3686–90 15kHz Program Equalizer Amplifier (PG15EA) Unit

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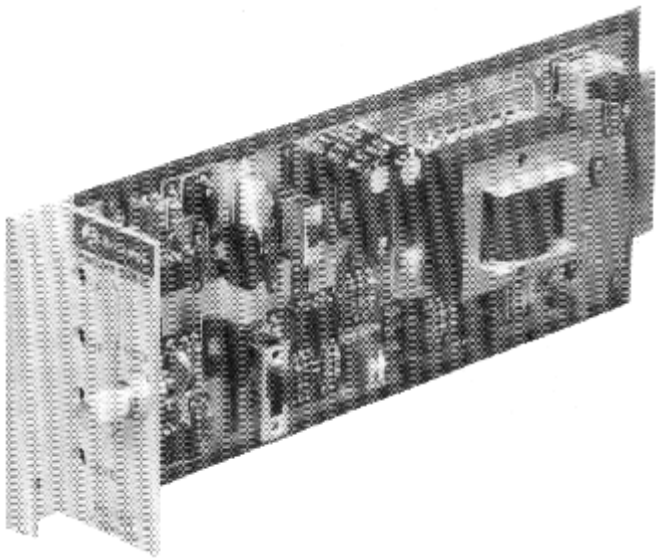

Figure 1. 3686–90 15kHz Program Equalizer Amplifier (PG15EA) Unit

1. GENERAL

1.1 Document Purpose

This document provides a circuit description, optioning, alignment, and testing information for the Charles Industries 3686–90 15kHz Program Equalizer Amplifier (PG15EA) Unit. The 3686–90 is shown in Figure 1.

1.2 Document Status

This document is reprinted to provide a general editorial update.

1.3 Equipment Function

The 3686–90 is used with the Charles Industries 3686–00 15kHz Transmit Program Channel (PG15T) unit to provide post-equalization and amplification for a metallic interface containing program material.

1.4 Equipment Location/Mounting

The 3686–90 physically plugs into the 3686–00 via the movable spring-loaded flap on the front panel of the 3686–00.

1.5 Equipment Features

The 3686–90 provides the following features:

- Impedance matching of 150 ohms.
- Gain for input levels below +8dBm.
- Equalization for cable losses at 15kHz.
- Sealing current lead optioning.
- Secondary lightning protection.

2. INSPECTION

2.1 Inspect for Damages

Inspect the equipment thoroughly upon delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

2.2 Equipment Identification

Charles Industries' equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by 1 and imprinted on subsequent units manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

3. CIRCUIT DESCRIPTION

Refer to the block diagram in Figure 2 while reading this description.

Input signals are applied to the TIP 3 and RING 4 leads. Transformer T1 couples the signal to the PREAMP circuitry. The PREAMP output gain is controlled by the LEVEL potentiometer and can be adjusted to a maximum of 14dB.

If equalization is not required, the signal is routed through the OUT contacts of switch S2 to the POWER AMP circuitry. If equalization is required, the signal is routed through the IN contacts of switch S2 to the EQUALIZER circuitry. The EQUALIZER circuit provides high- and low-frequency equalization, low-frequency trim, and loop-length matching options.

The POWER AMP output gain is controlled by switch S4 and can be set for 0, 10, 20, or 30dB in 10dB increments. The POWER AMP circuit provides the output signal (maximum gain of 44dB) to the TIP C and RING D leads. The output signal is routed to the DIFFERENTIAL AMP circuit on the 3686–00.

