7305–45 4/2–4 Data Channel Interface

CLEI™ Code: 8D29W511AA

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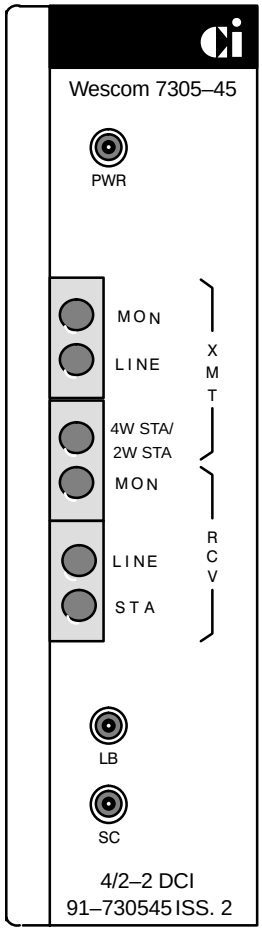

Figure 1. 7305—45 4/2—4 Data Channel Interface

1. GENERAL

1.1 Document Purpose

This document provides general, installation and testing information for the 7305–45 4/2–4 Data Channel Interface (DCI), shown in Figure 1.

1.2 Document Status

This document is reprinted to provide a general editorial update.

1.3 Equipment Function

The 7305–45 4/2–4 Data Channel Interface (DCI), depicted in Figure 1, is a 400-type plug-in module designed for terminating 4-wire cable facilities into a 600-ohm 4-wire or 2-wire modem.

1.4 Equipment Location/Mounting

Mounts in 829MA-6 Data Mounting, TL40XX or TL42XX NCTE Mounting Assemblies, or unwired 400-type mounting shelves.

1.5 Equipment Features

This unit provides the following features:

- Transformer coupling included on all transmission ports
- Switch-selectable 4-wire or 2-wire Side A transmission interface
- Switch-selectable Side B terminating impedance of 150, 600, or 1200 ohms
- Fixed Side A terminating impedance of 600 ohms
- Prescription-adjustable receive gain or attenuation of up to 24dB in 0.1dB increments
- Western Electric Type 309B prescription adjustable post (receive) equalizer in the B to A amplifier
- Equalizer bypass option for flat frequency response applications
- Prescription adjustable transmit attenuation of up to 24dB in 0.1dB increments
- Front-panel-mounted B to A receive (RCV LINE), monitor (MON), and receive station (RCV STA) bantam test jacks
- Front-panel-mounted A to B transmit (XMT 4W STA/2W STA, LINE), and monitor (MON) bantam test jacks
- SXRV-NOR, NOR-SC and SCL-SCG switches for simples lead and sealing current control
- Sealing current optionable for generator or loop closure
- Front-panel-mounted amber SC (sealing current) LED
- 2713Hz tone-activated loopback
- Equal level loopback
- Manually loopback activated by switch or external contact closure
- DTD (tone loopback disable) switch optionable
- Four-minute or 20-minute loopback time-out, switch-selectable
- TEK 5 and TEK 6 leads

- Sealing current path opened during loopback
- Front-panel-mounted red LB LED to indicate loopback status
- Power input can be 24Vac or –22 to –53.5Vdc
- Front-panel-mounted green PWR (power) LED

2. APPLICATION GUIDELINES

The 7305–45 is used to terminate a 4-wire private line voice-band data channel where receive gain and equalization are required. It is installed between the 4-wire metallic facility and the 4-wire or 2-wire modem.

3. CIRCUIT DESCRIPTION

Refer to Figure 2, the 7305–45 4/2–4 DCI Block Diagram (Issue 2), while reading the following circuit description.

3.1 Transmission

3.1.1. Receive Path

VF data transmission from the 4-wire facility appears at the RCV LINE pins 7 and 13 (T and R) and is routed through the RCV LINE and RCV MON jacks to the impedance-matching transformer T1. Transformer T1 provides switch-selectable (S1) impedance of 150, 600, or 1200 ohms for the RCV LINE input port. The GAIN/ATN switch S2 and the B TO A LVL switches on S3 provide up to 24dB of gain or attenuation in 0.1dB increments. The prescription B TO A EQUALIZER provides height (HT) and bandwidth (BW) switches on S4 and slope switches on S5 for for equalizing for H88 loaded and/or nonloaded cable. With switch S6 in the 4W position, data transmission is routed through transformer T3 and the RCV STA jack pins 5 and 15 (DT and DR) for transmission to the receive channel of the 4-wire modem. With switch S6 in the 2W position, data transmission is routed through the 2W hybrid, transformer T4, and the XMT 4W STA/2W STA jack to connector pins 55 and 49 (DT1 and DR1) for transmission to the 2-wire port of the modem.

