PROGRAM OPERATING CENTER
PROGRAM AMPLIFIERS AND EQUALIZERS—QVF52B AND QVF52E
PROGRAM EQUALIZER—QVF52D
DESCRIPTION, INITIAL ADJUSTMENTS, AND TESTS

CONTENTS PAGE

1. GENERAL

1.01 The QVF52B and E program amplifier and equalizer units (Fig. 1 and 2) restore program signals by providing amplification and equalization for program circuits using various gauges of twisted pair cables up to 10 miles (16 kms) in length.

1.02 Whenever this section is reissued, the reason(s) for reissue will be given in this paragraph.

1.03 The gains of the QVF52B and E units are adjustable from 0 through 41 dB in 1-dB steps. In addition, the QVF52E unit has a further continuous adjustment range of 0 through 1 dB gain.

1.04 The equalizer section uses both high- and low-frequency correction circuits for amplitude equalization of 5-, 8-, or 15-kHz audio programs. The main—or high-frequency—equalizer consists of an adjustable parallel circuit in series with an adjustable resistor. The resonant frequency is determined by the characteristics of the cable facility to be equalized and can be varied from 5 kHz to approximately 40 kHz. The low-frequency equalizer provides additional equalization for frequencies below 1.4 kHz.

1.05 The QVF52B and E units have a distribution bridge of up to eight isolated outputs. Unused output ports do not need to be terminated.

1.06 The QVF52D program equalizer unit (Fig. 3) provides high- and low-frequency equalization for 5-, 8-, or 15-kHz program circuits. The equalization section is identical to that used in the QVF52B and E units.

1.07 QVF52B, D, and E units occupy a single position on the VF-300 shelf. All adjustments are made by operating switches and controls located on the faceplate and the printed circuit board. The units are powered from either a −24V or −48V office battery.

1.08 ***References:***

SD-6812-01 — VF-300, QVF52A, B, C, E, and H Plug-In Unit, Program Amplifier, and Equalizer

SD-7123-01 — VF-300, QVF52D Plug-In Unit Program Equalizer

1.09 *Specifications:*

Power Requirements

QVF52B and E — −48 or −24 Vdc ±10 percent with up to 100 mV ripple and noise

QVF52D — None

Input Level

1-kHz Test Tone — 0 to −41 dBm

Output Level (on Each of 8 Outputs)

1-kHz Test Tone — 0 dBm

Program — +8 VU

Overload Level

+18 dBm

Gain

QVF52B — 0 to 41 dB (1-dB steps)

QVF52E — 0 to 41 dB (1-dB steps) 0 to 1 dB (continuous)

QVF52D — None

The main equalizer can be adjusted for up to 10 miles (16 kms) of nonloaded cable as specified in Table A.

Frequency Response

±1 dB

Input Impedance (Selectable)

600 or 150Ω

2. DESCRIPTION

2.01 *Input:* The input can be wired through the VF-300 shelf or plugged into the access jacks of the faceplate. The impedance of the input can be set to 150 or 600 ohms with switches SC-1, SC-2, and SC-3. (See Fig. 4 and 5.)

2.02 *Low-Frequency Equalizer:* This section equalizes frequencies below 1.4 kHz and is controlled by switches SA-8 through SA-10 (capacitance) and SA-2 through SA-7 (resistance). The unit is in series with the amplifier and can be bypassed by closing switch SA-1.

2.03 *Main Equalizer:* The main equalizer is shunt-connected across the input to the amplifier. It consists of an adjustable parallel resonant circuit in series with an adjustable resistor. The equalizer equalizes the frequency response of the cable, which results in an overall flat response at the input to the amplifier. The main equalizer is controlled by:

(a) Resistance thumbwheel switches S1, S2, and S3 located on the faceplate. The resistance switches control the level of attenuation at lower frequencies.

Note: The resistance scale setting is an arbitrary number proportional to resistance value in ohms.

(b) Resistance bypass switches SC-4 through SC-6.

(c) Inductor switches SE-1 through SE-6 and SF-1 through SF-7.

(d) Capacitor switches SD-1 through SD-8. The inductance and capacitance switches control the high-frequency attenuation. The length of various cables that this section can equalize is shown in Table A.

2.04 *60-Hz Rejection Filter (QVF52B and E):* The 60-Hz rejection filter is a narrow bandpass filter tuned to 60 Hz. It is connected between the amplifier input and ground. The filter can be switched into the circuit by switch SB-4.

2.05 *Amplifier (QVF52B and E):* The signal level (which has been attenuated by cable and equalizer losses) is restored by the amplifier circuit. The gain of the QVF52B is adjustable from 0 to 41 dB as follows:

- 0 to 30 dB (in 10-dB steps) by switches SB-1, -2, -3, -4, -5, and -6, (Table F)
- 0 to 11 dB (in 1-dB steps) by the faceplate-mounted GAIN control.

The gain of the QVF52E has an additional gain control (also mounted on the faceplate) which provides a continuous adjustment from 0 to 1 dB.

2.06 ***Outputs:*** The QVF52B and E units have eight isolated outputs. When used in a standard VF-300 shelf, three outputs are provided and additional shelf wiring is required to bring into use all eight outputs. Outputs 1 and 2 can be set to a 150- or 600-ohm impedance with switches SG-1 through SG-4. All other outputs are 600 ohms. Output 1 is accessible at the LINE AMP output jack on the faceplate. When used in a standard VF-300 shelf, output 3 can be disconnected (to minimize crosstalk interference) by opening switches SG-5 and SG-6. The QVF52D has a single output set for an output impedance of either 150 or 600 ohms by switches SG-1, SG-2, and SG-3.

2.07 ***Monitor Points:*** Faceplate-mounted jacks allow terminated measurements (or signal connection) at the amplifier input and the first output. The amplifier output can be monitored with a high-impedance meter through the MON jack.

3. INSTALLATION

3.01 The QVF52B, D, and E units are designed to be plugged into a VF-300 shelf equipped with a suitable wiring class. Generally, the use of units of other types mounted adjacently in the same shelf will not cause additional noise in the program circuit.

3.02 ***QVF52B and E Only:*** When one to three amplifier outputs are required, plug the unit into a position in a standard VF-300 shelf. This provides connection to the unit as follows:

−48V battery — connector pin 8

ground — connector pin 7

−24V battery — connector pin 36

input — connector pins 23(T) and 24(R)

output 1 — connector pins 1(T) and 4(R)

output 2 — connector pins 2(T) and 3(R)

output 3 — connector pins 22(T) and 25(R)

Note: If output 3 is not used, it should be disconnected (operate internal switch SG-5 and SG-6 to the open position) to reduce crosstalk and noise pickup in the shelf and intraoffice cabling.

When more than three outputs are required, the VF-300 shelf must be wired to provide connections to the required outputs:

output 4 — connector pins 27(T) and 28(R)

output 5 — connector pins 29(T) and 30(R)

output 6 — connector pins 44(T) and 45(R)

output 7 — connector pins 49(T) and 50(R)

output 8 — connector pins 51(T) and 52(R)

All input and output connections should be made using twisted pairs to retain circuit balance.