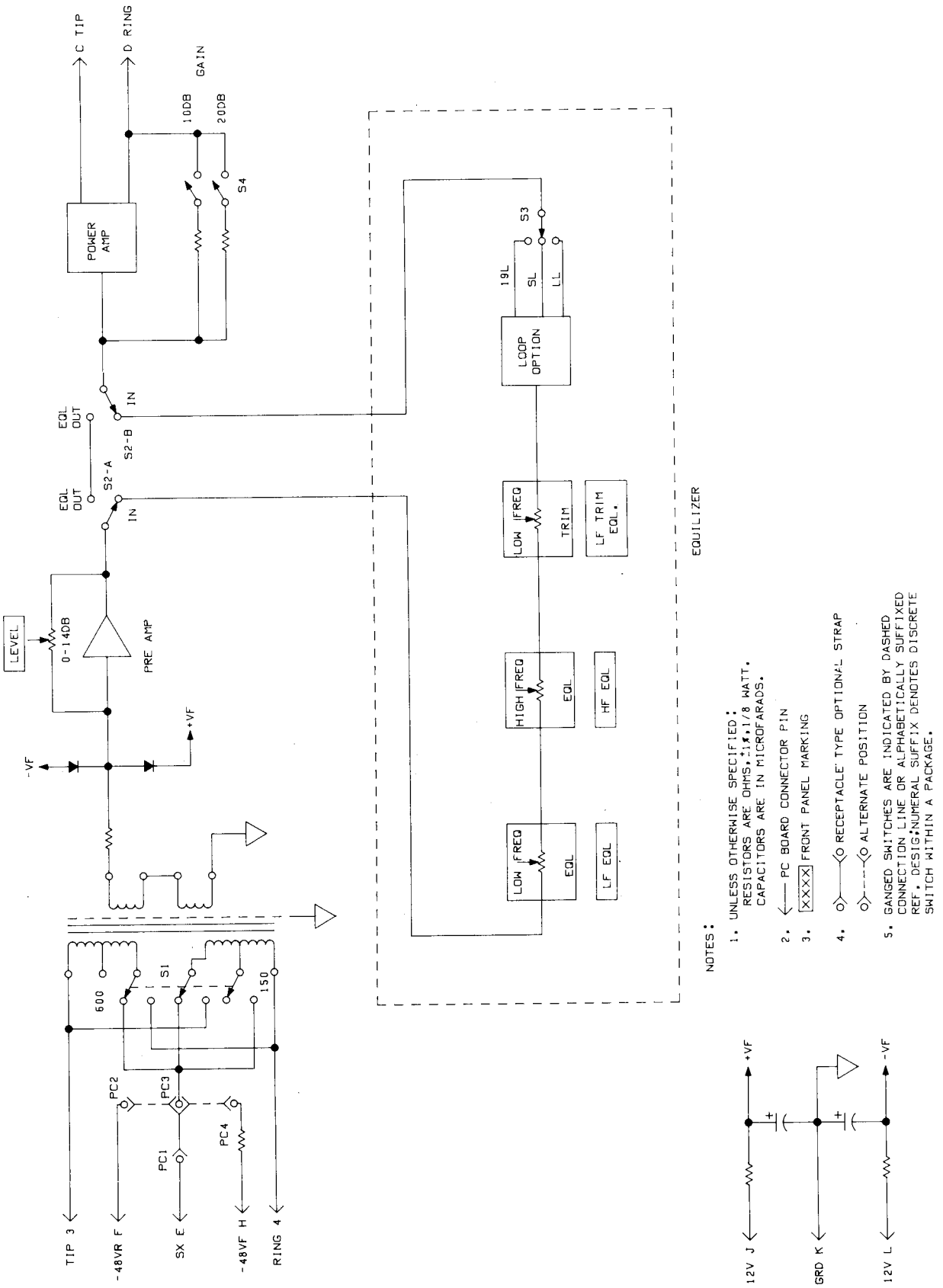

Figure 2. 3686–90 15kHz Program Equalizer Amplifier (PG 15EA) (Issue 1) Block Diagram

4. OPTIONS

The 3686–90 is equipped with front-panel mounted potentiometers, switch options and a push-on jumper option to condition the 3686–90 for various applications. Figure 3 shows the location of each option and the following paragraphs provide a description of each option.

