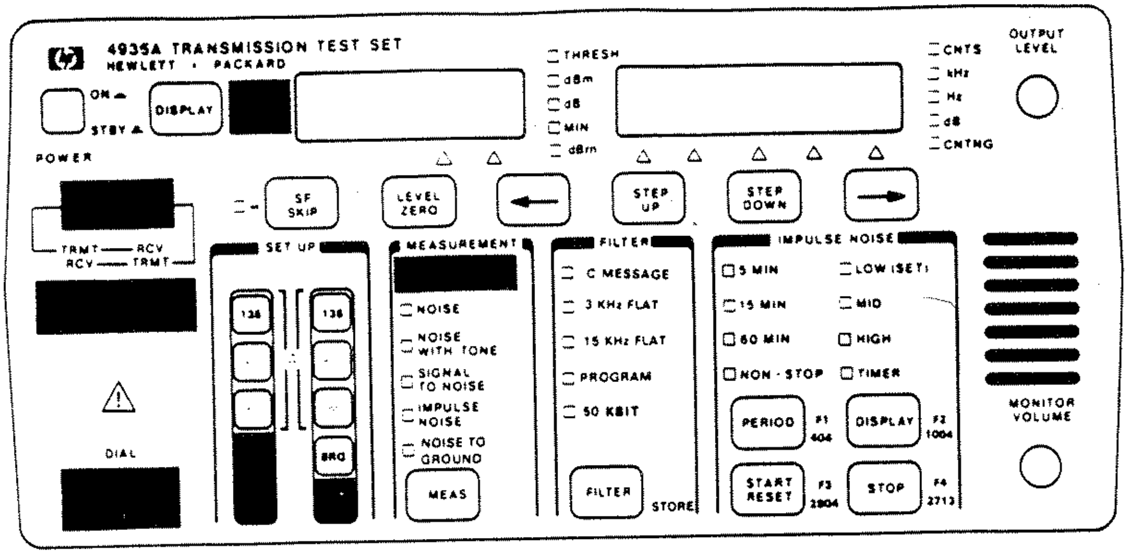
P/AR — RECEIVER (Option 002 and 003)

a. Press DISPLAY TRMT-RCV key to display the received signal. RCV light will be on.

b. Press MEAS key to select P/AR.

c. Read P/AR units in right display.

Figure 3-2. Measurements (Continued)



DIAL and HOLD (WET DIAL-UP and 2 two-wire circuits)

DIAL AND HOLD PROCEDURES

The 4935A has the capability to hold wet dial-up lines (lines where the central office provides battery. For example: DDD; Direct Distance Dialing network). Dialing can be accomplished with a butt-in. The procedure is as follows:

1. Connect circuit to left 310 jack.
2. Push NOR switch to connect TRMT side to left jack.
3. Connect the butt-in handset to the DIAL binding posts.
4. Push TRMT DIAL switch. Use the butt-in to dial the remote end of the circuit.
5. After the circuit is answered, push the TRMT HOLD switch to hold the circuit.
6. Push the TRMT DIAL switch again to release it. This disengages the dial circuitry and allows testing.
7. If the 4935A is designated the receive set, press RCV HOLD switch and then push REV switch to connect RCV side to left 310 jack.

For 2 two-wire circuits, follow preceding steps 1 through 6 for the first side, then:

1. Push RCV HOLD switch.
2. Push REV switch to transfer the transmit side.
3. Push TRMT DIAL switch. Use the butt-in to dial-up the other end.
4. After the circuit is answered, push the TRMT HOLD switch to hold this circuit.
5. Release TRMT DIAL switch by pushing it again.

Figure 3-2. Measurements (Continued)

3-10. MEASUREMENT PRINCIPLES

3-11. The principles for making measurements with the 4935A are described in the following paragraphs. Included are explanations of the measurements and the effects of certain parameters on data transmission.

3-12. INPUT-OUTPUT SWITCHING

3-13. The TRMT and RCV 310 jacks provide connection between the 4935A and the circuit under test. Pressing in the NOR button selects the transmit function for the left 310 jack. The right 310 jack simultaneously performs the receive function. If the REV button is pressed in, the opposite is true as illustrated by Figure 3-3.

3-14. Pressing the two HOLD buttons allows the 4935A to simultaneously hold two DDD (Direct Distance Dialing) circuits. Used with the NOR and REV buttons this permits changing the direction of the test signal without physically changing the test cables and potentially dropping the circuits.

3-15. The input and output impedances are the standard values of 135, 600, or 900 ohms. The 4935A impedance selected must match the impedance of the circuit under test, or erroneous measurements will be obtained.

3-16. The receive input may be internally terminated or bridged across the circuit under test. The 4935A internal termination provides a resistive load which matches the impedance of the line under test. If the line is terminated externally, the internal termination is switched out of the circuit by pressing in the BRG button. The bridged mode provides a high impedance receive input (greater than 50 kohms).

