

4204-03 Master/Slave Bridge and 4204-11 Auxiliary Bridge

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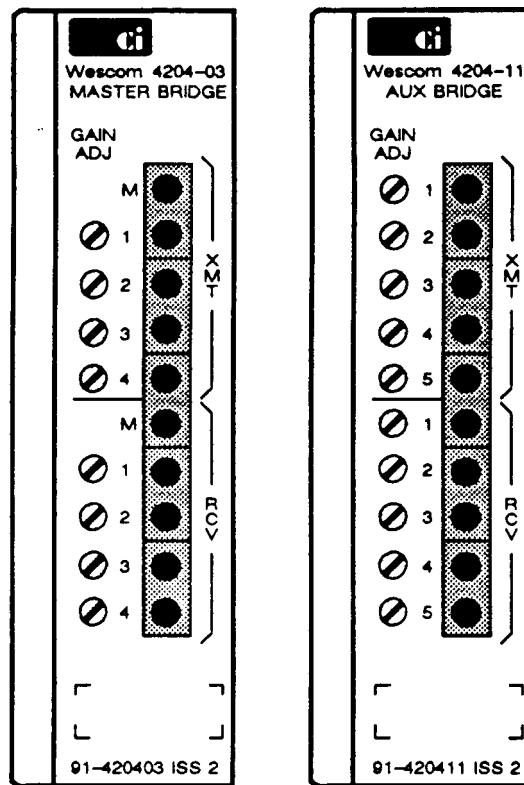


Figure 1. 4204-03 and 4204-11 Front Panels

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 4204–03 Master/Slave Bridge and the 4204–11 Auxiliary Bridge, shown in Figure 1.

1.2 Document Status

This document is reprinted to include a general editorial update.

1.3 Equipment Function

1.3.1. 4204–03 Master/Slave Bridge

The 4204–03 Master/Slave Bridge provides distribution from a 4-wire master port to four 4-wire slave ports. Signals entering the RCV MASTER port are distributed to each of the RCV SLAVE ports. The gain for each leg in this direction may be individually set anywhere from –8dB to +8dB by means of a front-panel-mounted potentiometer. A single push-on strapping option allows the gain of all RCV legs to be reduced by 7dB, providing a range of –15dB to +1 dB of gain for every RCV leg. Signals entering each of the XMT SLAVE ports are summed and appear at the XMT MASTER port. The gain for each leg in this direction may be individually set anywhere from –8dB to +8dB by means of a front-panel-mounted potentiometer. A single push-on strapping option allows the gain of all XMT legs to be reduced by 16dB, providing a range of –24dB to –8dB of gain for every XMT leg.

1.3.2. 4204–11 Auxiliary Bridge

The 4204–11 Auxiliary Bridge is employed in conjunction with a 4204–03 Master/Slave Bridge. The 4204–11 allows distribution from the 4-wire master port of the 4204–03 to five additional 4-wire slave ports on the 4204–11. The gain of each XMT and RCV leg of the 4204–11 may be individually set anywhere from –8dB to +8dB by means of a front-panel-mounted potentiometer. The push-on strapping options which allow the gains of the 4204–03 XMT and RCV legs to be reduced by 16dB and 7dB, respectively, also allow the gains of the 4204–11 XMT and RCV legs to be reduced by 16dB and 7dB, respectively.

1.4 Equipment Location/Mounting

Each module occupies one position in a Type 400 Mounting Assembly.

1.5 Equipment Features

The 4204–03 and 4204–11 include the following features:

- All master and slave ports are provided with transformer isolation
- The input impedances of the XMT SLAVE ports and the output impedances of the RCV SLAVE ports may each be set to either 600 or 900 ohms by means of push-on strapping options
- The output impedance of the XMT MASTER port and the input impedance of the RCV MASTER port may each be set to 150, 600, or 1200 ohms by means of push-on strapping options
- SX signaling lead derived at each port
- Front-panel-mounted bantam test jacks for each port
- When suitably optioned on the 4204–03, sealing current may be applied via the SX leads of the XMT and RCV MASTER ports

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.

2.3 Static Concerns

Each module is shipped in static-protective packaging to prevent electrostatic charges from damaging static-sensitive devices. Use approved static-preventive measures, such as static-conductive wrist straps and a static-dissipative mat, when handling modules outside of their protective packaging. A module intended for future use should be tested as soon as possible and returned to its original protective packaging for storage.