3.03 ***QVF52D:*** Plug the unit into a position in a standard VF-300 shelf to provide connections for:

input — connector pins 23(T) and 24(R)

output — connector pins 22(T) and 25(R)

ground — connector pin 7

4. EQUALIZER ADJUSTMENT PROCEDURES

4.01 The portable test apparatus required for these procedures is given in Table B.

4.02 ***Initial Tests and Adjustments:***

Note 1: Initial switch settings and cable measurement of Table C and Chart 1 must be completed before proceeding to Chart 2 for adjusting a 15-kHz bandwidth channel or Chart 4 for adjusting a 5- or 8-kHz bandwidth channel.

Note 2: A sweep generator can also be used for adjusting the QVF52 to bandwidths of 5, 8, or 15 kHz.

Note 3: Equalized adjustment guidelines for 15-kHz equalization are given in Part 5.

5. EQUALIZER ADJUSTMENT GUIDELINES FOR 15-kHz EQUALIZATION

5.01 The QVF52 main equalizer consists of three elements: inductance, capacitance, and resistance in a shunt-type arrangement. The three elements are adjustable to accommodate various lengths and characteristics of circuits. The following paragraphs give general guidelines for fitting the equalizer to a circuit, based on cable measurements in the field.

5.02 Before adjusting the equalizer transmission frequency, runs should be made on the cable pair at the following frequencies:

100, 1,000, 5,000, 8,000, 10,000, 12,000, 15,000 Hz.

The above measurements should show loss increasing with frequency.

5.03 The equalizer introduces a tuned resonant circuit into the transmission path. The frequency response of the equalizer has a characteristic opposite to that of the cable pair, with more loss at low frequencies than at high frequencies. Using Table D and the 5- and 15-kHz level difference, the equalizer is adjusted with a resonant frequency between 16 and 19 kHz.

5.04 After the initial settings are determined using Chart 2, any readjustments should be made with the following in mind:

- A change in the ratio of inductance (L) to capacitance (C) can be obtained by moving up or down Table D.
- Moving up the table decreases the loss at the intermediate frequencies between 1,000 and 15,000 Hz.
- Moving down the table increases the loss between 1,000 and 15,000 Hz.

5.05 ***Change in Resonant Frequency:*** The equalizer may be tuned to different frequencies by changing the value of inductance or capacitance. The effect of this is in the frequency range of 8 to 13 kHz. Table I may be used to make the following changes:

- Always begin by locating the present setting of switches SD, SE, and SF in Table I.
- To decrease a dominant peak between 8 and 15 kHz, move to the right of the present setting in Table I.
- To increase the level between 8 and 15 kHz, move to the left of the present setting in Table I.

5.06 ***Change in Resistance (R):*** The resistance setting of the equalizer affects the loss in the frequency range between 50 and 1,000 Hz.

5.07 Using the faceplate-thumbwheel switches and SC-4, SC-5, and SC-6 (see Table E), increase the setting to increase the level at 100 Hz, or decrease the setting to decrease the 100-Hz level.

CHART 1

INITIAL SWITCH SETTINGS AND CABLE MEASUREMENTS

APPARATUS:

See Table B.

CHART 1 (Contd)

STEP	PROCEDURE
	REFERENCES: Circuit Information (Fig. 6)
	PREPARATION FOR TESTS
1	***Initial Switch Settings:*** Set up the QVF52 unit according to Table C. This adjusts the unit for 150-ohm input impedance, 600-ohm output impedance, 0-dB gain, and no equalization.
	CABLE MEASUREMENT
2	Connect the test setup shown in Fig. 6 for the sending-end and the receiving-end of the circuit.
3	Set the oscillator at 15 kHz to obtain a 0-dB reading on the level meter with the cable disconnected. (Repeat coil must be disconnected from the oscillator.)
4	Adjust the frequency of the oscillator at the sending-end according to the following table. Measure the level through the cable at the receiving-end of the circuit of each frequency transmitted. Readjust the oscillator output to correct the level change with frequency change. (This is not necessary with an oscillator that has $\leq$0.2 dB output level variation over the frequency range.)

PROGRAM CIRCUIT BANDWIDTH	ADJUST OSCILLATOR TO EACH FREQUENCY IN TURN
5 or 8 kHz	100 Hz, 1 kHz, 5 kHz, 8 kHz
15 kHz	100 Hz, 5 kHz, 15 kHz

	Record all measurements.
5	For 15-kHz equalization, proceed to Chart 2. For 5- or 8-kHz equalization, proceed to Chart 4.

CHART 2

EQUALIZER ADJUSTMENT PROCEDURES (15-kHz BANDWIDTH)

APPARATUS:

See Table B and Fig. 6.

STEP	PROCEDURE
	REFERENCES:
	(a) Chart 1 for initial switch settings. This ensures that no switch is incorrectly set.
	(b) Circuit information for the circuit being installed.
	(c) Tables D, E, and F.
	PREPARATION FOR TESTS
1	Set switch positions of switch SC as follows: • For 150-ohm cable termination, close SC-1, SC-3, and open SC-2. • For 600-ohm cable termination, close SC-2 and open SC-1 and SC-3.
2	Subtract the 5-kHz loss from the 15-kHz loss: (loss at 15 kHz) dB minus (loss at 5 kHz) dB = ...dB Match the above difference to the closest value in Table D. Set switches SD, SE, and SF for the required inductor and capacitor settings.
3	Subtract the 100-Hz loss from the 15-kHz loss: (loss at 15 kHz) dB minus (loss at 100 Hz) dB = ...dB. Use Table E to determine the resistance setting, and set SC-4, SC-5, SC-6, and faceplate-thumbwheel switches accordingly.
4	***QVF52B and E Only:*** (For QVF52D, proceed to Chart 3.) • From the circuit information, determine the overall net gain requirement in dB. (If this information is not supplied, assume 0 dB.) Let this value equal A. • Using Table D determine the equalizer insertion loss for the switch settings selected in Step 2 above. Let this value equal B. • Let the 15-kHz loss as determined in the cable measurements (Chart 1, Step 4) equal C.

CHART 2 (Contd)

STEP	PROCEDURE
	Add the values determined above for the overall gain requirement.
	AMP GAIN REQUIRED = A + B + C.
	Using Table F determine the gain switch settings and set the switch positions accordingly.
5	Proceed to Chart 3.

CHART 3

QVF52B, D, E VERIFICATION OF PRESCRIBED SETTINGS AND FINE TUNING (15-kHz EQUALIZATION)

APPARATUS:

See Table B.