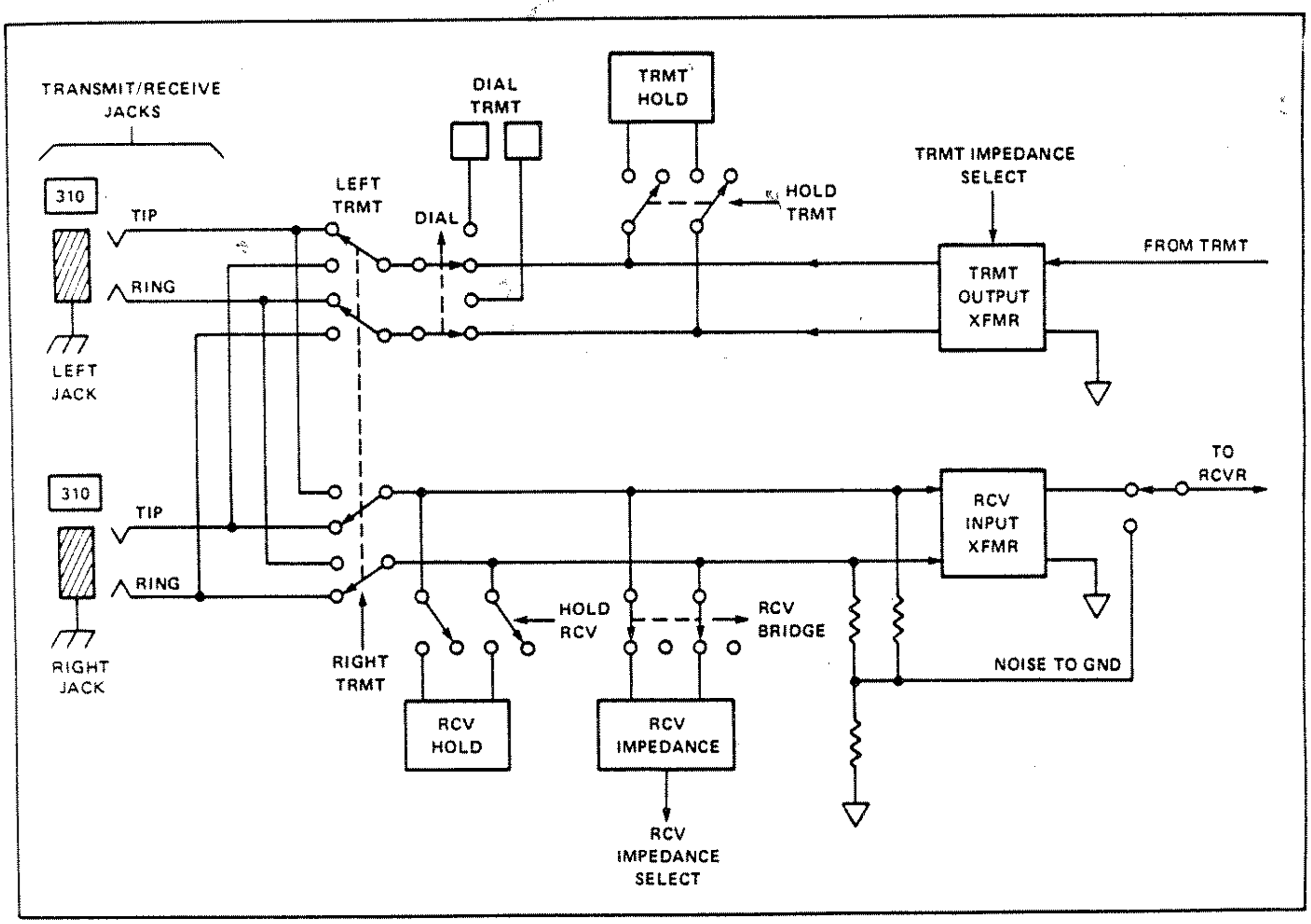


Figure 3-3. Input-Output Switching

3-17. The 4935A input and output circuits are balanced to match standard voice channel lines. A balanced line is electrically symmetrical; the two sides of the line have equal series resistance, series inductance, shunt capacitance, and leakage-to-ground.

3-18. To allow dialing, talking, and listening on the circuit under test, the lineman may plug his handset into the handset terminals (binding posts).

3-19. LEVEL AND FREQUENCY MEASUREMENTS

3-20. The LEVEL FREQUENCY measurement identifies the amplitude versus frequency response of a voice channel, 1000 Hz loss, frequency shifts, and attenuation distortion. The setup as shown in Figure 3-4 is used for all of these functions.

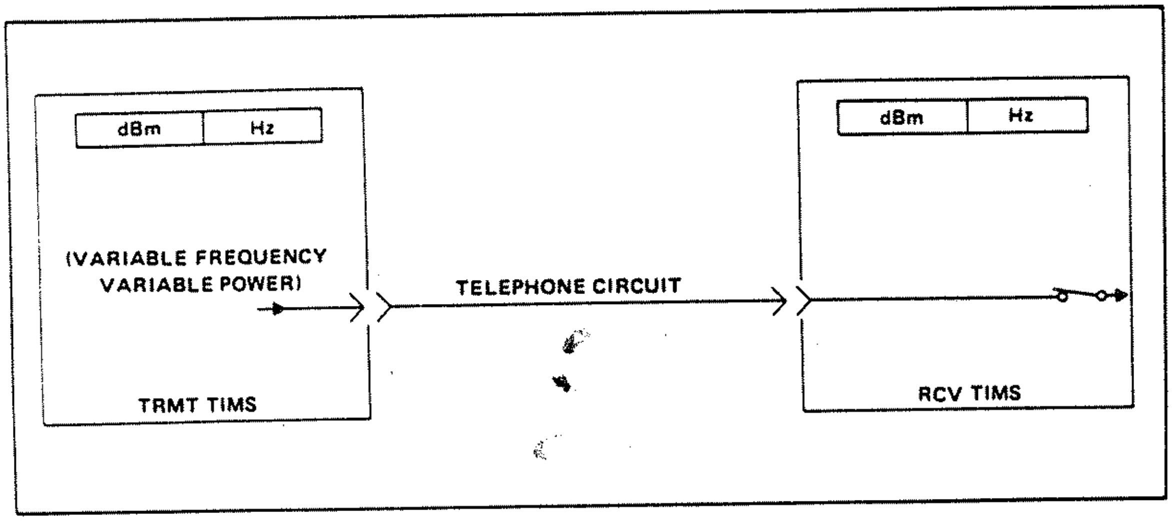


Figure 3-4. Level and Frequency Measurements

3-21. 1000 Hz LOSS

3-22. The 1000 Hz loss mea rement determines the point-to-point loss (or gain) of a 1000 Hz test tone transmitted over a voice chan make this measurement, a 1004 Hz test frequency is transmitted at the data level. At the receiving 4 he received loss or gain is measured (in dBm).

3-23. The wakeup transmit frequency is actually 1004 Hz (not 1000 Hz), to prevent errors over certain circuits. This 4 Hz offset avoids measurement errors caused by test frequencies which are submultiples of the 8 kHz "T-carrier" sampling rate. The other preset frequencies F_1, F_3, and F_4 are offset for the same reason.