STATIC-SENSITIVE



This equipment contains static-sensitive electronic devices. To prevent electrostatic charges from damaging static-sensitive units:

- **Use approved static preventive measures (such as a static-conductive wrist strap and a static-dissipative mat) at all times whenever touching units outside of their original, shipped static-protective packaging.**
- **Do not ship or store units near strong electrostatic, electromagnetic, or magnetic fields.**
- **Use static-protective packaging for shipping or storage.**

3. CIRCUIT DESCRIPTION

3.1 4204–03 Master/Slave Bridge

3.1.1 Transmit Paths

Signals which are to appear at the XMT MASTER port (terminals 54 and 56) are applied to the XMT SLAVE ports (XMT SLAVE 1, terminals 51 and 52; XMT SLAVE 2, terminals 42 and 50; XMT SLAVE 3, terminals 38 and 40; XMT SLAVE 4, terminals 34 and 36). A given port may be accessed by means of a front-panel-mounted bantam jack. When a plug is inserted into the jack, the signal at the input pins is disconnected from its associated input transformer. The input impedance of each XMT SLAVE port may be set to either 600 or 900 ohms by means of its associated option straps (e.g., 7A for XMT SLAVE port 1).

A signal induced in the secondary of a XMT SLAVE port input transformer is amplified by its associated amplifier. The gain of each of these amplifiers is adjustable from –8dB to +8dB by means of its associated front-panel-mounted potentiometer (e.g., XMT GAIN 1 for XMT SLAVE port 1).

The outputs of the four amplifiers associated with the XMT SLAVE ports are summed at the input of amplifier U4. The summing point is also connected to terminal 55 to provide an input from the 4204–11 Auxiliary Bridge (if employed). The summed signals are buffered by U4 and applied to the output transformer T2. The gain of U4 can be set to either –16dB or 0dB by means of the 12A option strap. With the gain of U4 set for 0dB, the total gain of a signal applied to a given XMT SLAVE port is simply the gain set on the amplifier's front-panel-mounted XMT GAIN potentiometer associated with the port (–8dB to +8dB). With the gain of U4 set for –16dB, the total gain of a signal applied to a given XMT SLAVE port is the same as above minus 16dB. Thus, by optioning U4 for –16dB, the individual gain controls for each XMT SLAVE port have their ranges altered to –24dB to –8dB (instead of –8dB to +8dB).

The output of summing amplifier U4 is applied to T2 through the 2A option strap. This option strap determines the output impedance of the XMT MASTER port and may be set for either 150, 600, or 1200 ohms. The summed signal is induced in the secondary of T2 and appears at the XMT MASTER port. A front-panel-mounted bantam jack allows access to the summed signal. When a plug is inserted into the jack, the summed signal is disconnected from the output pins of the XMT MASTER port.

3.1.2 RCV Paths

The master receive signal which is to be distributed to the RCV SLAVE ports (RCV SLAVE 1, terminals 20 and 22; RCV SLAVE 2, terminals 10 and 16; RCV SLAVE 3, terminals 6 and 8; RCV SLAVE 4, terminals 4 and 3) is

applied to the RCV MASTER port (terminals 24 and 26). Access to the master receive port can be achieved via a front-panel-mounted bantam jack. When a plug is inserted in the jack, the RCV MASTER line pins are disconnected from the RCV MASTER port.

The master receive signal is applied to the primary of input transformer T1 and induces a signal in its secondary. The 1A option strap determines the input impedance of the RCV MASTER port and may be set for either 150, 600, or 1200 ohms. The signal induced in the secondary of T1 passes through the 11A option strap to the inputs of the slave amplifiers. The signal is also connected to terminal 1 to provide an output to the 4204–11 Auxiliary Bridge (if employed). Each slave amplifier has a variable gain of –8dB to +8dB, adjustable by means of a front-panel-mounted potentiometer (e.g., RCV GAIN 1 for RCV SLAVE port 1). With the 11A option set to 0dB, the total gain for the signal appearing at a RCV SLAVE port is simply the gain set on the front-panel-mounted potentiometer for the associated slave amplifier. With the 11A option set to –7dB, the total gain for the signal appearing at a RCV SLAVE port is the same as above minus 7dB. Thus, by optioning 11A for –7dB, the individual gain controls for each RCV SLAVE port have their ranges altered to –15dB to +1dB (instead of –8dB to +8dB).