STEP	PROCEDURE
	REFERENCES: Table D.
1	Connect the level meter to the AMP OUT jack (QVF52B, E) or the EQL OUT jack (QVF52D).
2	With the oscillator, set a 0-dBm measure and record the receive level at the following frequencies:

CHART 3 (Contd)

STEP	PROCEDURE
	50 Hz = 100 = 400 = 800 = 1,000 (ref. value) = 5,000 = 8,000 = 10,000 = 12,000 = 15,000 =
	Requirement: ±1.0 dB (referenced to 1-kHz level).
	If the response does not meet the requirements specified, it can be improved by following Steps 3 through 8. Best results are usually obtainable with the amplifier input set to 150 ohms. If the response cannot be improved by following Steps 3 through 8, refer to Part 5 for general readjustment guidelines.
3	Set the oscillator to 100 Hz and adjust the resistance setting (faceplate-thumbwheel switches) to make the 100-Hz and 15-kHz levels as close as possible.
	Note: Increase the setting to increase the level at 100 Hz, or decrease setting to decrease 100-Hz level.
4	Measure the frequency response at: 1 kHz = 5 = 10 = 15 =
5	If there is a dip in the frequency response between 1 and 15 kHz, reduce the dip by setting switches SD, SE, and SF to the next higher L/C setting (use Table D and move to the setting above the present one). This should be done one L/C setting at a time until the response ripple has been minimized. Generally, the optimum setting is obtained when the level at 10 kHz is as close as possible to the level at 15 kHz without going over it.
6	If there is a peak in the frequency response between 1 and 15 kHz, reduce the peak by changing to the next lower L/C setting (use Table D), one step at a time, until the response ripple has

CHART 3 (Contd)

STEP	PROCEDURE
	been minimized.
7	Readjust the resistance setting (faceplate-thumbwheel switches) to have the 1-kHz level midway between the lowest and highest levels obtained at 5, 10, and 15 kHz.
8	***QVF52B, E Only:*** Adjust the gain control to bring the 1-kHz measurement as close as possible to a 0-dB reading for 600-ohm output impedance, or −6 dB reading for a 150-ohm output impedance. ***Note:*** On the 600-ohm dB scale of the high input impedance meter terminated for the 150-ohm load, the −6 dB indication is equal to a true level of 0 dB.
9	***Noise Measurement:*** Perform circuit noise measurement according to standard practices. If the noise figure is not within requirement due to 60-Hz interference and cannot be improved by normal means, a 20-dB improvement can be made by inserting the 60-Hz blocking filter (close switch SB-4) on the QVF52B and E.
10	Record frequency response of system as required.
11	Refer to Table J for final in-service output impedance selection.
12	With a pencil, record switch settings within blocks on rear of unit and adjacent to switches on faceplate. ***Note:*** Additional equalization may be obtained by wiring two QVF52 units in series with one unit set to 0-dB gain.

CHART 4

EQUALIZER ADJUSTMENT PROCEDURE
(5- and 8-kHz BANDWIDTH)

APPARATUS:

See Table B.

CHART 4 (Contd)

STEP	PROCEDURE
	REFERENCES:
	(a) Circuit information
	(b) Chart 1 for initial settings of all switches. This ensures that no switch is incorrectly set.
1	***High-Frequency Equalization:*** Set the following switches to the closed position: • SD-4, SD-5, SD-7, SD-8 (capacitance) • SE-1 (inductance) • SF-7 (inductance). ***Note:*** Set all other positions of SD, SE, and SF switches to OPEN.
2	Set to 150-ohm input impedance (if required) by closing SC-1 and SC-3 and opening SC-2.
3	Connect the test setup shown in Fig. 6 for the sending- and receiving-end of the circuit.
4	Adjust the oscillator to obtain a 0-dB reading on the meter (repeat coil must be disconnected from the oscillator) at the maximum frequency (5 or 8 kHz).
5	Connect the level meter to the amplifier output jack (Fig. 2) on the QVF52B and E, or the equalizer output jack on the QVF52D (Fig. 3).
6	***QVF52B, E Only:*** Adjust the amplifier gain using switch SB and the faceplate gain control to achieve a 0-dB reading for 600-ohm output impedance (or −6 dB reading for 150-ohm output impedance). ***QVF52D Only:*** Record the level at maximum frequency. ***Note:*** On the 600-ohm dB scale of the high input impedance meter terminated for the 150-ohm load, the −6 dB indication is equal to a true level of 0 dB.
7	Change the oscillator frequency to 100 Hz.
8	***QVF52B, E Only:*** Adjust the equalizer-thumbwheel switch to achieve a 0-dB reading. ***QVF52D Only:*** Adjust the equalizer-thumbwheel switch to achieve a level equal to the level at maximum frequency (5 or 8 kHz) as recorded in Step 6.

CHART 4 (Contd)

STEP	PROCEDURE
9	Measure the frequency response at: 100 Hz = 1000 = 5000 = 8000* = * Not required for 5-kHz channels. ***Requirement:*** ±1 dB (referenced to 1-kHz level). If the frequency response does not meet the requirements, follow Steps 10 through 13. ***Note:*** Subsequent frequencies in brackets are for 5-kHz equalization.
10	If a dip occurs between 1 and 8 kHz (100 Hz and 5 kHz), reduce the dip by referring to Table G for the next setting above that indicated by the start position. This should be done, one step at a time, until the response ripple has been minimized. Generally, optimum results are obtained when the 5-kHz (1000-Hz) level is as close as possible to the 8-kHz (5-kHz) level.
11	If a peak occurs between 1 and 8 kHz (100 Hz and 5 kHz), reduce the peak by referring to Table G for the next setting below that indicated by the start position. This should be continued, one step at a time, until the response ripple has been minimized. Generally, optimum results are obtained when the 5-kHz (1-kHz) level is as close as possible to the 8-kHz (5-kHz) level.
12	Readjust the resistance setting (faceplate thumbwheel) to have the level at 100 Hz as close as possible to the level at the maximum frequency (5 or 8 kHz).
13	***QVF52B, E Only:*** Readjust the gain control to bring the 1-kHz measurement as close as possible to a 0-dB reading for 600-ohm output impedance, or −6 dB reading for 150-ohm output impedance. ***Note:*** On the 600-ohm dB scale of the high input impedance meter terminated for the 150-ohm load, the −6 dB indication is equal to a true level of 0 dB.
14	***Noise Measurement:*** Perform noise measurement on the circuit according to standard practices. If the noise figure is not within requirements due to 60-Hz interference and cannot be im-

CHART 4 (Contd)

STEP	PROCEDURE
	proved by normal means, a 20-dB improvement can be made by inserting the 60-Hz rejection filter (close switch SB-4) on QVF52B and E only.
15	Refer to Table J for final in-service output impedance selection.
16	Record frequency response of system as required.
17	With a pencil, record switch settings within switch blocks on rear of unit and adjacent to switches on faceplate.

CHART 5

LOW-FREQUENCY EQUALIZATION
(5-, 8-, and 15-kHz BANDWIDTH)

APPARATUS:

See Table B.

STEP	PROCEDURE
	Note: This chart is used only where additional signal level reduction is needed below 1.4 kHz, as with loaded cable.
	REFERENCES: Circuit information, Fig. 5, and Table H.
	Note: Switch SA-1 should be closed for Steps 1 through 5.
1	At the receiving-end, connect the level meter to the AMP OUT jack (QVF52B, E) or EQL OUT jack (QVF52D). Set the oscillator to 5 kHz, and measure the signal level at the receiving-end.
2	At the sending-end, reduce the oscillator frequency from 5 kHz and note the frequency at which the signal ***increases*** by 1 dB from the signal level at 5 kHz.
3	From Table H select the frequency which is closest to the frequency determined in Step 2. Select the proper switch settings for switches SA-8, SA-9, and SA-10.

CHART 5 (Contd)

STEP	PROCEDURE
	Example: Frequency (Step 2) = 956 Hz; therefore, select 700 Hz (close SA-8 and SA-9).
4	Reduce the oscillator frequency to 30 Hz and measure the signal level at the receiving-end. Determine the amount by which the signal level measured at 30 Hz is greater than the signal level measured at 5 kHz.
5	From Table H select the switch settings of switch SA-2 through SA-7 that correspond most closely to the value determined in Step 4.
	Example: Level difference between 5 Hz and 30 kHz = 4.8 dB; therefore, select 5 dB (close SA-5 and SA-7).
6	Open switch SA-1.
7	Measure the gain-frequency response at the value of 5 kHz and lower frequencies as given in Chart 3, Steps 1 and 2.