3-24. FREQUENCY SHIFT

3-25. The frequency shift measurement checks for any difference in the received frequency with reference to the transmitted frequency (frequency translation) as caused by carrier facilities. To make this measurement, a test tone of known frequency is transmitted. At the receiving end, the received frequency is observed and compared with the transmitted frequency. Any difference between transmitted and received frequencies indicates a frequency shift in the test signal. This measurement is not valid when measured on looped-around carrier facilities, since the frequency shift in one direction (near-end to far-end) may be cancelled by the frequency shift in the other direction (far-end to near-end).

3-26. ATTENUATION DISTORTION

3-27. The attenuation distortion measurement checks the amplitude-versus-frequency characteristics of a circuit using a single frequency measurement technique and defines the circuit's usable bandwidth. To make the measurement, a 1004 Hz test frequency is transmitted at the data level. At the receiving 4935A the power is recorded as the reference level at 1004 Hz. Frequencies between 20 Hz and 110 Hz can be transmitted. The different power readings may be compared to the 1004 Hz reference to obtain the frequency attenuation characteristics of the voice channel in dBm.

3-28. To obtain loss deviations relative to 1004 Hz, the LEVEL ZERO button is pressed during reception of the 1004 Hz reference signal. The received power level is stored (in dBm) and simultaneously displayed as 0 dB. Level readings taken at other frequencies are compared to the 1004 Hz reference and displayed in dB. The 1004 Hz reference level will not have to be subtracted from levels at other frequencies to obtain dB readings.

3-29. According to telephone industry convention, attenuation is defined as a change in loss of a telephone circuit, compared to the loss of a nominal 1000 Hz signal on that circuit. For example, a circuit with 6 dB more loss at 2800 Hz would have an attenuation distortion of −6 dB.

3-30. SF SKIP

3-31. SF Skip (single frequency skip) automatically prevents the 4935A from transmitting frequencies in the 2450 Hz to 2750 Hz range. This feature is used when transmitting over a dial-up network with single frequency signaling units. Any skipped frequency can be programmed using the STORE capability of the 4935A (see Figure 3-1).

3-32. MESSAGE CIRCUIT NOISE MEASUREMENTS

3-33. The message circuit noise measurements determine the effects of background noise and tones. Figure 3-5 illustrates the basic setup for these measurements.

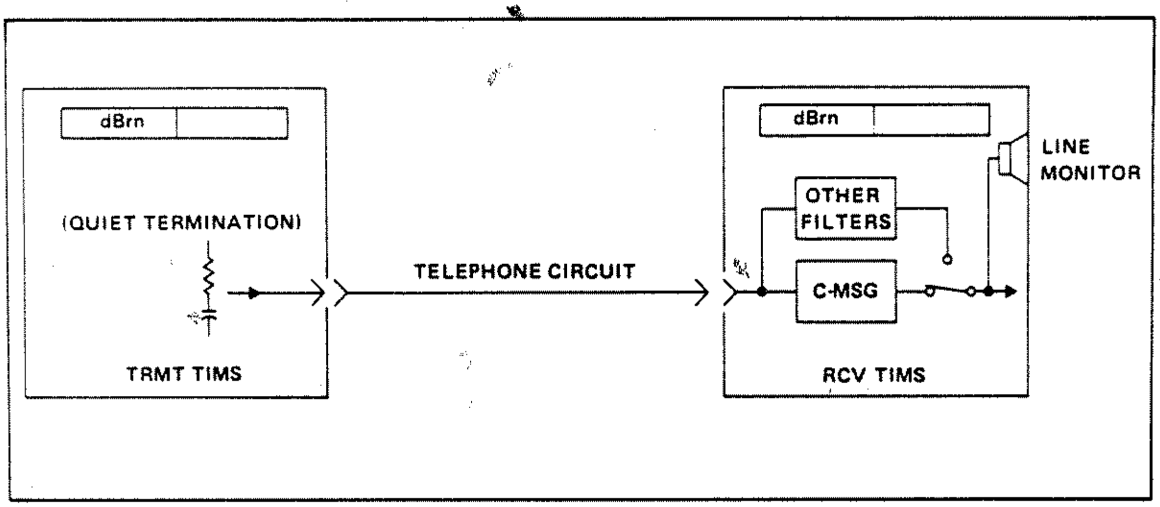


Figure 3-5. Message Circuit Noise Measurements

3-34. The message circuit measurement is obtained by measuring the noise present on a line with a quiet termination on one end (supplied by the transmitting 4935A) and a weighted measuring device on the other end (receiving 4935A).

3-35. The C-message filter measures noise signals that annoy the typical telephone service subscriber. C-message weighting is also used to evaluate the effects of noise on voice-grade data circuits. C-weighting is valid for data transmission since the response characteristic is relatively flat over most of the frequency range for data transmission (600 to 3000 Hz, see Figure 3-6).

3-36. The 3 kHz flat filter has a response that provides much less attenuation to the low frequencies (60 Hz to 500 Hz) than the C-message filter. By comparing a 3 kHz flat noise measurement to a C-message noise measurement, the relative influence of low frequency noise (60 Hz commercial power, 20 Hz ringing, etc.) can be determined (see Figure 3-7).