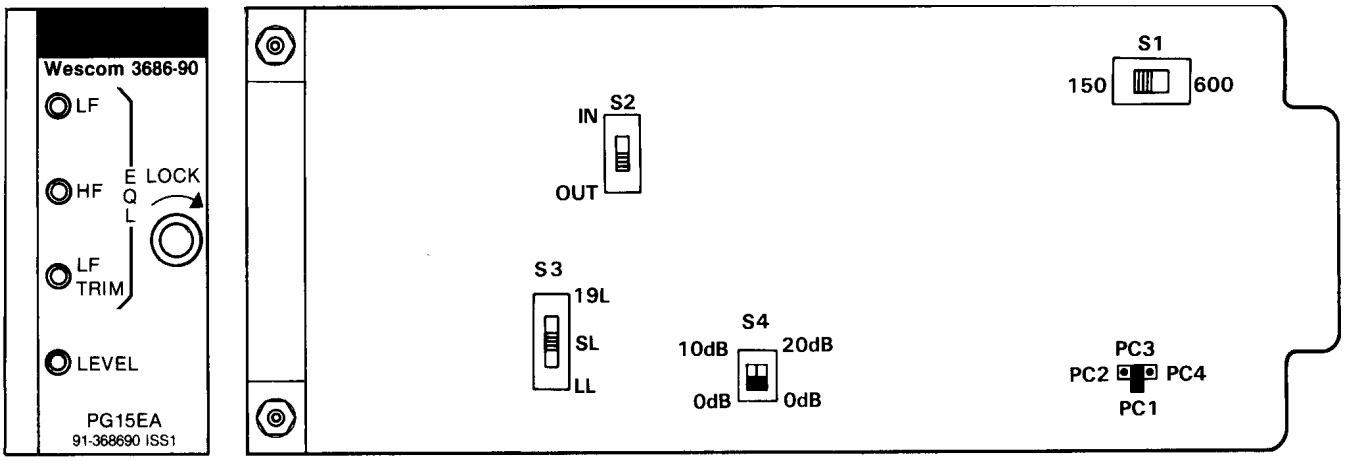

Figure 3. 3686–90 Option Locations

4.1 Switch S1 – Impedance Matching

S1 selects 150 or 600 ohms for impedance matching; the 150 ohm option gives more flexibility to equalize the line. Driving the line at 150 ohms will give the effect of pre-equalization.

4.2 Switch S2 – Frequency Equalization

S2 enables or disables the equalization circuitry. When set to the OUT position, the EQUALIZER circuit is disabled resulting in a flat gain response. When set to the IN position, it enables the EQUALIZER circuit and allows adjustments to be made to compensate for cable losses and to match slope response of a nonloaded cable. When equalization is required, switch S3 must also be set as prescribed in Paragraph 4.3.

4.3 Switch S3 – Loop Length Option

S3 provides for the proper response characteristics necessary for equalizing nonloaded cable with respect to its gauge, length, and terminating impedance. Refer to Table 1 when selecting the position of S3.

4.4 Switch S4 – Gain Selection

S4 selects the gain range of the LEVEL potentiometer. The 3686–00 expects a level of +8dBm (nominal) input level. S4 and the LEVEL potentiometer are used to compensate for 30Hz cable loss or if the level at the originating end differs from +8dBm. Refer to Table 2 when selecting the position of S4.

4.5 Sealing Current Selection – (Option PC3)

PC3 is a push-on jumper option used to obtain sealing current optioning. Three positions are available for this application: PC1 to PC3 for external sealing current equipment (SX); PC2 to PC3 for ground return; or PC4 to PC3 for negative source of sealing current (limited to 50mA). Sealing current is used to prevent contact deterioration and reduces contact noise in nonsoldered cable connections. When sealing current is not used, one sealing current lead of each channel should be grounded at one end with the other end open. Figure 4 and Figure 5 show four typical applications of sealing current optioning.