TABLE A

CABLE LENGTH EQUALIZATION

CABLE GAUGE	5 kHz		8 kHz		15 kHz	
	(MILES)	(KM)	(MILES)	(KM)	(MILES)	(KM)
26 all types	4.0	6.4	3.5	5.6	2.5	4.0
24 all types	5.0	8.0	4.5	7.2	3.5	5.6
22 all types	6.5	10.4	6.0	9.6	5.0	8.0
19 CNB	9.5	15.2	9.5	15.2	9.0	14.4
19 DNB	10.0	16.0	10.0	16.0	10.0	16.0

TABLE B

TEST APPARATUS REQUIRED

DESCRIPTION	QUANTITY
APPARATUS:	
30-Hz through 15-kHz, 600-ohm oscillator with an output level accuracy ±0.2 dB over the frequency range (HP-236A, or equivalent, may be used if the output level is checked for every frequency transmitted)	1
Level meter with an input impedance of 1 megohm and an accuracy of ±0.2 dB in the range of 30 Hz to 15 kHz (eg, HP-400EL)	2
NE-3A/C noise measuring set with program weighting	1
Balanced transformers (eg, two NE-REP 111C repeat coils or one QVF52F	2
TERMINATIONS:	
QPF14A (Bantam) plug-type, 600-ohm termination	1 (Note)
600-ohm termination resistor	2
TEST CORDS:	
Bantam jack to oscillator connector type	1
Bantam jack to level meter connector type	2

Note: The QPF14A plug is used to terminate the sending-end of the circuit during noise tests.

TABLE C

QVF52B, D, AND E INITIAL SETTINGS (NOTE)

QVF52B	D	E	FUNCTION	SWITCHES	SETTINGS
*		*	Faceplate Gain Control (0-11 dB)		0 dB
		*	Faceplate Gain Control (0-1 dB)		0 dB
*	*	*	Faceplate Equalizer Switches	Thumbwheels	000
*		*	Gain	SB-1, SB-2, SB-5	Open
*		*		SB-3, SB-6	Closed (ON)
*	*	*	Input Impedance	SC-1, SC-3	Closed (ON)
*	*	*		SC-2	Open
*		*	Output Impedance	SG-1 through 4	Open
	*			SG-2	Closed (ON)
	*			SG-1, SG-3	Open
*		*	60-Hz Filter	SB-4	Open
*	*	*	LF Equalizer	SA-1	Closed (ON)
*	*	*		SA-2 through 10	Open
*	*	*	Main Equalizer	SC-4 through 6	Closed (ON)
*	*	*		SD-1 through 8	Open
*	*	*		SE-1 through 6	Open
*	*	*		SF-1 through 7	Open

Note: Select the column for the appropriate unit (QVF52B, D, or E) and set the switches denoted by an asterisk (*).

Use Table C to adjust the QVF52B, D, and E for:

- 150-ohm input impedance
- No equalization
- 0-dB gain (QVF52B and E only)
- 600-ohm output impedance
- No 60-Hz filter.

TABLE D

15-kHz MAIN EQUALIZER L/C SETTINGS

15-kHz LOSS MINUS 5-kHz LOSS	EQUALIZER INSERTION LOSS	L/C SWITCH SETTINGS (See Note)			RESONANT FREQUENCY (kHz)
		SD-	SE-	SF-	
1.0	0.1	8	1	1	18
1.5	0.1	7	1	2	18
2.5	0.1	6	4	1	18
3.2	0.1	5	1	3	18
3.7	0.1	7,8	4	2	18
4.5	0.2	7,8	1	4	19
5.5	0.3	5,7	1	7	18
7.0	0.3	6,7,8	5	1	18
7.5	0.3	5,6,8	1	6	18
8.0	0.3	5,7,8	4	3	18
9.0	0.5	5,6,7	6	1	18
10.4	0.5	5,6,7,8	4	4	18
10.7	0.6	4	5	2	18
11.5	0.6	4,8	3	1	18
13.0	0.8	4,7,8	4	7	18
13.1	1.2	4,6,8	6	2	18
14.0	2.1	4,5,7,8	2	1	18
14.5	1.7	4,5,6,7	2	1	18
15.5	1.7	3,5	4	6	18
16.0	2.0	3,6,7	3	2	18
17.5	3.0	1	1	5	18
18.0	4.0	1,6,8	5	3	18
18.5	5.0	1,4,5	2	2	18
19.5	10.0	1,2,3,4,5,6,7,8	3	6	18
20.0	1.0	2,3	1	5	16
21.0	1.5	1,4,7,8	5	3	16
22.0	1.9	1,2,6	2	2	16
25.0	3.0	1,2,3,4,5,6,7,8	6	3	16

Note: Switch settings are closed (ON) positions; all other positions for SD, SE, and SF are open.

TABLE E

15-kHz MAIN EQUALIZER RESISTANCE SETTING

15-kHz LOSS MINUS 100-Hz LOSS (dB)	FACEPLATE EQUALIZER RESISTANCE SETTING	15-kHz LOSS MINUS 100-Hz LOSS (dB)	FACEPLATE EQUALIZER RESISTANCE SETTING
1	2988*	21	42
2	1452*	22	38
3	936	23	34
4	674	24	30
5	517	25	27
6	408	26	24
7	331	27	21
8	274	28	19
9	230	29	17
10	194	30	15
11	166	31	13
12	142	32	12
13	123	33	11
14	107	34	10
15	93	35	9
16	81	36	8
17	71	37	7
18	63	38	6
19	55	39	5
20	49	40	5
		41	4
		42 and beyond	0

* 4th digit controlled internally on SC-4, SC-5, and SC-6.
0 to 999 = SC-4, SC-5, and SC-6 Closed (ON)
1000 to 1999 = SC-4 Open, SC-5, and SC-6 Closed (ON)
2000 to 2999 = SC-4 and SC-5 Open, SC-6 Closed (ON)

For intermediate settings or fine adjustement:

- To increase level at 100 Hz, increase the setting.
- To decrease level at 100 Hz, decrease the setting.

TABLE F

QVF52B AND E AMPLIFIER GAIN SETTING

GAIN (NOTES 1, 2)	SWITCH SETTINGS (NOTE 3)	
0 dB	SB–3	SB–6
10 dB	SB–2	SB–6
20 dB	SB–1	SB–6
30 dB	SB–1	SB–5

Note 1: Overall gain is the ***sum*** of these settings plus the faceplate control setting. Maximum gain is 41 dB (QVF52B) and 42 dB (QVF52E).

Note 2: Faceplate controls are varied from 0 through 11 dB in 1-dB steps (QVF52B and E), and by continuous adjustment of 1 dB (QVF52E).

Note 3: Settings indicated are for switch positions ***closed (ON)*** — all other switch positions must be open.