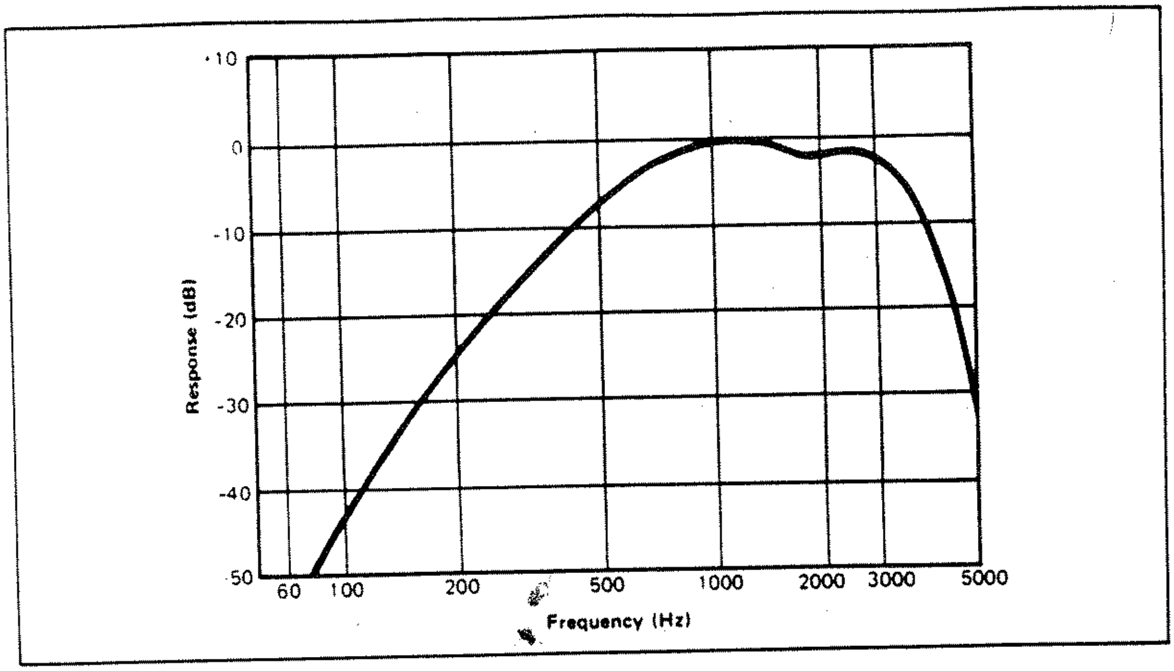


Figure 3-6. C-Message Weighting Characteristic

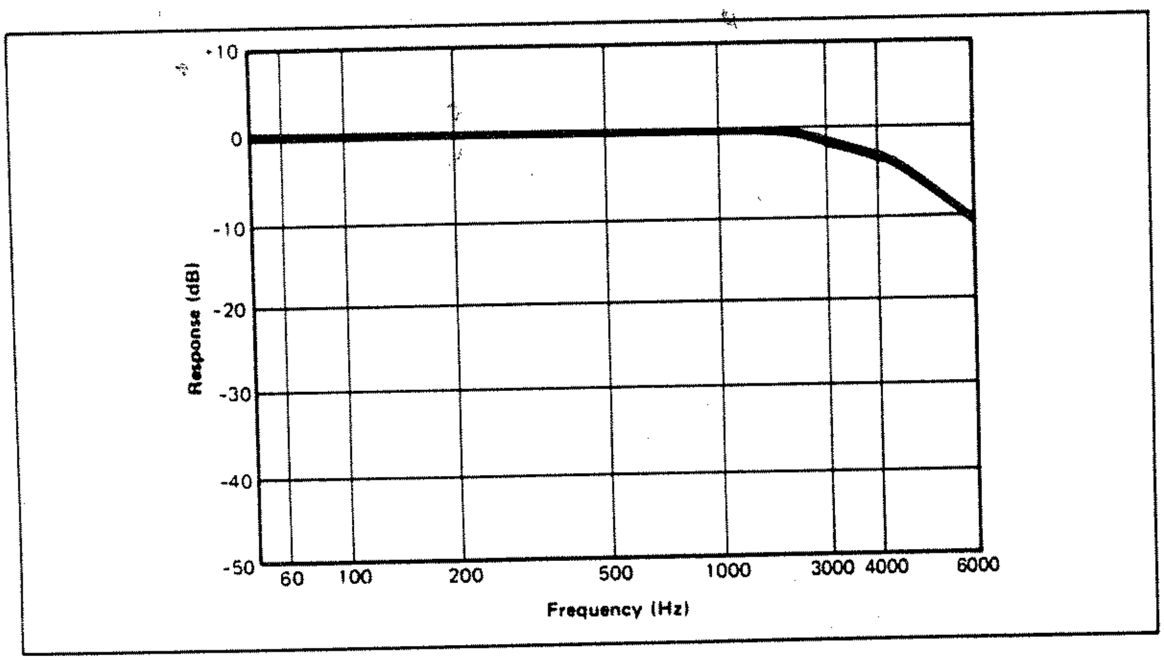


Figure 3-7. 3 kHz Flat Weighting Characteristic

3-37. The program weighted filter is designed for weighted noise measurements on program channels used primarily by the broadcast industry to communicate between studio and transmitter site (see Figure 3-8).

3-38. The 15 kHz flat filter is also designed for measurements on program channels. Like the 3 kHz flat filter, it includes low frequency noise in the measurement (see Figure 3-9).

3-39. The 50 kBit filter is designed to measure weighted noise on wide-band data circuits (see Figure 3-10).

