4203-00 Master/Slave 4-Wire 6-Port Bridge

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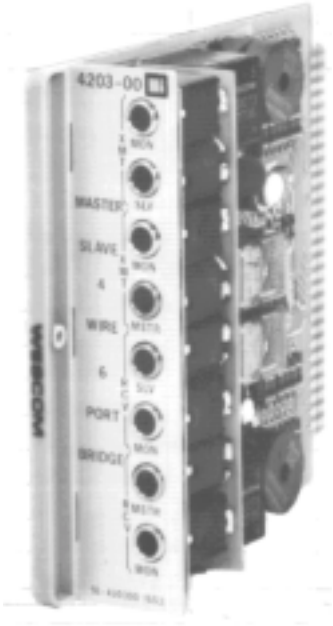

Figure 1. 4203-00 Master/Slave 4-Wire 6-Port Bridge

1. GENERAL

1.1 Document Purpose

This document provides general, circuit, optioning, installation and testing information for the Charles Industries 4203-00 Master/Slave 4-Wire, 6-Port bridge.

1.2 Document Status

This document is reprinted to include a general editorial update.

1.3 Equipment Function

The 4203-00 Master/Slave 4-Wire 6-Port bridge provides distribution from a receive master input to up to six receive slave ports, and combines the input from six transmit slave ports and applies the combined signal to the transmit master output. Both the distribution and the summing functions take place with 0 dB insertion loss. These levels are factory-adjusted, but may be varied throughout a range of from –3 to +9 dB using potentiometers. The gain levels of both the transmit and receive sides are independently adjustable.

The unit also includes two loopback options with permit testing of both the facility and the bridge. Positive battery applied to the simplex (SX) lead, pin 44, will cause the unit to loop back through the master receive and master transmit ports. Positive battery applied to the SX lead, pin 14, causes a loopback through a transmit slave port and a receive slave port.

Monitor and drop test jacks are provided on the front panel at the master transmit and receive ports and at the slave transmit and receive ports to facilitate alignment and monitoring of the bridge.

1.4 Equipment Location/Mounting

The 4203-00 unit occupies one position in a Charles Industries type 440X mounting assembly. This assembly accommodates from 1 to 13 modules and allows either KTU apparatus case or relay-rack mounting. Electrical connections to the unit are made through a 56-pin, wire-wrapped card-edge connector provided as part of the mounting assembly.

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 unit 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 units outside of their protective packaging. A unit 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.**