TABLE G

5– AND 8-kHz MAIN EQUALIZER L/C SETTINGS

L/C	SETTING		RESONANT FREQUENCY (kHz)
SD-	SE-	SF-	
5,7	1	1	10
5,7,8	1	2	10
5,6,7,8	4	1	10
4	1	3	10
4,7	4	2	10
4,7,8	1	4	10
Start: 4,5,7,8	1	7	10
3,6	5	1	10
3,7,8	1	6	10
3,4,6	4	3	10
2,5,8	6	1	10
2,4	4	4	10
2,4,8	5	2	10
1,5,6	3	1	10
1,4,6,7	4	7	10
1,4,6,7,8	6	2	10

TABLE H

LOW-FREQUENCY EQUALIZER

FUNCTION	SWITCH SA SET TO CLOSED (ON) (NOTE)
Low-frequency equalizer bypassed	1
1-dB attenuation at 400 Hz	8
1-dB attenuation at 700 Hz	8, 9
1-dB attenuation at 1400	9, 10
30-Hz to 5-kHz level:	
1	2
2 dB	3
3 dB	4, 5, 6, 7
4 dB	5, 6, 7
5 dB	5, 7
6 dB	6, 7
7 dB	4
8 dB	5
9 dB	6
10 dB	7

Note: Set all other positions of switch SA to open (OFF).

TABLE I

RESONANT FREQUENCY ADJUSTMENT TABLE

16 kHz			17 kHz			18 kHz			19 kHz		
SD	SE	SF	SD	SE	SF	SD	SE	SF	SD	SE	SF
7	1	1	7	1	1	8	1	1			
6	1	2	7	1	2	7	1	2	8	1	2
5	4	1	5	4	1	6	4	1	6	4	1
68	1	3	78	1	3	5	1	3	6	1	3
67	4	2	68	4	2	78	4	2	5	4	2
57	1	4	67	1	4	68	1	4	78	1	4
568	1	7	56	1	7	57	1	7	67	1	7
567	5	1	578	5	1	678	5	1	56	5	1
567	1	6	578	1	6	568	1	6	56	1	6
5678	4	3	567	4	3	578	4	3	678	4	3
4	6	1	5678	6	1	567	6	1	578	6	1
47	4	4	4	4	4	5678	4	4	5678	4	4
46	5	2	48	5	2	4	5	2	5678	5	2
468	3	1	46	3	1	48	3	1	4	3	1
4567	4	7	457	4	7	478	4	7	46	4	7
3	6	2	456	6	2	468	6	2	46	6	2
						4578	2	1	456	2	1
						4567	2	1			
			37	2	1				45678	4	6
367	2	1				35	4	6	36	3	2
			356	4	6	367	3	2			
									2568	1	5
268	4	6	25	3	2				3467	5	3
2678	3	2				1	1	5	23	2	2
			246	1	5	168	5	3	1245	6	3
			2478	1	5	145	2	2	1234	5	4
24578	1	5	23	5	3	ALL	3	6			
23	1	5	234	2	2						
1478	5	3									
126	2	2	12348	6	3						
125	2	2	134	2	2						
ALL	6	3									

TABLE J

QVF52B AND E OUTPUT IMPEDANCE SETTINGS (NOTE)

	600 ohms	150 ohms
Output 1:	SG-1, SG-2 open	SG-1, SG-2 closed
Output 2:	SG-3, SG-4 open	SG-3, SG-4 closed

Note: Outputs 3 through 8 are fixed at 600-ohm impedance.

