4201–00 4-Wire 4-Way and 4202–00 4-Wire 6-Way Conference Bridges

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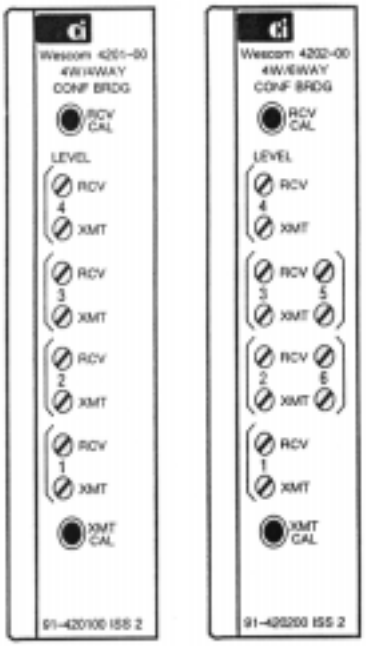

Figure 1. 4201–00 and 4202–00 Front Panels

1. GENERAL

1.1 Document Purpose

This document provides a general description, a circuit description, installation procedures, and basic testing information for the Charles Industries 4201–00 and 4202–00 Conference Bridges, shown in Figure 1.

1.2 Document Status

This document is reprinted to include a general editorial update.

1.3 Equipment Function

The 4201–00 and the 4202–00 are 4-wire active conference bridges. Each port receives VF or data signals from all other ports of the bridge; additionally, each port transmits signals to all other ports. Front-panel-mounted transmit and receive potentiometers are provided for each bridge port. The proper adjustment of these potentiometers allows all signals on the bridge to be transmitted and received at the same level.

The 4201–00 and the 4202–00 are nearly identical except for the number of circuits: the 4201–00 provides four bridge circuits, while the 4202–00 provides six bridge circuits.

1.4 Equipment Location/Mounting

The 4201–00 and 4202–00 each mount in one module mounting position of Charles Industries Type 400 Mounting Assembly. They make electrical connection to the system via a 56-pin, wire-wrapped, card-edge connector, provided as part of the mounting assembly.

1.5 Equipment Features

Features provided by the 4201–00 and 4202–00 are as follows:

- Selectable –7dB (receive) and –16dB (transmit) pads for each bridge circuit, which allows proper interface with carrier facilities.
- Can be used with voice, or data up to 9.6kbps.
- SX leads for each transmit and receive port.
- Front-panel-accessible RCV CAL and XMT CAL jacks, for simplified alignment.
- Zero dB loss bridge, with an adjustable gain of –10 to +22dB (receive-to-transmit).
- Can be powered from any input voltage between –22 and –55VAC.

2. APPLICATION GUIDELINES

The 4201–00 and 4202–00 are normally used as a conference bridge between 4-wire telephones or data sets. In these applications, signals present on the receive sides of each port are transferred to the transmit sides of all other ports on the bridge. Figure 2 illustrates a 4201–00 used in this application.

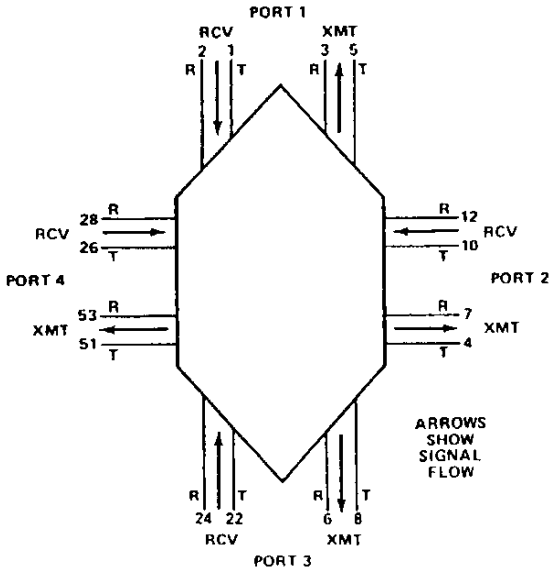

Figure 2. 4201–00 Typical Application

3. CIRCUIT DESCRIPTION

The 4201–00 provides summing and distribution of up to four VF or data channels, while the 4202–00 provides an identical function for up to six voice or data channels. Refer to the 4201–00 functional block diagram, Figure 3, while reading the following circuit description. The 4202–00 functional block diagram is shown in Figure 4.