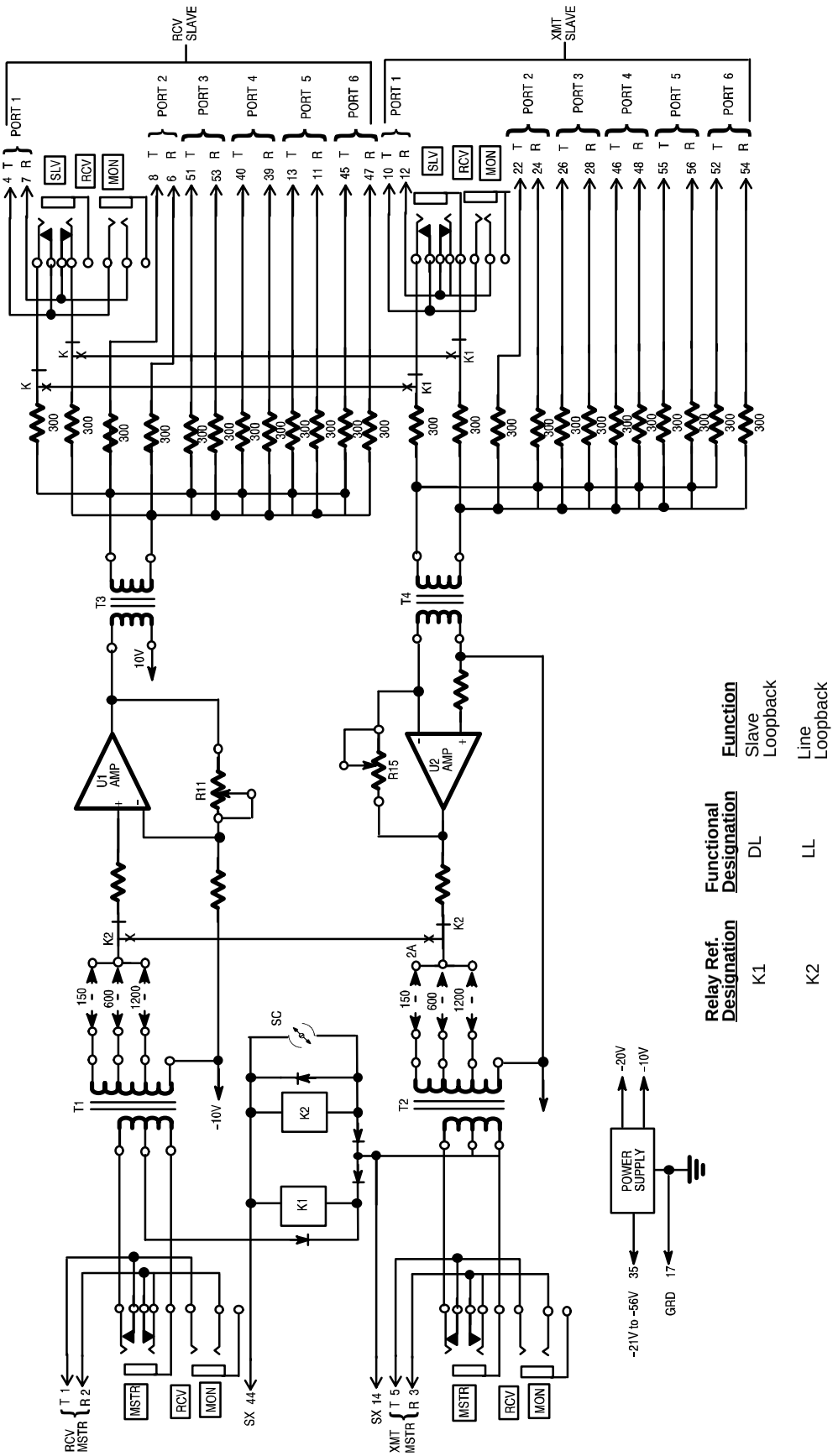

Figure 2. Block Diagram

3. CIRCUIT DESCRIPTION

The 4203-00 unit provides coupling of voice and data circuits by means of a 4-wire, 6-port, transformer-coupled bridge. Refer to the block diagram while reading the following circuit description.

3.1 Receive Circuit Operation

Voice or data signals enter the receive side from the master station or line on terminals 1 (TIP) and 2 (RING). These signals are coupled to the receive circuitry by transformer T1. Optional strapping of T1 provides an input impedance of 150, 600, or 1200 ohms. The input signal is then routed to amplifier U1, the gain of which is factory-adjusted by potentiometer R11 to yield an insertion loss of of 0 dB. The amplifier level may be adjusted to provide a gain of –3 dB to +9 dB between the master receive port and the slave ports. Upon leaving U1, the signal is routed to transformer T3 and tot the receive slave ports.

3.2 Transmit Circuit Operation

A signal originating at one of the remote stations will enter the unit at one of the slave port terminal pairs. The signal is then coupled to the transmission circuitry by transformer T4 and amplified by U2 and associated circuitry. Potentiometer R15 is factory-adjusted to provide 0 dB insertion loss, but can be varied through a –3 to +9 dB range. Transformer T2 is optionally strapped for an impedance of 150, 600, or 1200 ohms. The signal is available for transmission at the master transmit pairs pins 5 (T) and 3 (R).

3.3 Loopback Operation

The unit is conditioned for loopback operation when option SC is open. Relay K2 will be operated when positive battery is applied to pin 44. Relay K2 in the energized state connects the secondary windings of T1 and T2 and allows testing of the facility lines. If positive battery is applied to the other simplex lead, pin 14, relay K1 will operate, allowing testing of the bridge.

3.4 Sealing Current

Option SC must be closed when the unit is used in conjunction with equipment which requires sealing current. Loopback operation using relay K2 is not possible in this mode of operation because closing SC allows a bypass around K2. The sealing current (applied at pins 14 and 44) does not prohibit the use of K1 to provide a loopback at the slave ports of the unit.

3.5 Power Supply

The unit is equipped with an internal power supply which provides regulated voltages to the internal circuitry, and operates on an input voltage of from –21 to –56 VDC.