TABLE K

QVF52D OUTPUT IMPEDANCE SETTINGS

600 ohms	150 ohms
SG-2 closed	SG-2 open
SG-1, SG-3 open	SG-1, SG-3 closed

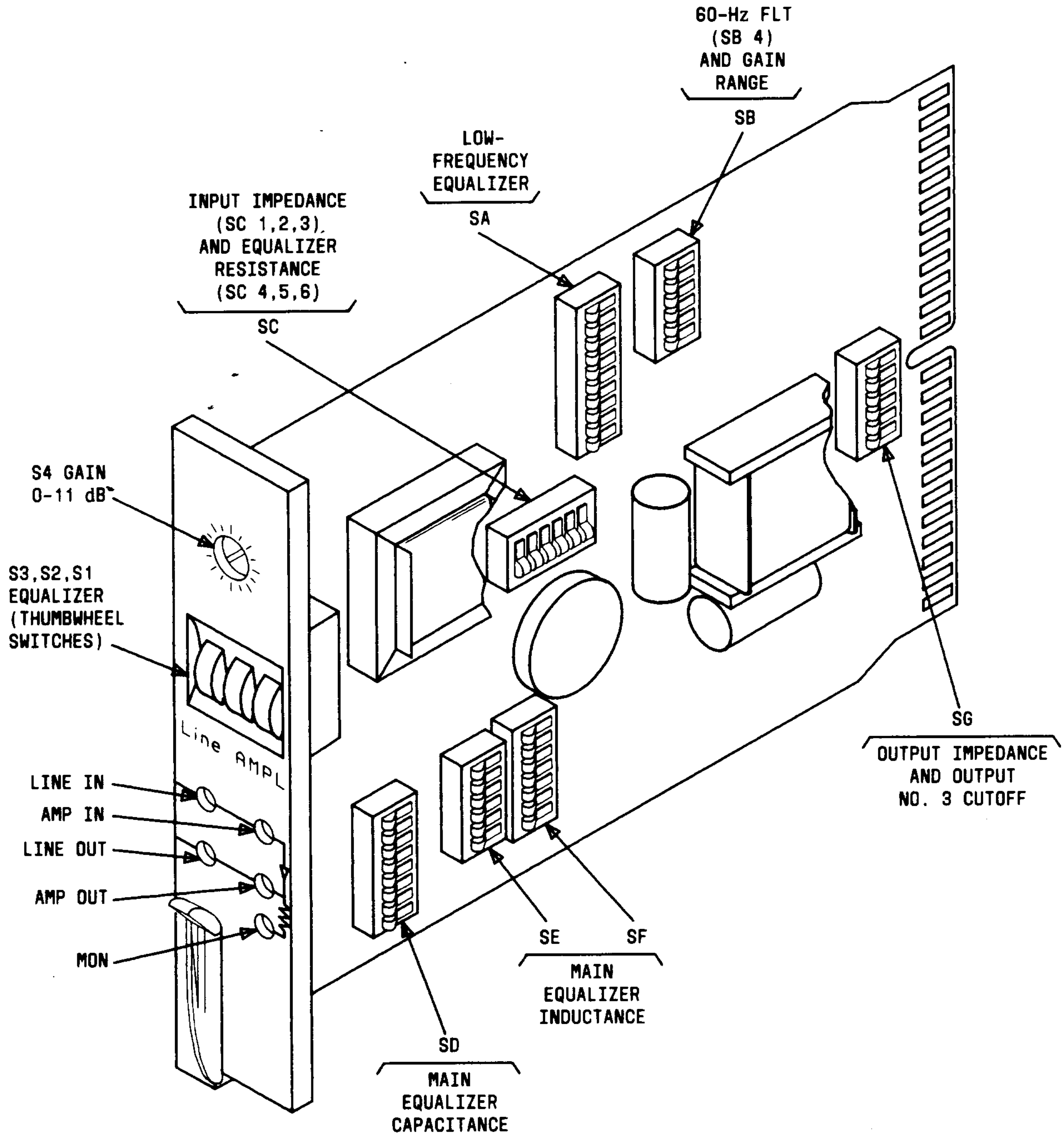


Fig. 1—QVF52B Physical Layout