References to transmit and receive are with respect to the bridge. Thus, when a VF or data set is transmitting, the bridge is receiving; similarly, when a VF or data set is receiving, the bridge is transmitting. All transmit line and receive line circuits for each port are identical; therefore, this circuit description is based on RCV LINE 1 and XMT LINE 1.

Data or VF signals enter the 4201–00 on the RCV LINE 1 tip and ring leads (pins 1 and 2, respectively) and are transformer-coupled (via T1) to the input of operations amplifier U2–1. A –7db RCV PAD can be selected to provide the proper level for 4-wire carrier applications. The front-panel-accessible RCV LEVEL potentiometer, connected in the feedback loop of U2–1, provides a level adjustment of –4dB to +12dB. This is used to compensate for losses in the receive line. The output of U2–1 is coupled to the operational amplifiers associated with transmit lines 2, 3, and 4. Thus, all signals present at the RCV LINE 1 input appear at the XMT LINE outputs of all other ports on the bridge.

At the transmit side, signals from the RCV LINES 2, 3, and 4 enter operational amplifier U2–3 and are transformer-coupled to the XMT LINE 1 tip and ring leads (pins 5 and 3, respectively). The front-panel-accessible XMT LEVEL potentiometer provides a range of –6dB to +12dB to compensate for line losses. A –16dB XMT PAD can be places in the circuit for 4-wire carrier applications.

The circuit operation for RCV LINES 2, 3, and 4 is identical to RCV LINE 1, as described in Paragraph 3.3. In all cases, the signals present on a given RCV LINE are coupled to all XMT LINE ports, except the XMT LINE port associated with the RCV LINE port that is originating the signals.

3.1 Calibration Circuits

The outputs of the four RCV operational amplifiers appear at the input of the RCV TEST AMP. This amplifier provides an impedance match for an AC voltmeter, which is plugged into the RCV CAL jack during the receive alignment.

The output of the XMT TEST AMP is coupled to the inputs of the four XMT LINE operational amplifiers. The XMT TEST AMP, in conjunction with the XMT CAL jack, provides the interface for an oscillator, which is used for the transmit level alignment on each transmit line. Complete receive and transmit alignment is provided in Part 8.