The signal appearing at the output of a given slave amplifier passes through impedance option straps to the primary of the associated output transformer. The 3A to 6A options determine the output impedances of the corresponding RCV SLAVE ports (e.g., 3A for output impedance of RCV SLAVE port 1). The output impedance of each RCV SLAVE port can be set to either 600 or 900 ohms by means of these options.

The RCV signal induced in the secondary of each RCV SLAVE output transformer appears at the associated RCV SLAVE port. The signal at each port can be accessed by means of a front-panel-mounted bantam jack. When a plug is inserted in the jack, the RCV signal is disconnected from the corresponding RCV SLAVE port pins.

3.1.3. Sealing Current Operation

When screw option SC is closed, the sealing current mode is selected. When positive sealing current from the distant end is applied to the RCV MASTER port, it passes through the 4204–03 and exits the XMT MASTER port.

3.1.4. Power Supply

The 4204–03 is equipped with a regulated power supply providing the required potentials for the unit. The power supply operates from an external input of –22 to –56Vdc. The negative battery input, terminal 35, is multiplexed to pin 37, the PWR INTLK lead. This lead provides power to the 4204–11 Auxiliary Bridge (if employed). This arrangement assures that the 4204–03 and 4204–11 units are always on or off together. The 4204–03 power supply also provides a regulated –11Vdc potential for the 4204–11. This potential leaves the 4204–03 via terminal 33.

3.2 4204–11 Auxiliary Bridge

3.2.1. Transmit And Receive Paths

The 4204–11 provides five additional XMT SLAVE and RCV SLAVE ports for connection to the 4204–03 Master/Slave Bridge. The XMT summing point on the 4204–03 connects to the 4204–11 via terminal 55. The RCV slave amplifier input bus on the 4204–03 connects to the 4204–11 via terminal 1. The delay circuit is necessary for initialization at turn-on, or when the 4204–11 is plugged in with power already applied to the associated 4204–03.

With the exception of pin assignments, the circuit description for the transmit and receive paths of the 4204–11 is similar to that for the corresponding sections of the 4204–03.

3.2.2. Power Supply

The 4204–11 contains a regulated power supply providing potentials for the unit. The power supply operates from –22 to –56Vdc and –11Vdc, both provided by the associated 4204–03. The –22 to –56Vdc is obtained from terminal 37 of the 4204–03 and enters the 4204–11 on terminal 37. The –11Vdc is obtained from terminal 33 of the 4204–03 and enters the 4204–11 on terminal 33.

4. MOUNTING

Each of the 4204–03 and 4304–11 units is designed to mount in one module position of a Wescom Type 400 Mounting Assembly. Type 400 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 040–001–002 and 440–211–202 for more information on mounting assemblies.

5. INSTALLER CONNECTIONS

Connections to the 4204–03 and 4204–11 units are made via 56-pin, wire-wrap card-edge connectors provided as part of the Type 400 Mounting Assembly. Make all installer connections to the 4204–03 in accordance with Table 1. Make all installer connections to the 4204–11 in accordance with Table 2.

When a 4204–11 unit is employed to expand the slave ports capacity of a 4204–03, the power leads of the 4204–11 must be cross-connected to the 4204–03, and the XMT and RCV EXPANDER leads must be cross-connected between the two units. Figure 2 shows these required cross-connections.

6. OPTIONS

6.1 4204–03 Master/Slave Bridge

Refer to Figure 3 and the following paragraphs for option programming information for the 4204–03 Master/Slave Bridge.

6.1.1. 4204–03 Impedance Options

Ten push-on strapping options are provided to determine the impedances of the master and slave ports of the 4204–03. Table 3 shows which push-on strapping options are assigned to the individual master and slave ports, e.g., the RCV SLAVE port 1 impedance is determined by option 3A. Using Figure 3 and Table 3, set the impedances of the master and slave ports as desired.

6.1.2. 4204–03 Gain Options

Two push-on strapping options working in conjunction with eight front-panel-mounted potentiometers determine the gains of the XMT and RCV legs of the 4204–03.