4. INSTALLER CONNECTIONS

When the 4203-00 is installed in a type 440X mounting assembly, it makes electrical connection to the associated equipment through a 56-pin, wire-wrapped, card-edge connector provided as part of the mounting assembly. Make all installer connections to this connector in accordance with Table 1.

Table 1. Installer Connections

Lead Designation	Pin
T (receive master tip lead)	1
R (receive master ring lead)	2
T (transmit master tip lead)	5
R (transmit master ring lead)	3

Lead Designation		Pin
T (port 1 tip lead)	Receive Slaves	4
R (port 1 ring lead)		7
T (port 2 tip lead)		8
R (port 2 ring lead)		6
T (port 3 tip lead)		51
R (port 3 ring lead)		53
T (port 4 tip lead)		40
R (port 4 ring lead)		39
T (port 5 tip lead)		13
R (port 5 ring lead)		11
T (port 6 tip lead)		45
R (port 6 ring lead)		47
T (port 1 tip lead)	Transmit Slaves	10
R (port 1 ring lead)		12
T (port 2 tip lead)		22
R (port 2 ring lead)		24
T (port 3 tip lead)		26
R (port 3 ring lead)		28
T (port 4 tip lead)		46
R (port 4 ring lead)		48
T (port 5 tip lead)		55
R (port 5 ring lead)		56
T (port 6 tip lead)		52
R (port 6 ring lead)		54
SX	Simplex Leads	44
SX		14
–21 to –56V	Office Battery	35
Ground		17

5. OPTIONS

The 4203-00 is equipped with a sealing current (SC) option which must be closed if sealing current is to be applied. Positive battery is then connected to the receive line simplex lead (pin 44) and negative is connected to the transmit line simplex lead (pin 14). The battery locations of the 4203-00 options are shown in Figure 2

CAUTION

When opening a screw option, rotate the screw counterclockwise two full turns to ensure that the connection is open. When closing a screw option, rotate the screw clockwise. Overtightening screw options may damage the printed circuit board.

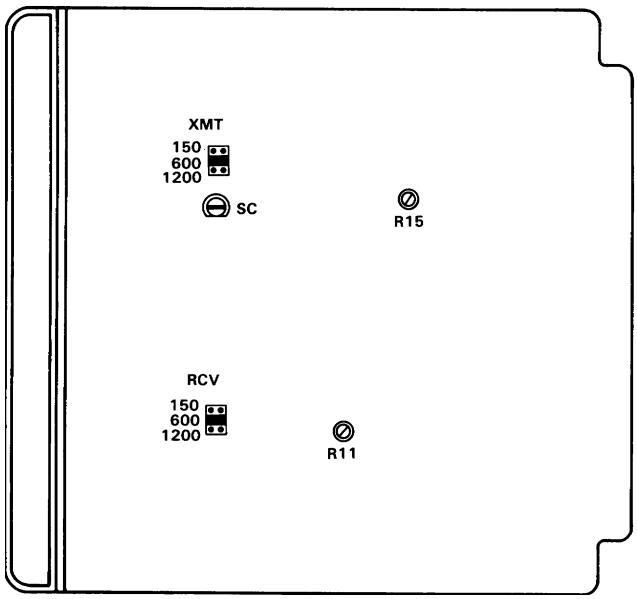

Figure 3. Option Locations

Table 2. Option Description

Label	Position	Function/Notes
SC	Closed	Allows sealing current to be applied to the facility, positive to RCV, negative to XMT. Disables line loopback.
	Open	Allows line loopback
1A, 2A	150	XMT MSTR and RCV MSTR impedance 150 ohms.
	600	XMT MSTR and RCV MSTR impedance 600 ohms.
	1200	XMT MSTR and RCV MSTR impedance 1200 ohms.

6. ALIGNMENT

Use the following alignment procedure to ensure that the receive and transmit channels are adjusted to provide the proper insertion loss

6.1 Test Equipment

The following equipment is required to align and test the unit:

- Transmission Test Set (TTS): WECo 23A or Hewlett-Packard 3551 (or equivalent) with self-contained variable frequency oscillator (VFO).
- Charles type 415 (or equivalent) card extender.

Step	Action	Verification
1.	If sealing current is required, verify that the SC option is closed.	
2.	Insert the unit into the 415 card extender and install the 415 into the mounting shelf.	
3.	Condition the VFO to apply a 1000 Hz test tone at 0 dBm, and to match the impedance of the input transformer T1. Connect the VFO to the RCV MSTR (receive master) jack on the unit's front panel.	