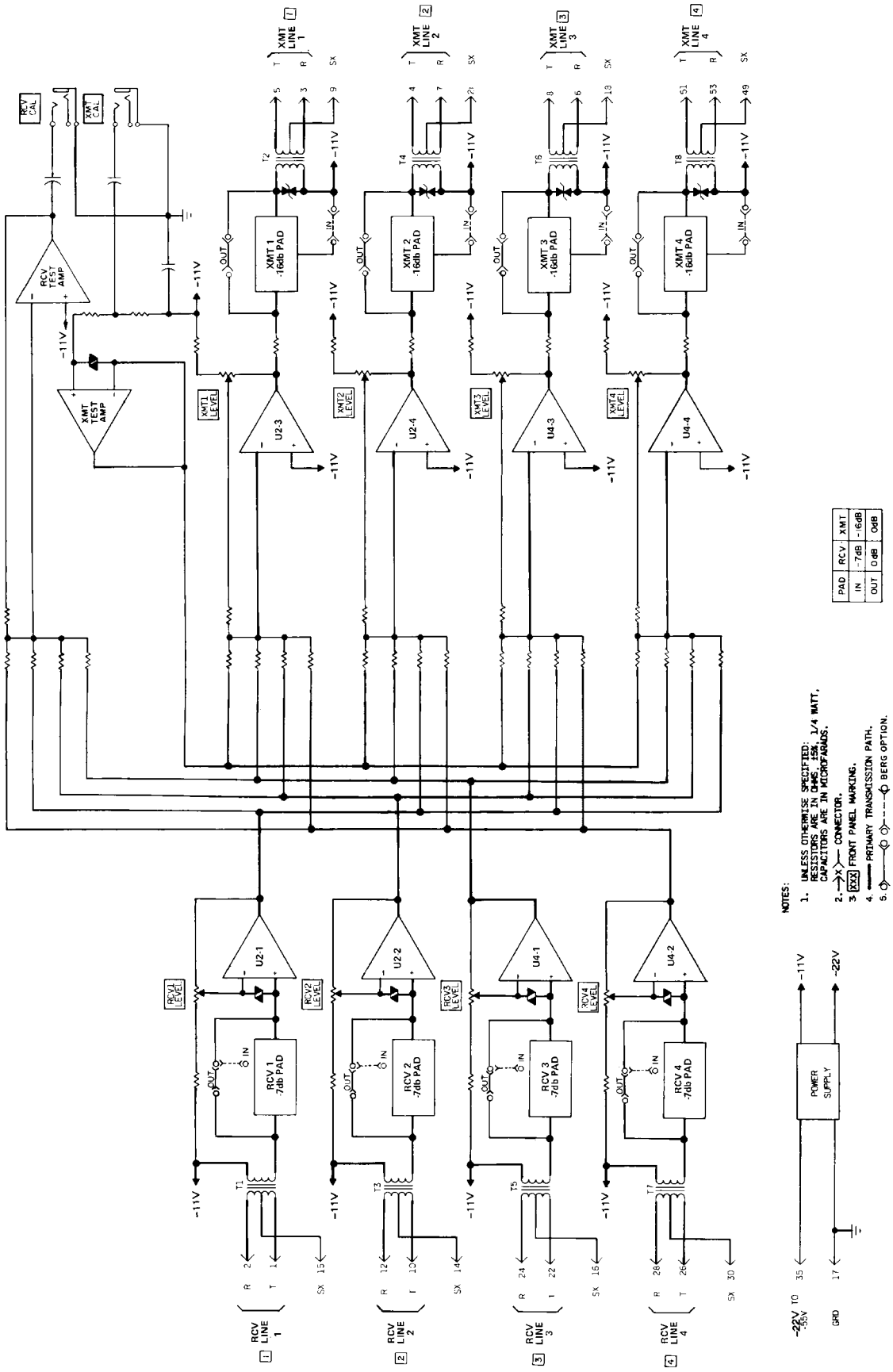

Figure 3. 4201–00 (Issue 2) Functional Block Diagram

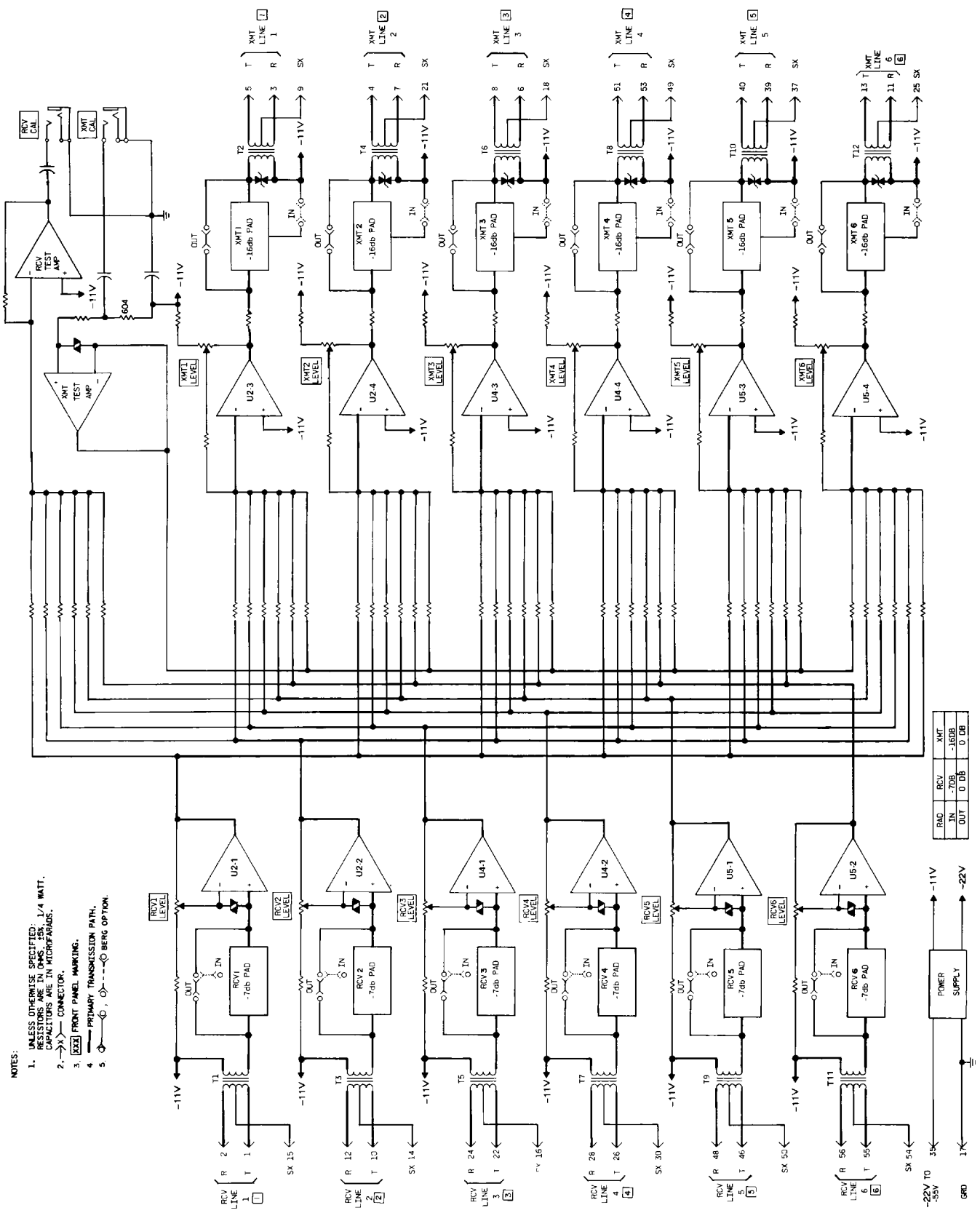

Figure 4. 4202–00 (Issue 2) Functional Block Diagram

4. INSPECTION

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

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 one number on any following models that are manufactured. Therefore, be sure to include the issue number along with the model number when making inquiries about the equipment.

5. MOUNTING

The 4201–00 and 4202–00 each mount in one module mounting position of a Wescom Type 440X Mounting Assembly. Type 440X Mounting Assemblies are available in capacities of 1 to 13 modules and allow for either KTU-apparatus-case or relay-rack mounting. Refer to Sections 440–211–202 through 440–723–202 and 400–103 for additional information regarding mounting assemblies.

CAUTION

Removal and installation of modules should be done with care. Do not force a module into place. If excessive resistance is encountered while installing a module, remove the module and check the card guides and connector to verify proper alignment and the absence of foreign material.

6. INSTALLER CONNECTIONS

The 4201–00 and 4202–00 make electrical connection to the associated equipment through a 56-pin, wire-wrapped, card-edge connector, provided as part of the mounting assembly. Make all connections to the connector in accordance with Table 1.

Table 1. 4201–00 And 4202–00 Installer

		PIN		
LINE	**LEAD**	**TIP**	**RING**	**SX**
1	RCV	1	2	15
	XMT	5	3	9
2	RCV	10	12	14
	XMT	4	7	21
3	RCV	22	24	16
	XMT	8	6	18
4	RCV	26	28	30
	XMT	51	53	49
5*	RCV	46	48	50
	XMT	40	39	37
6*	RCV	55	56	54
	XMT	13	11	25
	–21 to –55 V	35		
	Ground	17		
*4202–00 only				

7. OPTIONS

Each line circuit of the 4201–00 and 4202–00 contains two push-on jumper options: one selects the –7dB RCV PAD, and the other selects the –16dB XMT PAD. Refer to Figure 5 for the location of the 4201–00 options and the first four line circuit options of the 4202–00. Refer to Figure 6 for the option locations of circuits five and six of the 4202–00.