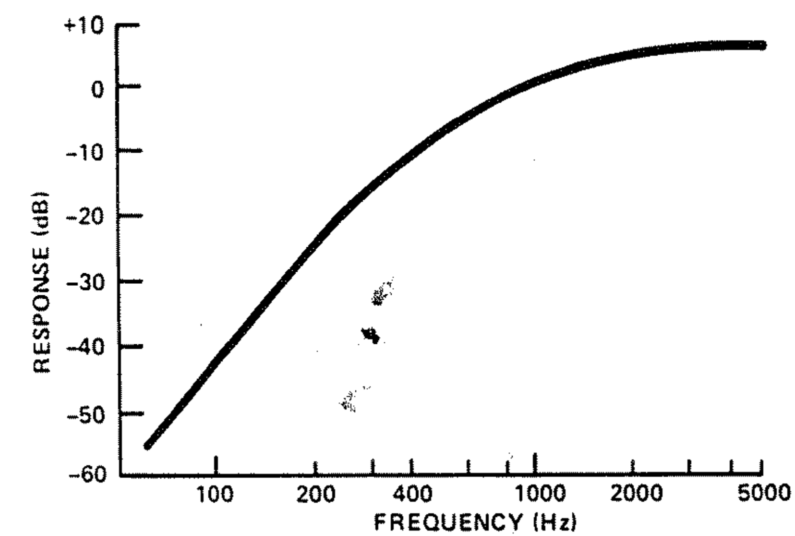


Figure 3-8. Program Weighted Filter

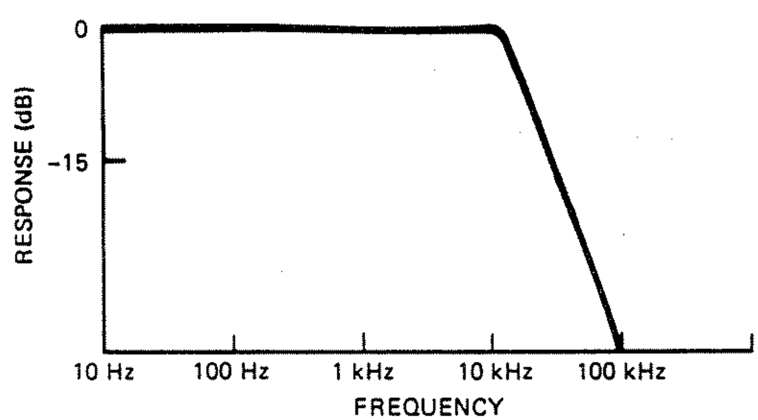


Figure 3-9. 15 kHz Flat Filter

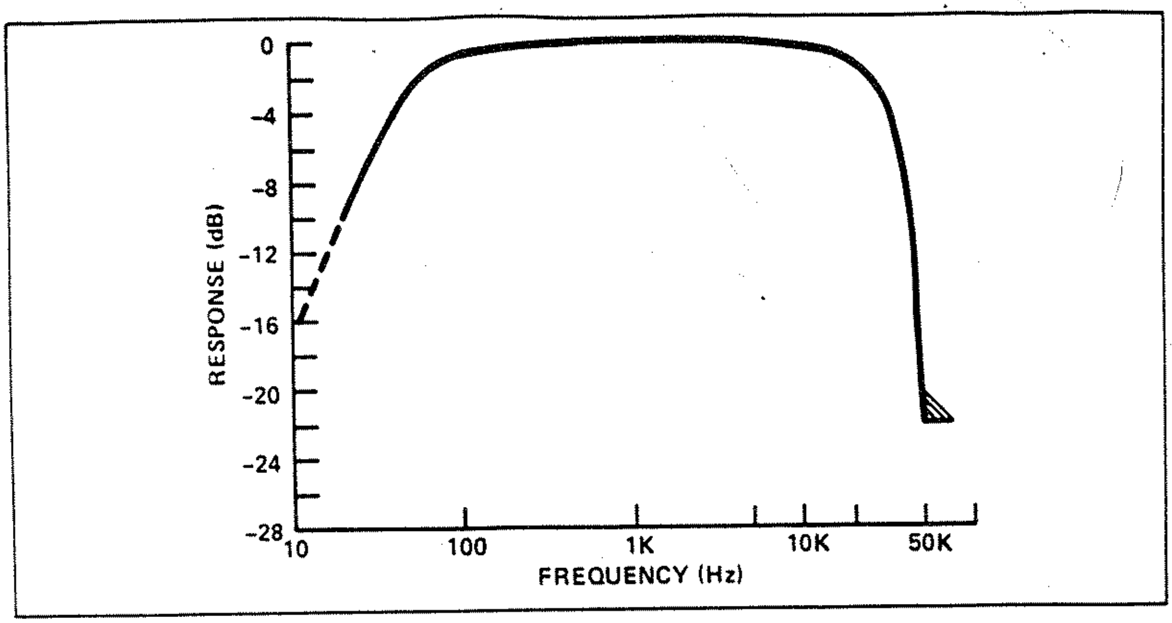


Figure 3-10. 50 kBit Filter

3-40. NOISE MEASUREMENTS

3-41. Received noise levels are displayed in units of dBrn, or dB with respect to reference noise (1000 Hz tone at -90 dBm). For example, a noise reading of 20 dBrn has an RMS power of -70 dBm (20 - 90 = -70). When the C-message filter is selected, readings are displayed in units of dBrn C and the noise level with a C-message weighted measuring device is displayed in dBm.

3-42. NOISE-WITH-TONE (Notched Noise)

3-43. The noise-with-tone measurement technique is used to condition compandors and/or quantizers in the transmission system to their normal operating levels for continuous data signals. Therefore, noise levels are received which duplicate levels present under operating conditions.

3-44. To make this measurement, a 1004 Hz test frequency (holding tone) is transmitted at a data level. At the receiving 4935A, the 1004 Hz holding tone is selectively attenuated by 50 dB using a notch filter (all frequencies between 995 Hz and 1025 Hz are attenuated by 50 dB). The remaining received signal (noise) is passed through a filter for measurement. The received noise level is displayed in units of dBrn. Figure 3-11 illustrates the combination of the C-message weighting and notch filter characteristics. The 4935A combines the notch with any of the five filters.

3-45. SIGNAL-TO-NOISE MEASUREMENT

3-46. The signal-to-noise mode allows measurement of the ratio of received signal-plus-noise power to noise power (S + N/N).

3-47. To make this measurement, a 1004 Hz test frequency is transmitted over the line. At the receiving 4935A, the 1004 Hz signal is selectively attenuated by 50 dB in the notch filter, usually C-message weighted. The remaining received signal (noise) is then compared with the original signal-plus-noise signal. The computed signal-to-noise ratio is displayed in units of dB. Figure 3-12 illustrates this measurement. This is one of the most important parameters for determining the quality of a line.