Step	Action	Verification
4.	Adjust the TTS for 600 ohms and connect it to the RCV SLV (receive slave) jack.	The desired receive level is indicated on the TTS (0 dBm). If the level is incorrect, continue with step 5. If the level is correct, continue with step 6.
5.	Locate potentiometer R11 and adjust it until the desired level is shown on the TTS.	
6.	Remove the TTS and VFO from the test jacks.	
7.	Connect the VFO to the XMT SLV (transmit slave) jack.	
8.	Adjust the TTS to match the impedance of the transmit line transformer T2 and connect it to the XMT MSTR (transmit master) jack.	The desired receive level is indicated on the TTS (0 dBm). If the level is incorrect, continue with step 9. If the level is correct, continue with step 10.
9.	Locate potentiometer R15 and adjust it until the desired level is shown on the TTS.	
10.	Remove the TTS and VFO from the test jacks. This concludes the alignment procedure.	

7. TESTING

If trouble is encountered with the operation of the unit, verify that all installer connections have been properly made in accordance with Table 1, and that the SC and impedance options have been properly conditioned for the specific application. Ensure that the unit is making proper connection with the card connector; remove and re-insert the unit in the connector. If trouble persists, use the following procedure to test the unit:

Step	Action	Verification
1.	Open screw option SC.	
2.	Mount the unit in the 415 card extender and install the 415 in the shelf.	
3.	Adjust the VFO for an output of 0 dBm at 1000 Hz, and to match the impedance of the RCV MSTR line transformer, T1. Connect the VFO to the RCV MSTR test jack.	
4.	Apply ground to pin 44 of the 415, and battery to pin 14.	Insertion loss is 1 +/–0.5 dB at 600 ohms.
5.	Reverse the lead configuration used in step 4.	The level indicated on the TTS is equip to the sum of the transmit and receive channel insertion losses (for instance, if both amplifiers are adjusted to +3 dB gain, the level should read +6 +/–0.3 dB.
6.	Disconnect all test equipment and reinstall the unit for standard operation.	

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 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
   503 N.E. 15th St., P.O. Box 339
   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 Specifications

Electrical specifications for the unit are as follows:

(a) INSERTION LOSS: Factory-adjusted to 0.0 +/–0.1 dB; adjustment range +9 to –3 dB.

(b) MASTER PORT IMPEDANCES: Optional strapping provides impedances of 150, 600 or 1200 ohms.

(c) SLAVE PORT IMPEDANCES: 600 ohms, nominal.

(d) ECHO RETURN LOSS: Master port, greater than 20 dB; slave port, greater than 20 dB at 600 ohms.

(e) SINGING RETURN LOSS: Master port, 18 dB; slave port, 12 dB at 600 ohms.

(f) FREQUENCY RESPONSE: Less than +/–1.0 dB, 300 to 3300 Hz.

(g) ENVELOPE DELAY DISTORTION: Must not exceed 50 us measured between any two frequencies in the 1000 to 2400 Hz band, and 200 us in the 300 to 3300 Hz band.

(h) HARMONIC DISTORTION: Less than 1 percent total harmonic distortion at levels to +5 dBm.

(i) MAXIMUM OUTPUT: +12 dBm, with less than 10 percent harmonic distortion.

(j) NOISE: Less than 15 dBrnc at any output (with inputs terminated).

(k) LOOPBACK LEVEL: 1.0 +/–0.5 dB, with positive battery on pin 44; +/–0.3 dB, with positive battery on pin 14 (sum of transmit and receive gain levels).

(l) LOOPBACK OPERATE SIGNAL: 20 VDC minimum.

(m) LOOPBACK CURRENT: 20 mA to operate; 14 mA to hold.

(n) LOOPBACK RANGE: 1450 ohms total (including equipment resistance) at 48V operation.

(o) POWER REQUIREMENTS AND LIMITS: 20 mA at –24V (typical); 30 mA at –48V (typical); 45 mA at –56V (maximum).

10.2 Physical Specifications

See Table 3 for the physical characteristics of the

Table 3. 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	1 pound	454 grams
Operating Temperature	32° to 120° F	0° to 49° C
Humidity	to 95% (no condensation)	