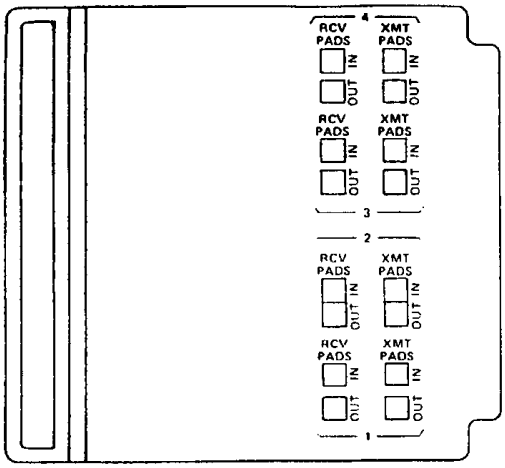

Figure 5. 4201–00 And 4202–00 (Circuits One Through Four) Option Locations

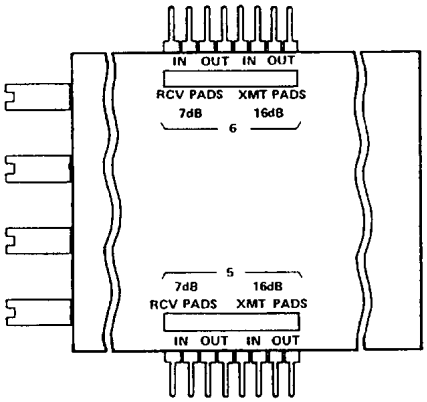

Figure 6. 4202–00 Circuits Five And Six Option Locations

7.1 Receive Pad Selection

The receive pad is normally selected when the 4201–00 or 4202–00 interfaces with a 4-wire carrier facility. The normal +7 dBm receive level from the carrier facility is attenuated by 7dB, thus presenting a 0dBm level to the bridge.

For carrier applications, place the jumper associated with the appropriate RCV LINE in the IN position. For all other applications, place the jumper in the OUT position.

7.2 Transmit Pad Selection

The XMT PAD is normally selected for carrier applications. The normal 0dBm output from the bridge is attenuated by 16dB, thus presenting a standard –16dBm transmit level to the 4-wire carrier facility.

For carrier applications, place the jumper associated with the appropriate XMT LINE in the IN position. For all other applications, place the jumper in the OUT position.

8. ALIGNMENT

The alignment for the 4201–00 and 4202–00 is divided into two areas: The receive alignment is performed to ensure that all signals enter the bridge at the same level. The transmit alignment is performed to ensure that all signals transmitted by the bridge are received at the same level at the data or VF unit.

Equipment required to perform the alignment is as follows:

- Hewlett-Packard 400FL (or equivalent) AC voltmeter.
- Hewlett-Packard 9040 (or equivalent) audio oscillator.
- Associated patch cords, as necessary.

8.1 Receive Alignment

The receive alignment consists of adjusting the RCV LEVEL potentiometers associated with each circuit to compensate for line loss.

Step	Action
1.	Consult the CLR (Circuit Layout Record) card and obtain the transmission loss of each receive line connected to the bridge.
2.	Adjust the oscillator to 1kHz, at a level equal to the transmission loss of the receive line 1 (e.g., if the line loss is 5 dB, adjust oscillator to –5dBm). Connect the oscillator to the receive line 1 tip and ring leads.
3.	Connect the AC voltmeter (terminated with a 600 ohm +/–1% resistor) to the RCV CAL jack.
4.	Verify that no signals are present on any of the other ports.
5.	Adjust the RCV LEVEL 1 potentiometer until the AC voltmeter reads 0 dBm.
6.	Repeat steps 2 through 5 for all other receive lines. In all cases, adjust the oscillator to a level equal to the transmission loss of the receive line being aligned.
7.	This completes the receive level adjustment. Proceed to the transmit level adjustment.