When the 11A push-on strapping option is set to 0dB, the overall gain via any given RCV leg is adjustable from –8dB to + 8dB by means of the corresponding front-panel-mounted potentiometer. When the 11A option is set to –7dB, the overall gain via any given RCV leg is adjustable from –15dB to + 1dB by means of the corresponding front-panel-mounted potentiometer. Using Figure 3, set the 11A option as desired.

When the 12A push-on strapping option is set to 0dB, the overall gain via any given XMT leg is adjustable from –8dB to + 8dB by means of the corresponding front-panel-mounted potentiometer. When the 12A option is set to –16dB, the overall gain via any given XMT leg is adjustable from –24dB to –8dB by means of the corresponding front-panel-mounted potentiometer. Using Figure 3, set the 12A option as desired.

6.1.3. 4204–03 Sealing Current Option

If sealing current is to be passed between the 4204–03 master ports, close screw option SC by screwing it down. Do not over-tighten, as damage to the PCB plating may occur.

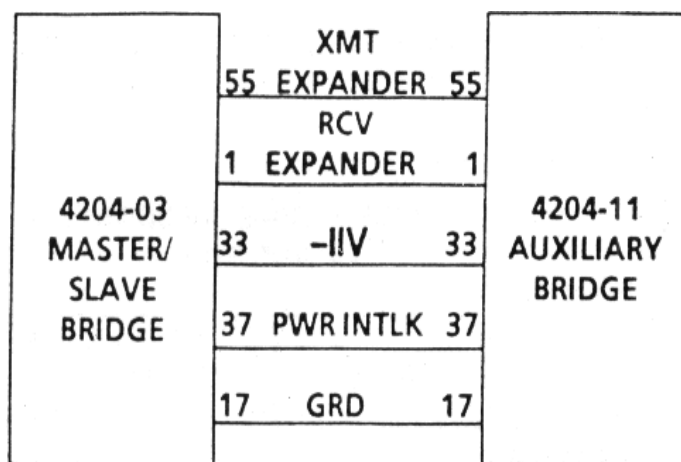


Figure 2. Cross-Connecting 4204–03 And 4204–11 Units

Table 1. Installer Connections For 4204–03 Master/Slave Bridge

Block Diagram Designation	Pin
XMT MASTER T	54
XMT MASTER R	56
XMT MASTER SX	46
RCV MASTER T	24
RCV MASTER R	26
RCV MASTER SX	11
XMT EXPANDER	55
RCV EXPANDER	1
XMT SLAVE 1T	51
XMT SLAVE 1R	52
XMT SLAVE 1SX	53
XMT SLAVE 2T	42
XMT SLAVE 2R	50
XMT SLAVE 2SX	48
XMT SLAVE 3T	38
XMT SLAVE 3R	40
XMT SLAVE 3SX	44
XMT SLAVE 4T	34
XMT SLAVE 4R	36
XMT SLAVE 4SX	30
RCV SLAVE 1T	20
RCV SLAVE 1R	22
RCV SLAVE 1SX	27
RCV SLAVE 2T	10
RCV SLAVE 2R	16
RCV SLAVE 2SX	14
RCV SLAVE 3T	6
RCV SLAVE 3R	8
RCV SLAVE 3SX	9
RCV SLAVE 4T	4
RCV SLAVE 4R	3
RCV SLAVE 4SX	2
–11V	33
–BATT (–22 TO –55Vdc)	35
PWR INTLK	37
GRD	17

Table 2. Installer Connections For 4204–11 Auxiliary Bridge

Block Diagram Designation	Pin
XMT EXPANDER	55
RCV EXPANDER	1
XMT SLAVE 1T	54
XMT SLAVE 1R	56
XMT SLAVE 1SX	46
XMT SLAVE 2T	51
XMT SLAVE 2R	52
XMT SLAVE 2SX	53
XMT SLAVE 3T	42
XMT SLAVE 3R	50
XMT SLAVE 3SX	48
XMT SLAVE 4T	38
XMT SLAVE 4R	40
XMT SLAVE 4SX	44
XMT SLAVE 5T	34
XMT SLAVE 5R	36
XMT SLAVE 5SX	30
RCV SLAVE 1T	24
RCV SLAVE 1R	26
RCV SLAVE 1SX	11
RCV SLAVE 2T	20
RCV SLAVE 2R	22
RCV SLAVE 2SX	27
RCV SLAVE 3T	10
RCV SLAVE 3R	16
RCV SLAVE 3SX	14
RCV SLAVE 4T	6
RCV SLAVE 4R	8
RCV SLAVE 4SX	9
RCV SLAVE 5T	4
RCV SLAVE 5R	3
RCV SLAVE 5SX	2
-11V	33
-11V TEST	35
-BATT (-22 TO -56Vdc)	37
GRD	17