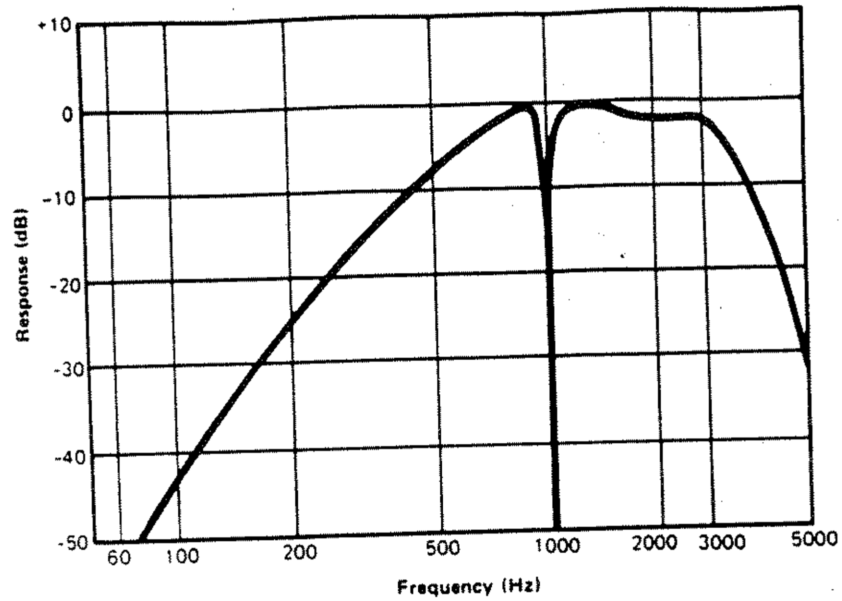
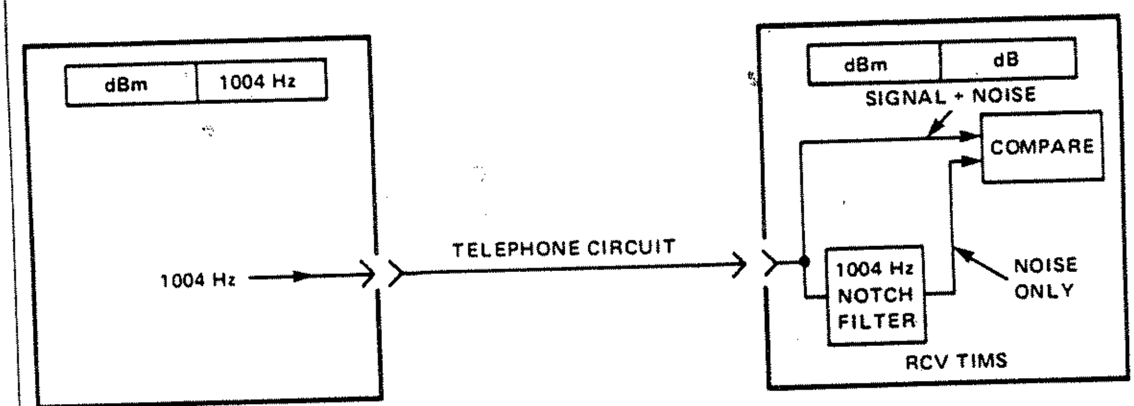


Figure 3-11. C-Message Weighting with Notch Characteristic



$$\text{S-T-N RATIO} = 10 \text{ LOG } \frac{P_{SIGNAL} + P_{NOISE}}{P_{NOISE}}$$

Figure 3-12. Signal-to-Noise Measurement

3-48 SINGLE FREQUENCY INTERFERENCE

3-49. Single frequency interference refers to unwanted stead tones which may appear in lines. Occasional bursts of low level tones which may occur from crosstalk of multifrequency signalling, for example, do not fall in this category. Single frequency tones may interfere with certain data signals, particularly narrowband signals which are multiplexed onto a voiceband channel.

3-50. A simple audio monitoring arrangement will usually detect this interference, since tones exceeding acceptable levels are easily heard if the C-message noise is within limits. The single frequency interference check is made with the setup shown in Figure 3-5. After the received noise signal passes through the C-message filter, the resultant signal is applied to the line monitor speaker. The 4935A operator listens for any predominant tone, which may indicate a single frequency interference problem.

3-51. If a single frequency tone (or tones) of long duration is heard, single frequency interference may be present and should be measured. To determine the frequency and level of the interfering tone, a frequency selective voltmeter or spectrum analyzer must be used. Single frequency interference during a C-message filter measurement occurs if the signal is 3 dB or less below the C-message noise limits.

3-52. IMPULSE NOISE

3-53. The 3-level Impulse Noise Mode measures one of the most important transient phenomena. Transient phenomena can cause data transmission errors and/or interruptions to datacom systems.

3-54. Impulse noise is that component of the received noise signal which is much greater in amplitude than the normal peaks of the message circuit noise. It occurs as short duration spikes and/or bursts of energy. Studies by Bell Telephone laboratories have shown that impulse noise spikes have a duration of less than one millisecond, and that all significant effects of the noise spike disappear within four milliseconds. Waveform (b) in Figure 3-13 illustrates a received holding tone (or test signal) that includes interfering impulse noise spikes. The impulse noise measurement counts the number of noise spikes above a selected threshold level during a specified time period.