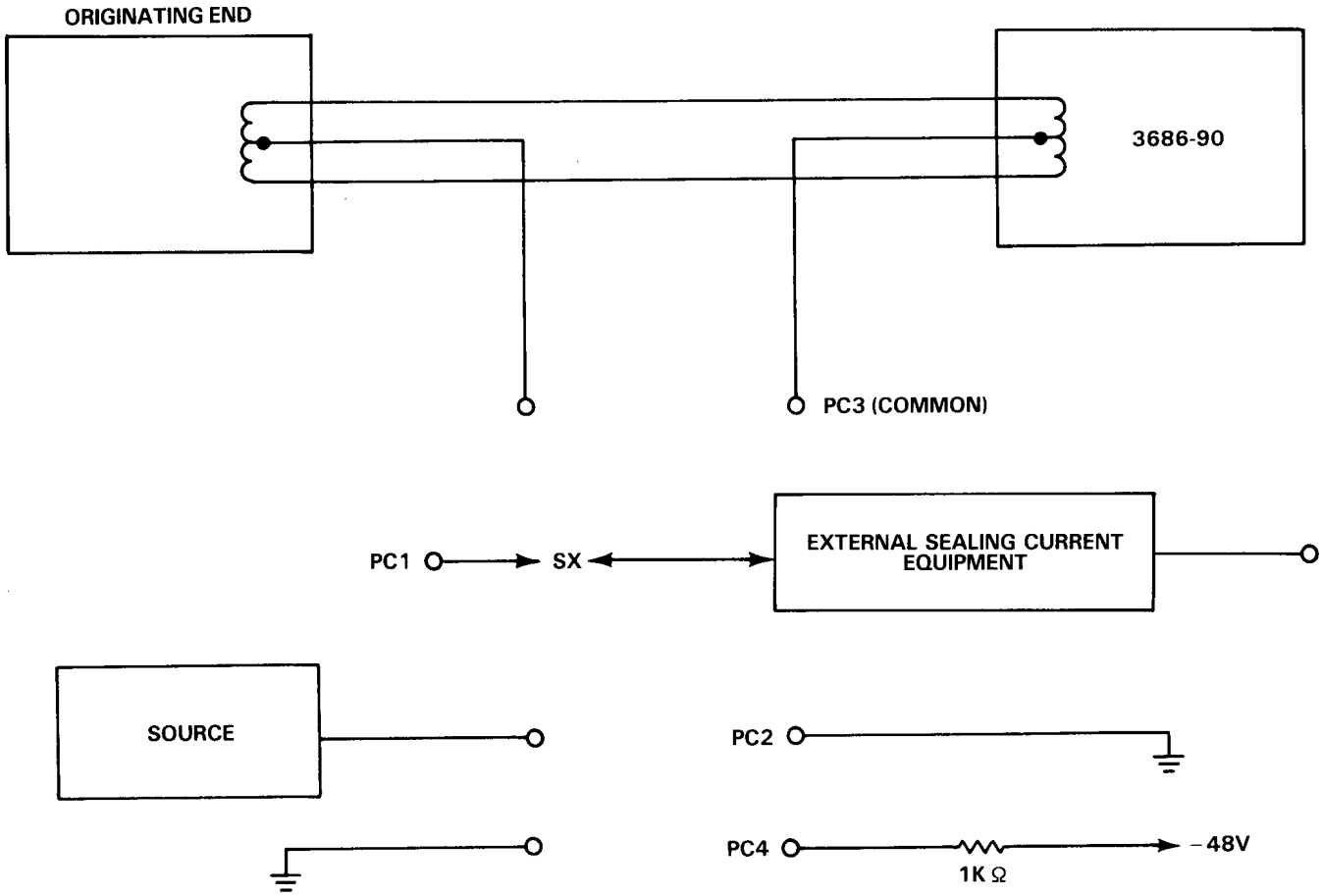

Figure 4. Typical Applications for Different Optioning Positions

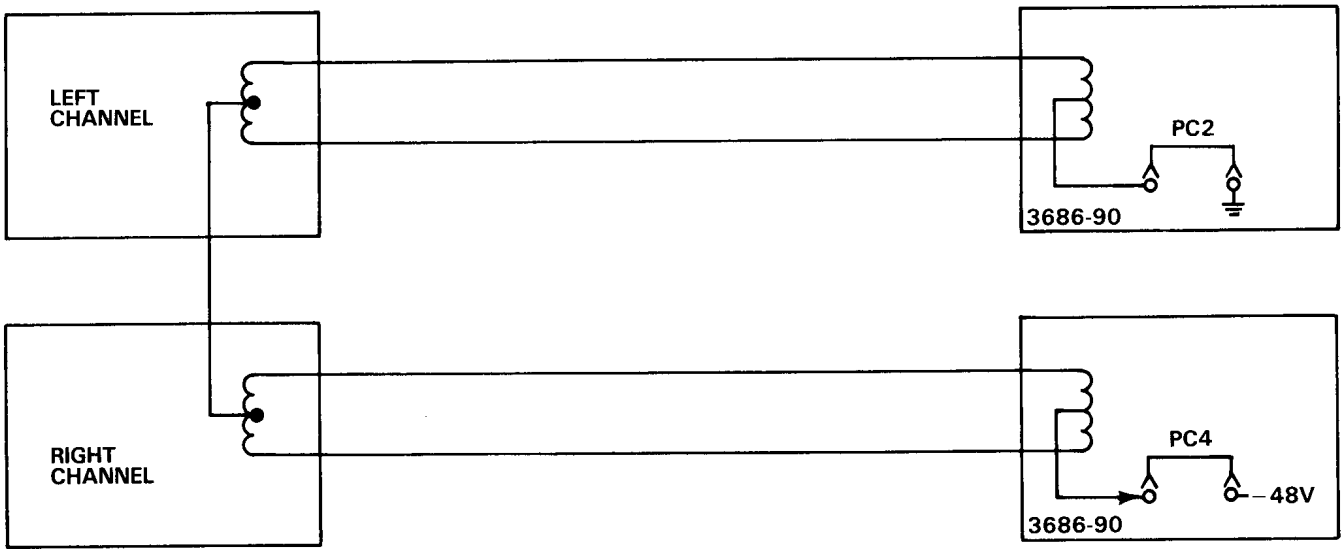

Figure 5. Stereo Sealing Current Lead Configuration

5. MOUNTING

The 3686–90 mounts through the front panel of the 3686–00. Locate the spring-loaded flap on the 3686–00 and insert the 3686–90 after the unit is optioned as indicated in Part 4. of this document.

Connection is made when the 3686–90 is inserted into the connector inside the 3686–00. External installer connections are made to the 3686–00 and can be found by referring to Section 360–68X–100.

6. ALIGNMENT

Use the following steps to align the unit. To ensure proper alignment of the 3686–90, it may become necessary to repeat each step of the procedure to obtain the best results and performance of the unit.

Adjustments during the alignment procedure are made from the front panel of the 3686–90 (shown in Figure 3). The output levels can be monitored at the MONITOR jack located on the front panel of the 3686–00 15kHz Transmit Program Channel Unit.