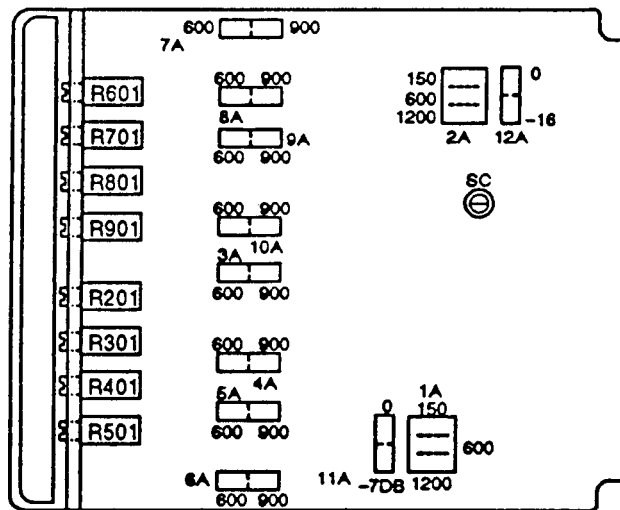


Figure 3. 4204–03 Master/Slave Bridge Option Locations

6.2 4204–11 Auxiliary Bridge

Refer to Figure 4 and the following paragraphs for option programming information for the 4204–11 Auxiliary Bridge.

6.2.1. 4204–11 Impedance Options

Ten push-on strapping options are provided to determine the impedances of the auxiliary slave ports of the 4204–11. Table 3 shows which push-on strapping options are assigned to the individual auxiliary slave ports, e.g., the XMT SLAVE port 3 impedance is determined by option SA. Using Table 3 and Figure 4, set the impedances of the auxiliary slave ports as desired.

Table 3. 4204–03 And 4204–11 Impedance Option Identification

Port	Corresponding Option For:	
	4204–03	4204–11
XMT MASTER	2A	—
XMT SLAVE 1	7A	6A
XMT SLAVE 2	8A	7A
XMT SLAVE 3	9A	8A
XMT SLAVE 4	10A	9A
XMT SLAVE 5	—	10A
RCV MASTER	1A	—
RCV SLAVE 1	3A	1A
RCV SLAVE 2	4A	2A
RCV SLAVE 3	5A	3A
RCV SLAVE 4	6A	4A
RCV SLAVE 5	—	5A

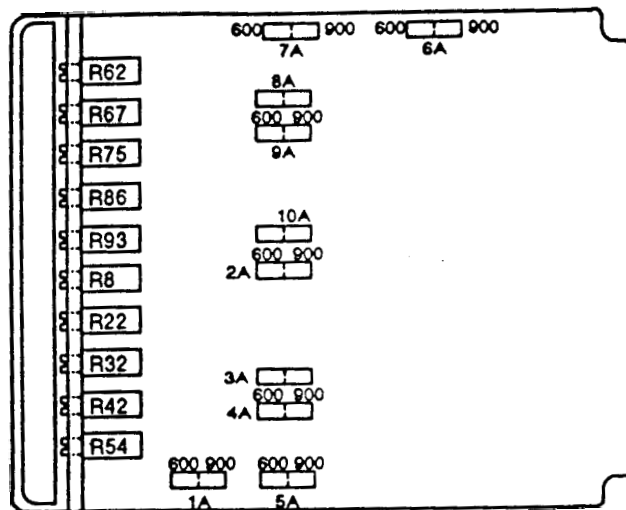


Figure 4. 4204–11 Option Locations

6.2.2. 4204–11 Gain Options

The overall gain via an auxiliary RCV slave port is determined by the setting of the 11 A option on the associated 4204–03 unit, and by the setting of the corresponding 4204–11 front-panel-mounted potentiometer. The overall gain via an auxiliary XMT slave port is determined by the setting of the 12A option on the associated 4204–03 and by the setting of the corresponding 4204–11 front-panel-mounted potentiometer. The 4204–03 11A and 12A options have the same effect on the gains of the auxiliary slave ports as they do on the gains of the 4204–03 slave ports.