8.2 Transmit Alignment

The transmit alignment consists of adjusting the XMT LEVEL potentiometers associated with each circuit to compensate for line loss.

Step	Action
1.	Consult the CLR (Circuit Layout Record) card and obtain the transmission loss of each transmit line connected to the bridge.
2.	Adjust the oscillator to 1kHz, at 0 dBm. Connect the oscillator to the XMT CAL jack.
3.	Connect the AC voltmeter (terminated with a 600 ohm +/–1% resistor) to the transmit line 1 tip and ring leads.
4.	Adjust the XMT LEVEL potentiometer 1 until the AC voltmeter reads the absolute value of the transmission loss of transmit line 1 (e.g., if the transmission loss is 5 dB, adjust the potentiometer until the AC voltmeter reads +5 dBm). *Note: If required, an appropriate transmit level other than the absolute cable loss level may be used for the transmit level adjustment.*
5.	Repeat steps 2–5 for all other transmit lines. In all case, adjust the XMT LEVEL potentiometer of the line being aligned until the AC voltmeter reads the absolute value of the transmission loss of the line being aligned.
6.	This completes the transmit level adjustment. Remove all test equipment.

9. TESTING

If trouble is encountered with the operation of the 4201–00 or 4202–00, verify that all installer connections have been completed in accordance with Part 6 and that all options have been conditioned as required in Part 7. Verify that the module is making proper contact with the mounting shelf card-edge connector; remove and reinsert the module. If trouble persists, verify that the alignment procedure has been completed as required in Part 8.

10. TECHNICAL ASSISTANCE

10.1 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)

10.2 Technical Assistance — Canada

Canadian customers contact:

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

11. WARRANTY & CUSTOMER SERVICE

11.1 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

Telephone: 847–806–6300 (Main Office)
847–806–6231 (FAX)

11.2 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.

11.3 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.

11.4 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.

12. SPECIFICATIONS

12.1 Electrical

The electrical characteristics of the 4201–00 and 4202–00 are as follows:

12.1.1. Power Requirements

(a) MAXIMUM INPUT CURRENT (AT –55V BATTERY): 4201–00, 65mA; 4202–00, 85mA.

12.1.2. Transmission

(a) INSERTION LOSS: Factory-adjusted to 0dB +/–0.3dB. Can be adjusted from –10dB to +22dB.

(b) FREQUENCY RESPONSE: +1.0dB, 300Hz to 3.2kHz (referenced to 1khz).

(c) HARMONIC DISTORTION: Less than 5 percent at +10dBm. +10dBm max. output.

(d) PORT IMPEDANCE: All ports 600 ohms +/–10 percent.

(e) IDLE NOISE: Less than 18dBrnC at +22dB bridge gain.

(f) IMPULSE NOISE: Zero hits in 5 minutes at 36dBrnC and +22dB bridge gain.

(g) ENVELOPE DELAY DISTORTION: Less than 100 microseconds, 500Hz to 4kHz.

(h) LONGITUDINAL BALANCE: Greater than 60dB, 200Hz to 3.5kHz.

(i) CROSSTALK (RECEIVE PATH TO TRANSMIT PATH): Greater than 60dB, 300Hz to 1kHz; greater than 50dB, to 3.3kHz.

12.2 Physical

The physical characteristics of the 4201–00 and 4202–00 are as follows:

Table 2. Physical Specifications

Feature	U.S.	Metric
Height	5.6 inches	14.2 centimeters
Width	1.5 inches	3.8 centimeters
Depth	6.0 inches	15.2 centimeters
Weight (4201–00) Weight (4202–00)	12 ounces 15 ounces	340 grams 425 grams
Temperature	32° to 120°F	0° to 49°C
Altitude	To 15,000 feet	To 4,572 meters
Humidity	To 95% (no condensation)	
Mounting	One module mounting position in a Type 440X Mounting Shelf.	