Step	Action
1.	Place switch S1 to either 150 or 600 ohms to match the impedance of the facility.
2.	Place switch S2 to either the IN position (for equalization) or the OUT position (no equalization).
3.	If equalization is not required, place switch S4 to the appropriate gain range (refer to Table 2) and proceed to Step 13.
4.	If equalization is required, place switch S3 to the position in accordance with Table 1. Switch S4 should be set to the 0 to 14dB range. *Note: When equalization is required, follow each step accordingly. The levels prescribed in this procedure must be met with accuracy to ensure top performance of the 3686—90. It may become necessary to repeat each step to obtain the correct output levels before proceeding to another step.*
5.	Adjust all equalizer potentiometers, on the front panel of the 3686–90, fully counterclockwise.
6.	Insert the 3686–90 into the movable flap on the 3686–00. Connect an AC Voltmeter to the MONITOR jack located on the 3686–00.
7.	From the originating end of the circuit (nonloaded cable), send a 1 kHz test tone at – 10dBm. Adjust the LEVEL potentiometer so the output level at the MONITOR jack is – 10dBm.
8.	From the originating end, send a 30Hz test tone and adjust the LF TRIM potentiometer until an output level of –10dBm (or as close as possible) is present. Refer to the 1kHz tone and readjust the LEVEL potentiometer for –10dBm. Repeat this step to ensure the correct output level before proceeding.
9.	From the originating end, send a 5kHz test tone and adjust the LF potentiometer until an output level of –10.5dBm is obtained. Refer to the 1kHz tone and readjust the LEVEL potentiometer for –10dBm. Repeat this step to ensure the correct output level before proceeding.
10.	From the originating end, send a 15kHz test tone and adjust the HF potentiometer until a level of –9.5dBm is obtained. Refer to the 1kHz tone and readjust the LEVEL potentiometer for –10dBm. Repeat this step to ensure the correct output level before proceeding.
11.	From the originating end, send the 30Hz test tone and verify the output level of –10. 5dBm. If not, readjust the LF TRIM potentiometer for a –10.5dBm. Refer to the 1kHz tone and readjust the LEVEL potentiometer for –10dBm.
12.	For verification purposes, repeat all the test tone cycles above and check for accuracy. If adjustments are necessary, repeat Steps 7 through 12. If all levels meet the above requirements, the 3686–90 is correctly aligned.
13.	S4 can be set to the gain range which encompasses the desired gain. Final precision adjustments are achieved from the LEVEL potentiometer.
Note:	*After the 3686—90 has met the above conditions, this unit can be inserted into another 3686—00 unit without realignment. This allows easy replacement of the 3686—00.*

Table 1. 3686–90 Loop-Length Cable Chart

Cable Gauge Used	Cable Length (Miles)	Terminating Impedance	S3 Position	Cable Loss @ 15khz
19	0 to 8.9	600	19L	0 – 34dB
22	0 to 5.5	600	SL	0 – 34dB
22	5.5 to 8.3	600	LL	34 – 48dB
22	0 to 8.4	150	SL	0 – 47dB
24	0 to 4.0	600	SL	0 – 33dB
24	4.0 to 6.5	600	LL	33 – 48dB
24	0 to 5.6	150	SL	0 – 43dB
26	0 to 3.1	600	SL	0 – 33dB
26	0 to 4.1	150	SL	0 – 42dB

Table 2. 3686–90 Gain Selection

Gain Range	S4 Position	
0 – 14dB	0dB	0dB
10 – 24dB	10dB	0dB
20 – 34dB	0dB	20dB
30 – 44dB	10dB	20dB

7. TESTING

Refer to Section 360–68X–100 for testing applications.

8. TECHNICAL ASSISTANCE

8.1 Technical Assistance — U.S.

If technical assistance is required, contact Charles Industries' Technical Services Center at:

847–806–8500
847–806–8556 (FAX)
800–607–8500
techserv@charlesindustries.com (e-mail)

8.2 Technical Assistance — Canada

Canadian customers contact:

905–821–7673 (Main Office)
905–821–3280 (FAX)

9. WARRANTY & CUSTOMER SERVICE

9.1 Warranty

Charles Industries, Ltd. offers an industry-leading, 5-year warranty on products manufactured by Charles Industries. Contact your local Sales Representative at the address or telephone numbers below for warranty details. The warranty provisions are subject to change without notice. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract.

Charles Industries, Ltd.
5600 Apollo Drive
Rolling Meadows, Illinois 60008–4049
847–806–6300 (Main Office)
847–806–6231 (FAX)

9.2 Field Repairs (In-Warranty Units)

Field repairs involving the replacement of components within a unit are not recommended and may void the warranty and compatibility with any applicable regulatory or agency requirements. If a unit needs repair, contact Charles Industries, Ltd. for replacement or repair instructions, or follow the *Repair Service Procedure* below.