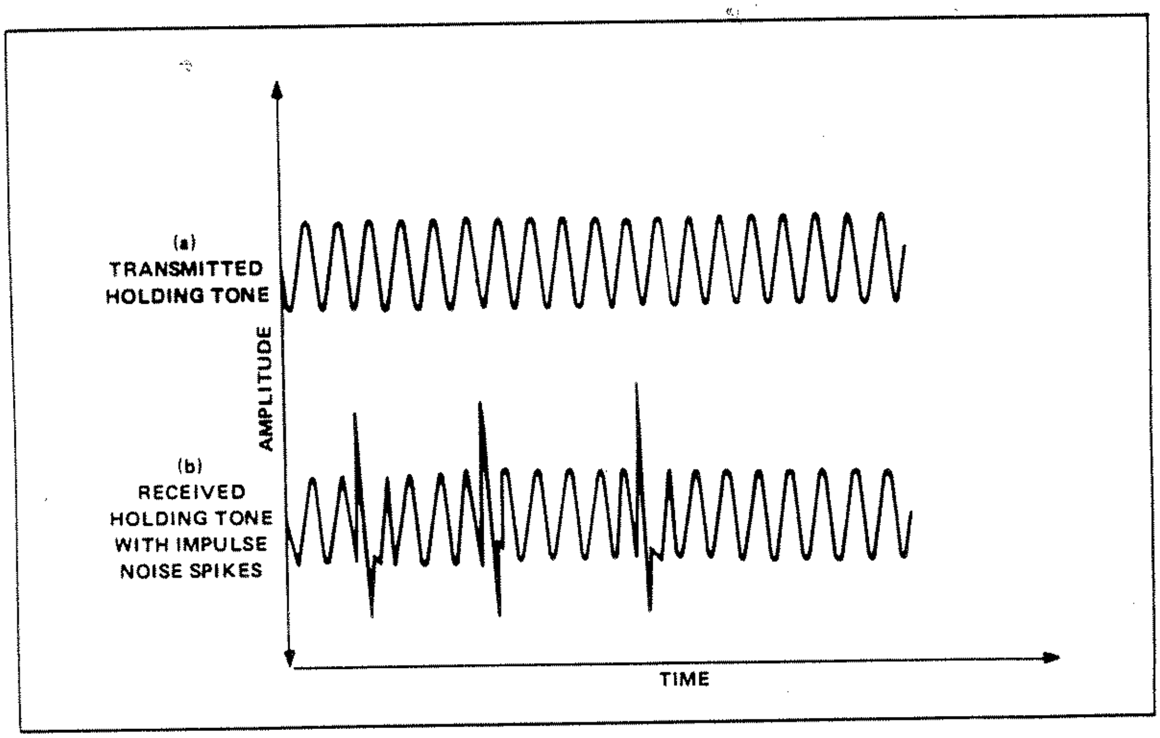


Figure 3-13. Impulse Noise Waveform Representation

3-55. NOISE-TO-GROUND MEASUREMENT

3-56. The 4935A uses noise-to-ground to measure the longitudinal noise present on a telephone circuit, with reference to ground. The transmitting 4935A provides a quiet termination at one end of the voice channel, and the receiving 4935A provides a frequency weighted filter and detector at the other end. The basic measurement technique used for the noise-to-ground measurement is very similar to the message circuit noise measurement: the main difference lies in the use of a ground reference. Figure 3-14 illustrates this difference.