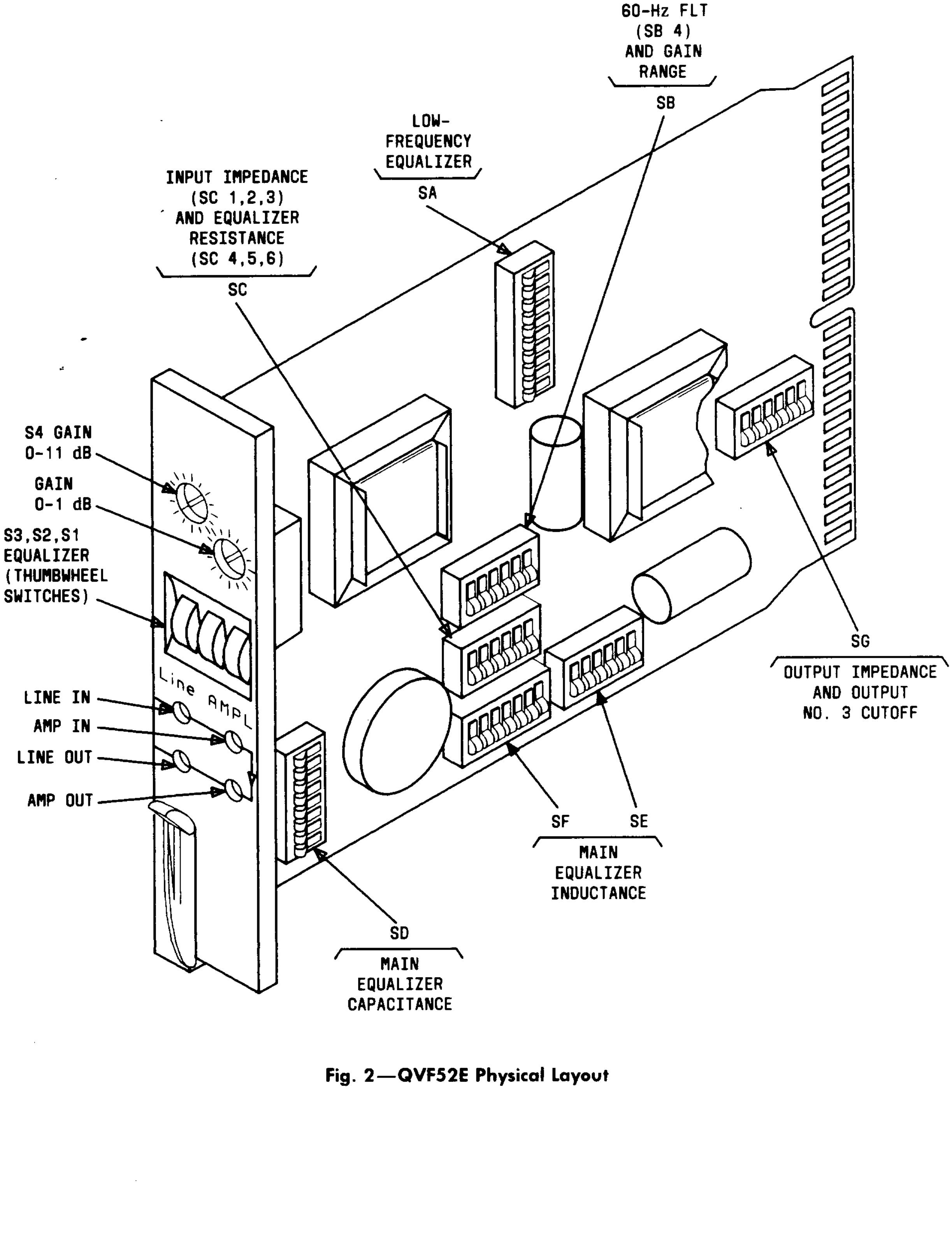


Fig. 2—QVF52E Physical Layout

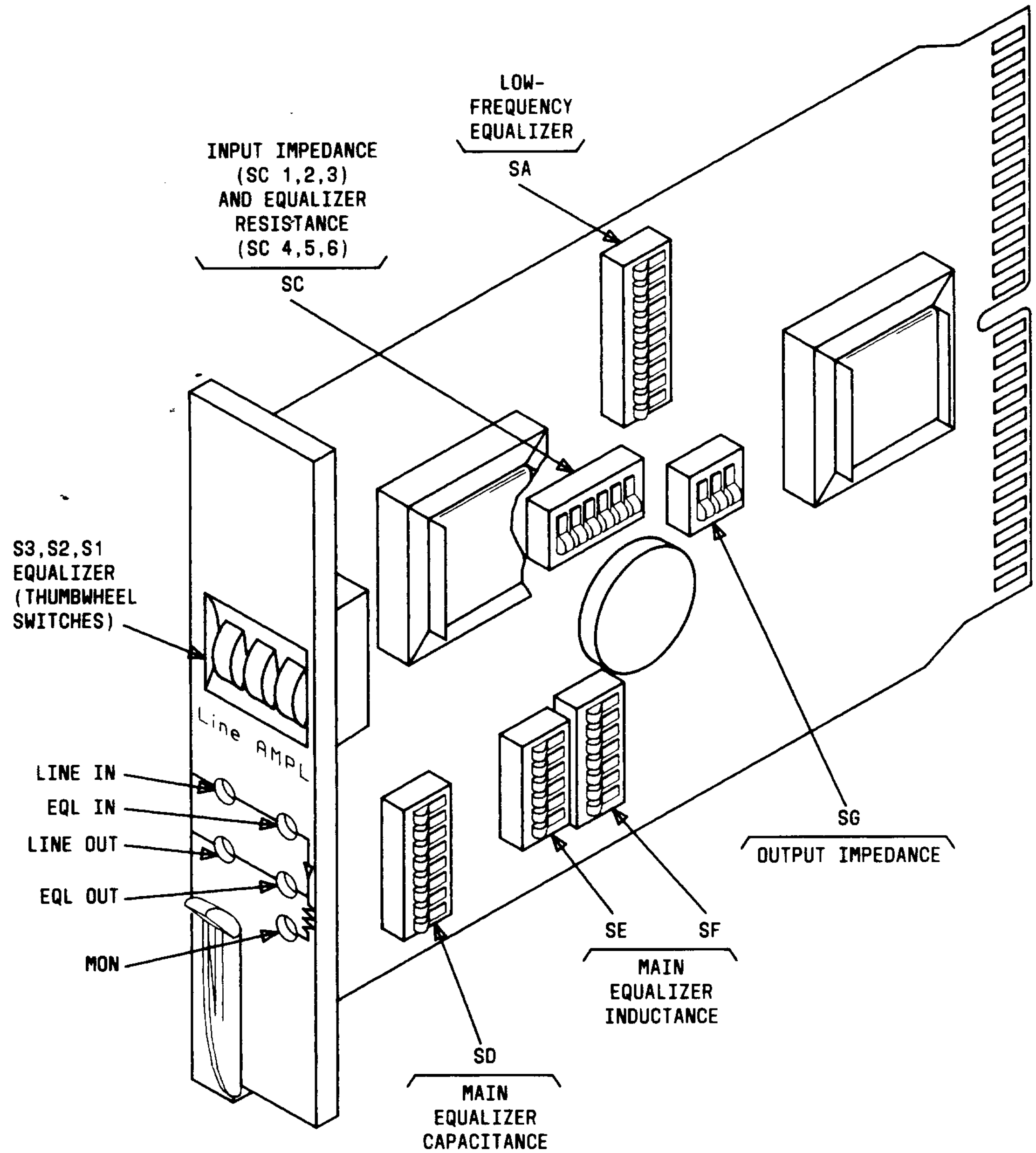
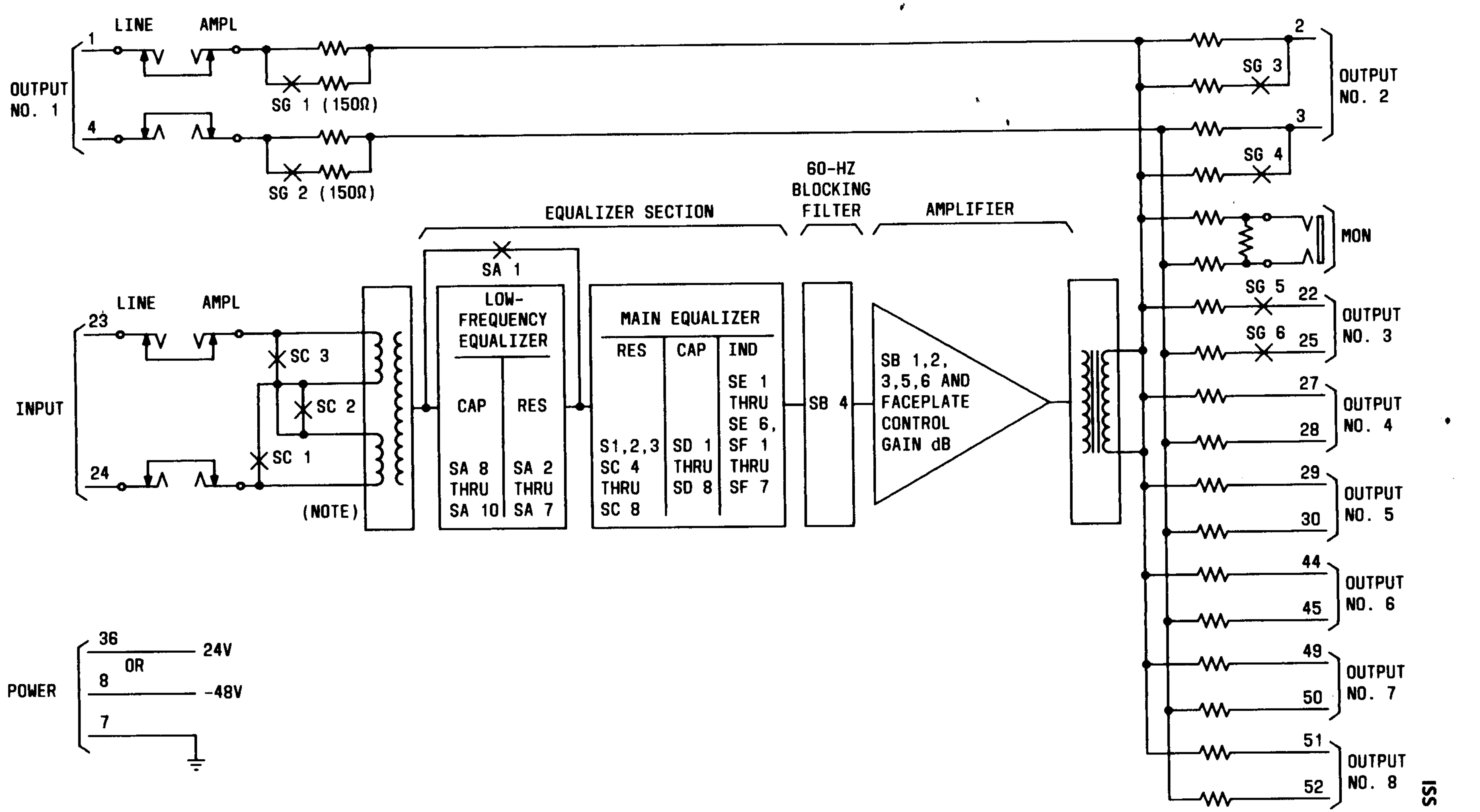
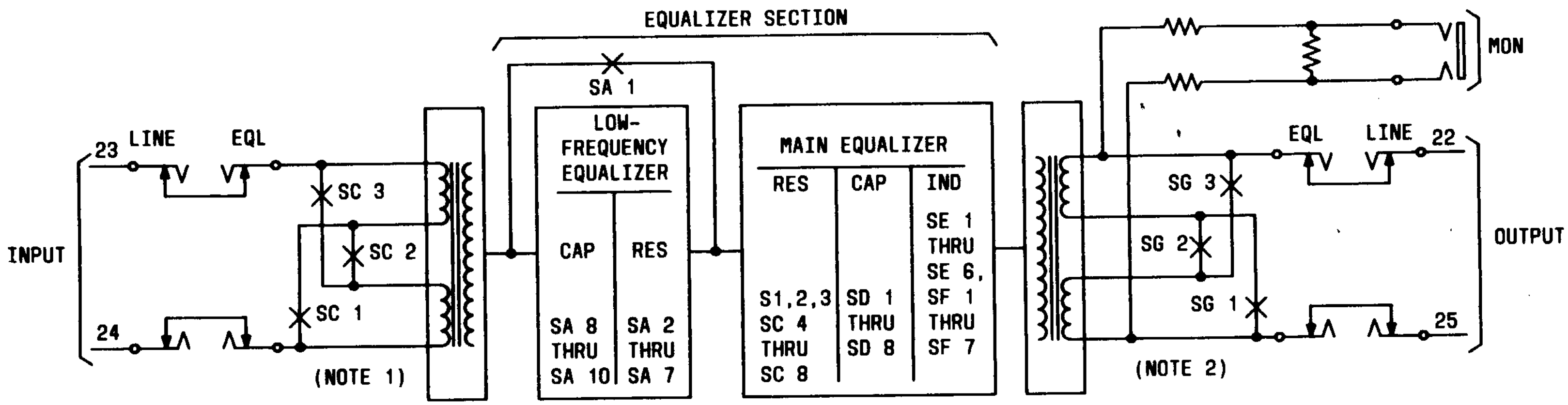