9.3 Advanced Replacement Service (In-Warranty Units)

Charles Industries, Ltd. offers an “advanced replacement” service if a replacement unit is required as soon as possible. With this service, the unit will be shipped in the fastest manner consistent with the urgency of the situation. In most cases, there are no charges for in-warranty repairs, except for the transportation charges of the unit and for a testing and handling charge for units returned with no trouble found. Upon receipt of the advanced replacement unit, return the out-of-service unit in the carton in which the replacement was shipped, using the preaddressed shipping label provided. Call your customer service representative at the telephone number above for more details.

9.4 Standard Repair and Replacement Service (Both In-Warranty and Out-Of-Warranty Units)

Charles Industries, Ltd. offers a standard repair or exchange service for units either in- or out-of-warranty. With this service, units may be shipped to Charles Industries for either repair and quality testing or exchanged for a replacement unit, as determined by Charles Industries. Follow the *Repair Service Procedure* below to return units and to secure a repair or replacement. A handling charge applies for equipment returned with no trouble found. To obtain more details of this service and a schedule of prices, contact the CI Service Center at 217–932–5288 (FAX 217–932–2943).

Repair Service Procedure

1. Prepare, complete, and enclose a purchase order in the box with the equipment to be returned.

2. Include the following information:

   – Company name and address
   – Contact name and phone number
   – Inventory of equipment being shipped
   – Particulars as to the nature of the failure
   – Return shipping address

3. Ship the equipment, purchase order, and above-listed information, transportation prepaid, to the service center address shown below.

   CI Service Center
   Route 40 East
   Casey, IL 62420–2054

4. Most repaired or replaced units will be returned within 30 or 45 days, depending on the product type and availability of repair parts. Repaired units are warranted for either 90 days from the date of repair or for the remaining unexpired portion of the original warranty, whichever is longer.

10. SPECIFICATIONS

10.1 Electrical

The electrical characteristics of the 3686–90 are as follows:

(a) RETURN LOSS: Greater than or equal to 26dB.

(b) POWER CONSUMPTION (TYPICAL): 1.1w @ –48V (23mA).

(c) LONGITUDINAL BALANCE (50Hz to 15kHz): Greater than or equal to 50dB.

(d) IDLE NOISE (FLAT WEIGHTED): Without equalization; 0 to 30dB flat gain, less than 30dBrn, 30 to 40dB flat gain, less than 35dBrn. With equalization; 0 to 34dB equalized gain, less than 30dBrn, 30 to 40dB equalized gain, less than 35dBrn.

(e) MAXIMUM OUTPUT: 30Hz to 15kHz, + 18dBm.

(f) EQUALIZATION CAPABILITY: ±1.0dB maximum deviation (relative to 1kHz).

(g) EQUALIZER GAIN STABILITY (FROM 25°C): ±0.5dB maximum deviation.

(h) GAIN RANGE: Continuously adjustable from 0 to 44dB in fixed increments of 14dB.

(i) AMPLIFIER GAIN STABILITY (FROM 25°C):±0.7dB maximum deviation.

(j) FREQUENCY RESPONSE: 30Hz to 15kHz; ± 0.5d B (relative to 1kHz).

(k) DISTORTION: (+8dBm input and 0dB gain) 50Hz to 15kHz; less than 0.5 percent.

(l) SIMPLEX UNBALANCE: 1mA maximum.

10.2 Physical

The physical characteristics of the 3686–90 are shown in Table 3.

Table 3. Physical Specifications

Feature	U.S.	Metric
Height	3.05 inches	7.65 centimeters
Width	1.5 inches	3.8 centimeters
Depth	8.5 inches	21.6 centimeters
Weight	9.5 ounces	268 grams
Temperature	32° to 122°F	0° to 50°C