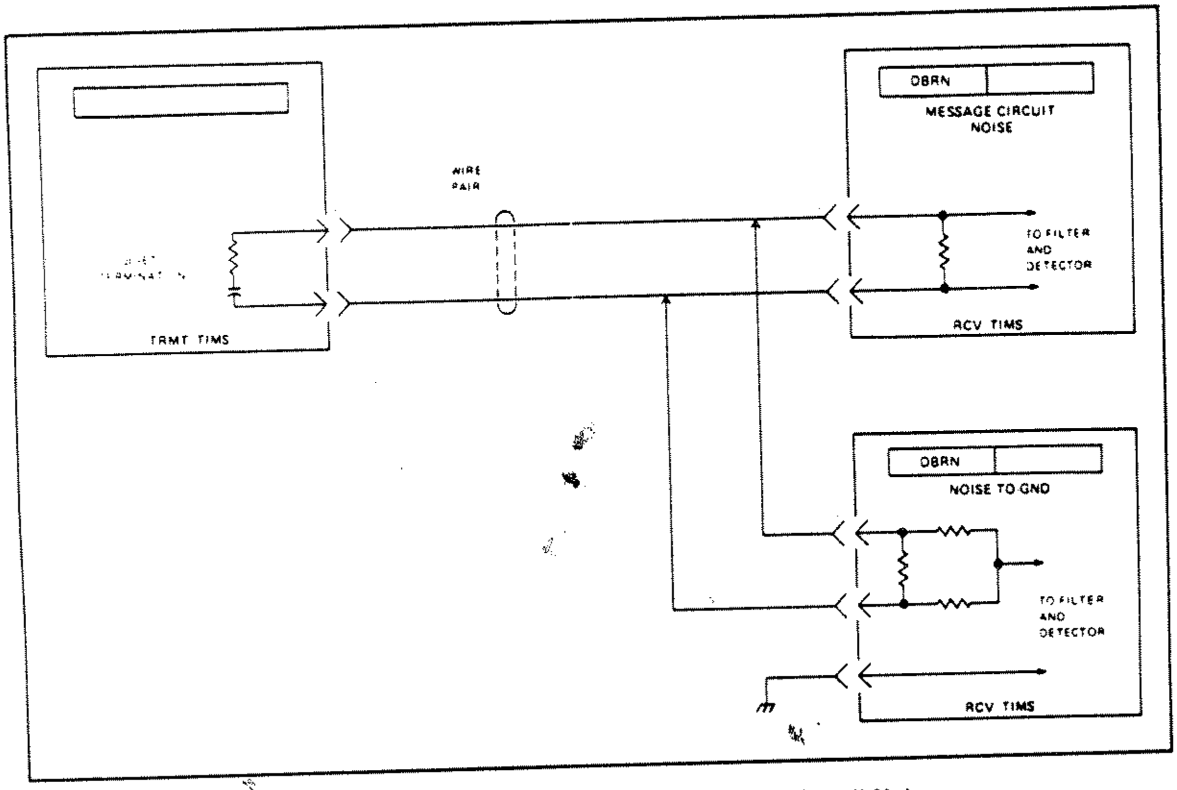


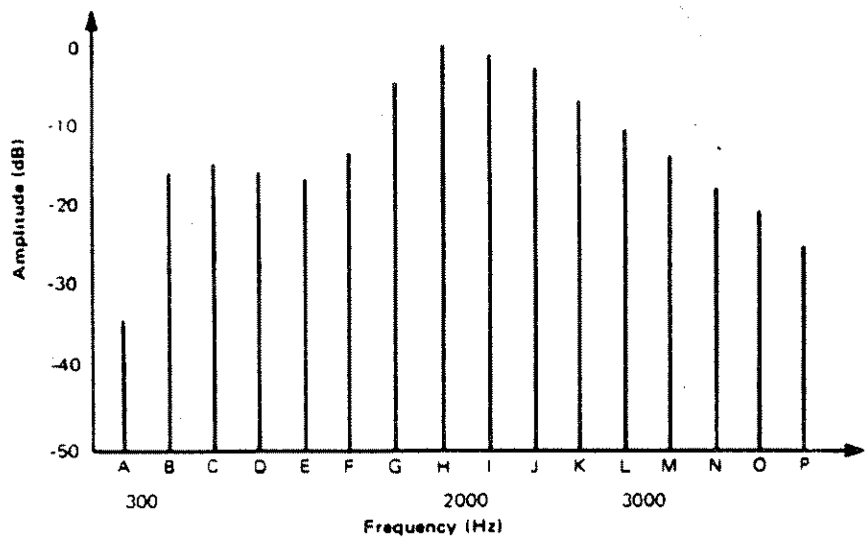
Figure 3-14. Noise-to-Ground Related to Message Circuit Noise

3-57. Noise-to-ground measurements are usually made for troubleshooting purposes; to measure the magnitude of longitudinal signals, which may indicate the susceptibility of a cable pair to electrical coupling from external sources. These measurements are also made to coordinate new installations with power companies, to minimize power line coupling.

3-58. The relative line balance of an end loop can be calculated by subtracting the measured noise-to-ground (N_g) value from the measured message circuit noise (N_m) value. This calculation is only valid if the measurements are made on a twisted pair and it is assumed that the message circuit noise is caused by longitudinal noise converted to message circuit noise by line imbalance. It is recommended that both message circuit noise and noise-to-ground be measured with the 3 kHz flat weighted filter to include the effects of power line related noise.

3-59. PEAK-TO-AVERAGE RATIO MEASUREMENT

3-60. The 4935A uses the peak-to-average ratio (P/AR) to measure the channel dispersion (spreading in time of signal amplitude) due to transmission imperfections. As the P/AR signal traverses a dispersive medium, the peak-to-average ratio will deteriorate. Then by measuring the peak-to-average ratio at the receiving end, a simple measure of dispersion is obtained. P/AR is measured as the ratio of the peak to full-wave rectified average values of a specially processed test signal transmitted over a line. The test signal has a peak-to-average ratio and a spectral content that approximates a data signal. Figure 3-15 illustrates the frequency spectrum of the transmitted P/AR test signal, and Figure 3-16 illustrates the signal envelope.



KEY	FREQUENCY
A	140.625
B	390.625
C	640.625
D	890.625
E	1140.625
F	1390.625
G	1640.625
H	1890.625
I	2140.625
J	2390.625
K	2640.625
L	2890.625
M	3140.625
N	3390.625
O	3640.625
P	3890.625

Figure 3-15. P/AR Transmit Signal Frequency Spectrum

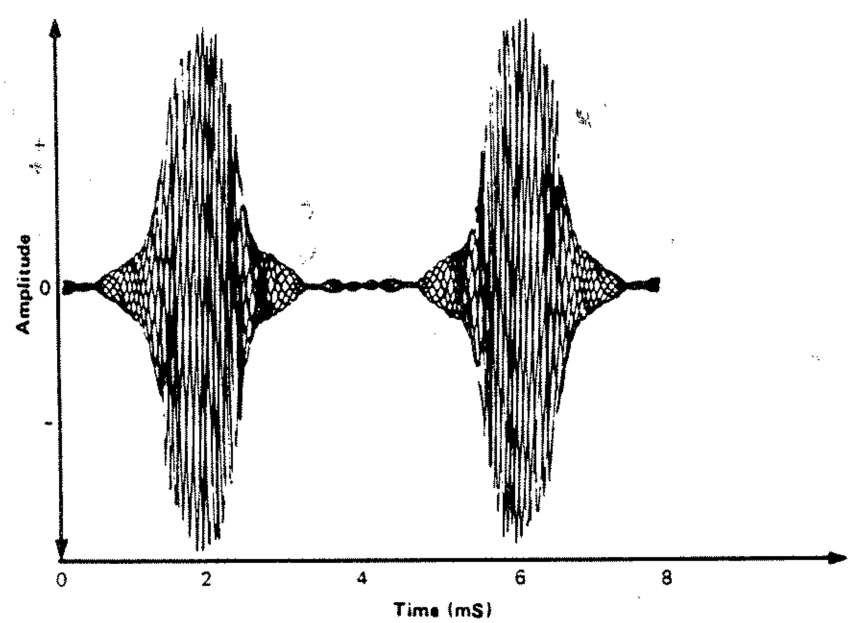


Figure 3-16. P/AR Transmit Signal Envelope

3-61. The P/AR measurement is a single number rating of the fidelity of a voiceband channel and is a weighted measure of the total attenuation, phase distortion, and noise. The P/AR rating is derived by comparing the P/AR of an ideal signal with the P/AR of the output signal of the system under test. The P/AR measurement is most sensitive to envelope delay distortion and is also affected by noise, bandwidth reduction, gain ripples, nonlinearities such as compression and clipping, and other impairments. P/AR is simpler to understand than envelope delay because it is only one number instead of a curve. Also P/AR can be measured in loop-around mode with only one instrument, unlike envelope delay. If the P/AR signal were received entirely undistorted, the P/AR rating would be 100, while a circuit that causes a 10% reduction in the peak-to-average ratio has a P/AR rating of 80.

3-62. The P/AR measurement provides little information about the nature of the fault condition in any particular case. However, since P/AR is a figure of merit for the channel, it can be used as a benchmark for future reference. After other measurements are made and a channel is considered acceptable, the P/AR rating can be recorded for future reference. In case of a suspected trouble on the channel, P/AR may be measured first and be compared to the benchmark P/AR value. Deviations in excess of ±4 P/AR units from an initial P/AR value provides sufficient reason to suspect that some channel characteristic has changed significantly.