7. TESTING

7.1 4204–03 Master/Slave Bridge

Step	Action
1.	Set all impedance options on the 4204–03 to 600.
2.	Set the 11A option to 0dB.
3.	Set the 12A option to 0dB.
4.	Terminate all master and slave ports with 600 ohms.
5.	Connect an oscillator to the RCV MASTER port jack. Calibrate the oscillator to send 1000Hz at 0.0dB.

Step	Action
6.	Test each RCV leg by following the steps below: <ol style="list-style-type: none"> 1. Connect an ac voltmeter calibrated for a 600-ohm terminated measurement to the slave port jack desired. 2. Apply power to the 4204–03 unit. 3. Verify that the reading on the meter can be varied from –8dB to + 8dB by means of the corresponding front-panel-mounted potentiometer. 4. Remove the meter from the tested port jack.
7.	Remove the oscillator from the 4204–03 RCV MASTER port jack and connect the meter to the XMT MASTER port jack. Test each XMT leg by following the steps below: <ol style="list-style-type: none"> 1. Connect the oscillator (calibrated for 0.0dB at 1000Hz) to the slave port jack to be tested. 2. Apply power to the 4204–03 unit. 3. Verify that the reading on the meter can be varied from –8dB to + 8dB by means of the corresponding front-panel-mounted potentiometer. 4. Remove the oscillator from the tested port jack.

7.2 4204–11 Auxiliary Bridge

To test a 4204–11 in conjunction with a 4204–03, simply cross-connect the 4204–11 to the 4204–03 as shown in Figure 2 and apply the tests above as if the 4204–11 slave ports were 4204–03 slave ports.

8. TECHNICAL ASSISTANCE

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)

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 pre-addressed 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 217–932–5292 (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

The electrical and physical characteristics of the 4204–03 and 4204–11 units are as follows:

10.1 Electrical

- (a) POWER REQUIREMENTS: Voltage: –22 to –56Vdc. Idle current: 30mA, maximum, at –22Vdc; 40mA, maximum, at –56Vdc. Peak current: 45mA, maximum, at –24Vdc; 60mA, maximum, at –56Vdc.
- (b) INSERTION LOSS: Factory set to 0dB +/-0.1dB (all unused ports terminated with 600 ohms). Each XMT and RCV leg adjustable from –8 to +8dB from the preset 0dB. Optional pads provide 7dB and 16dB losses on the RCV and XMT lines, respectively.
- (c) IMPEDANCE: Master port, strapping provides impedance of 150, 600, or 1200 ohms; slave ports, strapping provides impedances of 600 or 900 ohms.
- (d) FREQUENCY RESPONSE: Better than +/-1dB between 300 to 3300Hz (referenced to 1000Hz).
- (e) HARMONIC DISTORTION: Less than 1 percent total harmonic distortion at output level of + 5dBm.

- (f) IDLE NOISE: Less than 20dBnC at any output (all inputs terminated with 600 ohms).
- (g) ECHO RETURN LOSS: Master port, 25dB, minimum; slave ports, 20dB, minimum.
- (h) SINGING RETURN LOSS: Master port, 18dB, minimum; slave ports, 15dB, minimum.
- (i) ENVELOPE DELAY DISTORTION: 50usec, maximum, measured between any two frequencies in the band of 1000 to 2400Hz; 200usec, maximum, in the band of 300 to 3300Hz.
- (j) CROSSTALK: Coupling between legs on a given module, 60dB or better.
- (k) LONGITUDINAL BALANCE: Master port, greater than 60dB between 200 and 3500Hz.
- (l) MAXIMUM SIMPLEX CURRENT: 60mA.

10.2 Physical

See Table 4 for the physical characteristics of the units.

Table 4. Physical Specifications

Feature	U.S.	Metric
Height	5.6 inches	14.1 centimeters
Width	1.5 inches	3.8 centimeters
Depth	6.0 inches	15.3 centimeters
Weight (approximate)	20 ounces	0.560 kilogram
Temperature	32° to 120°F	0° to 49°C