Fig. 3—QVF52D Physical Layout



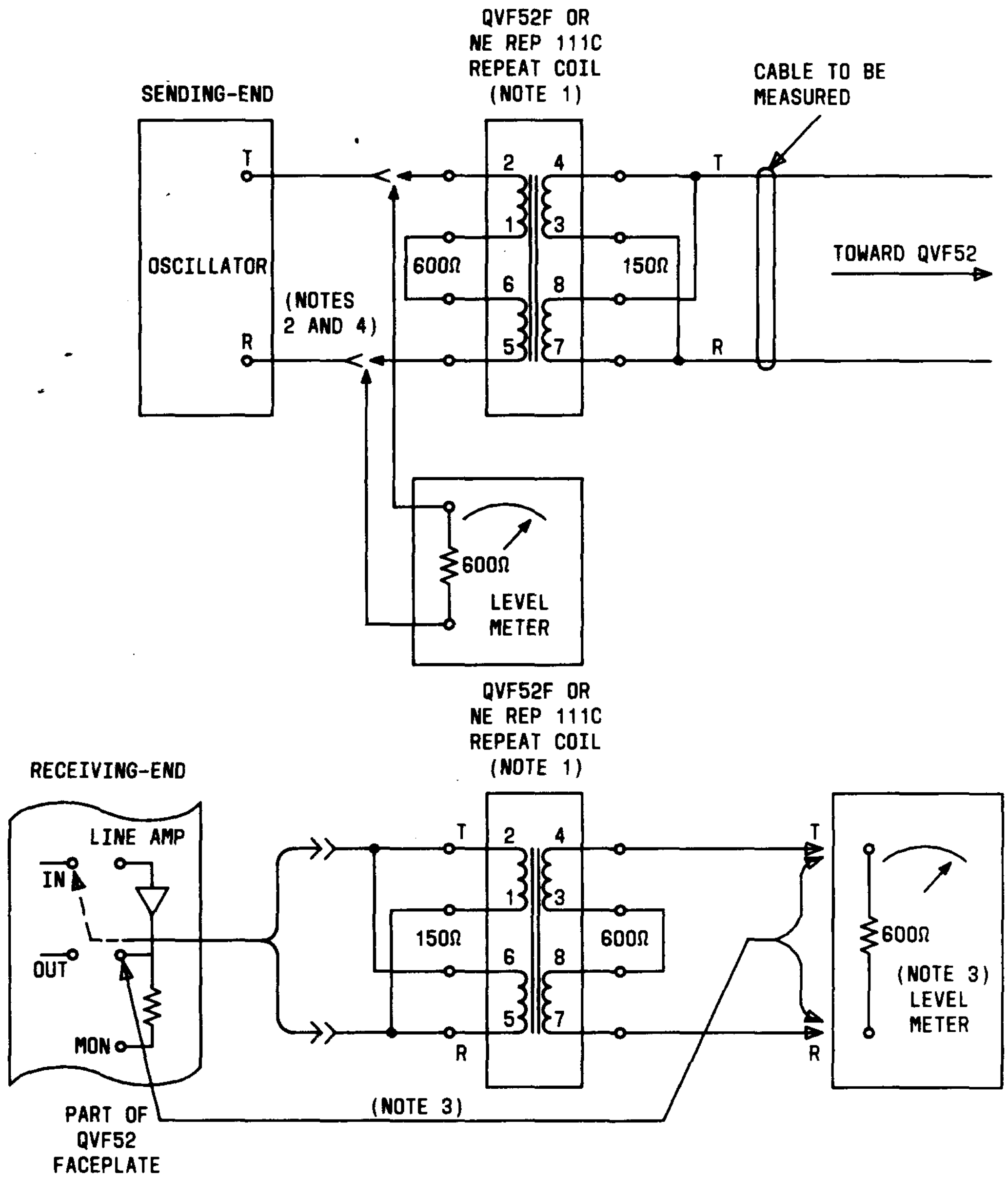
NOTE:
SC 2 IS NORMALLY CLOSED WHEN SC 1 AND 3 ARE OPEN.

Fig. 4—QVF52B and E Simplified Schematic



NOTES:
1. SC 2 IS NORMALLY CLOSED WHEN SC 1 AND 3 ARE OPEN.
2. SG 2 IS NORMALLY CLOSED WHEN SG 1 AND 3 ARE OPEN.

Fig. 5—QVF52D Simplified Schematic



NOTES:

1. STRAP THE INPUT AND OUTPUT TERMINALS OF THE REPEAT COIL TO OBTAIN THE PROPER IMPEDANCE. REFER TO THE CIRCUIT INFORMATION FOR THE CABLE IMPEDANCE.
2. WHEN MEASURING THE OUTPUT LEVEL OF THE OSCILLATOR, DISCONNECT THE REPEAT COIL. THE REPEAT COIL AND THE LEVEL METER SHOULD NEVER BE CONNECTED IN PARALLEL.
3. WHEN MEASURING THE OUTPUT OF THE QVF52 DIRECTLY, ENSURE THAT THE OUTPUT IMPEDANCE OF THE QVF52 IS SET TO 600Ω. THE LEVEL METER SHOULD BE TERMINATED IN 600Ω WHEN MEASURING THE QVF52 OR REPEATING COIL OUTPUTS.
4. THE REPEAT COILS ADD 1.0 dB LOSS TO MEASUREMENTS. THEREFORE THE REQUIRED AMPLIFIER GAIN IS 1.0 dB LESS THAN INDICATED IN TABLES C AND D.

Fig. 6—Test Arrangement

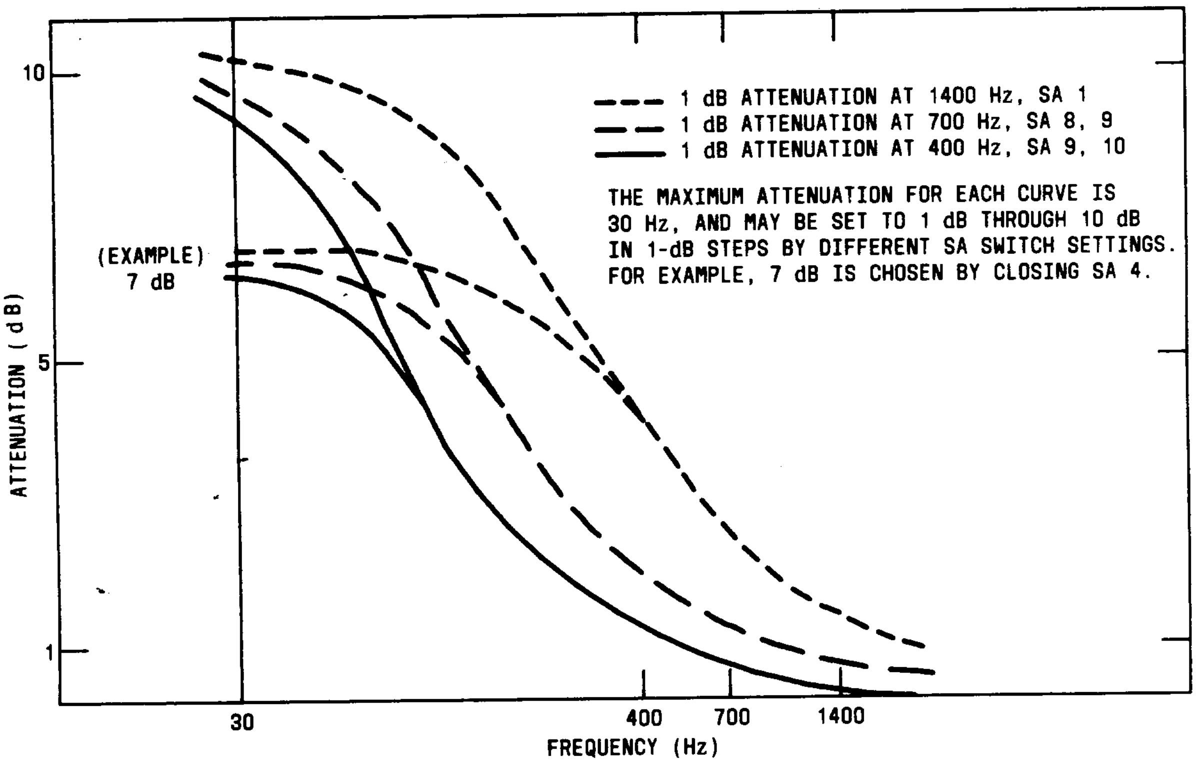


Fig. 7—QVF52B and E Low-Frequency Equalization