3.1.2. Transmit Path

VF data transmission from the modem appears at the XMT 4W STA/2W STA pins 55 and 49 (DT1 and DR1) and is routed through the XMT 4W STA/2W STA jack to transformer T4, which provides a fixed 600-ohm impedance toward the modem. Data transmission appearing at the secondary winding of T4 is passed to the active 2W HYBRID which, in the 4W mode, acts as a buffer; in the 2W mode, the 2W HYBRID limits receive path energy from being transmitted to the transmit facility. The A TO B ATN switches on S7 provide up to 24dB of transmit attenuation in 0.1dB increments. The XMT OUTPUT DRIVER provides the required output level for the selected output impedance, switch selectable (S1) for 150, 600, or 1200 ohms. Its output passes through transformer T2 and the XMT LINE and XMT MON jacks to pins 41 and 47 (T1 and R1) for transmission onto the 4-wire facility.

3.2 Loopback

The 7305–45 provides tone-operated or manual loopback. A continuous 2713Hz loopback control signal applied to the receive line for a minimum of 1.8 seconds will satisfy the first condition for loopback operation. Upon removal of the 2713Hz tone, the final condition is satisfied, resulting in the operation and latching of the LB RELAY and illumination of the front-panel-mounted LB LED. The LB RELAY performs the following functions while operated:

- Provides equal loopback levels for 8, 16 or 0dB data channels, selectable from switches S8–1 and S8–2.
- Opens the RCV STA pins 5 and 15 (DT and DR) and XMT 4W STA/2W STA pins 55 and 49 (DT1 and DR1), preventing transmission to and from the modem.
- Opens the sealing current path and extinguishes the amber SC LED if sealing current was present prior to loopback.
- Opens the normally closed loop between the TEK 5 and TEK 6 leads.

Loopback release is accomplished by the re-application of 2713Hz tone to the 7305–45. After 2713Hz tone has been received for approximately 0.9 seconds, the LB RELAY releases and the LB LED extinguishes, ending the loopback condition. The 7305–45 is also equipped with a switch-optioned (S8–5) time-out feature that will automatically end the loopback condition after approximately 4 or 20 minutes.

The DTD switch S8–3 is provided to disable the tone-operated loopback. Manual loopback can be accomplished from switch S8–4 or from an external contact closure between pins 39 and 37 (MLB and MLBG). This feature is operational whether the 2713Hz LOOPBACK DETECTOR AND CONTROL CIRCUIT is disabled or operational.

3.3 Simplex and Sealing Current Generator

The 7305–45 is equipped with switches for controlling the simplex leads and sealing current operation. The SXRV-NOR switch S12 provides for normal or reverse simplex leads and sealing current polarity toward or from the facility. The NOR-SC switch S11 provides external simplex leads (NOR) or sealing current (SC).

The SCL-SCG switch S9 provides for sealing current loop or sealing current generator. In the sealing current loop position (SCL), the 7305–45 loops sealing current provided for the facility. With switch S9 in the SCG position, the 7305–45 generates sealing current provided for the facility when provided with –48Vdc. An amber SC LED is provided to indicate the presence of sealing current.

3.4 Power Supply

The on-board power supply derives the necessary voltages to operate the 7305–45 from a –22 to –53.5Vdc source and power return ground or from a 24Vac (nominal) source, applied at pins 35 and 17, respectively. When internally-generated sealing current is required, the 7305–45 must be powered from a –48Vdc source.

4. INSPECTION

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

Wescom 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 subsequent models that are manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

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.

CAUTION

Do not ship or store modules near strong electrostatic, electromagnetic, or magnetic fields. Use the original static-protective packaging for shipping or storage.

5. MOUNTING

The 7305–45 is a 400-type plug-in module that mounts in the 829MA–6 Data Mounting, TL40XX or TL42XX Mounting Assemblies, or an unwired 400-type mounting shelves. The 7305–45 can also be installed in a Western Electric 46A1 or 46A2 Data Mounting when used with the Charles Industries 829AD–2 Mounting Adaptor.

CAUTION

Installation and removal 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.

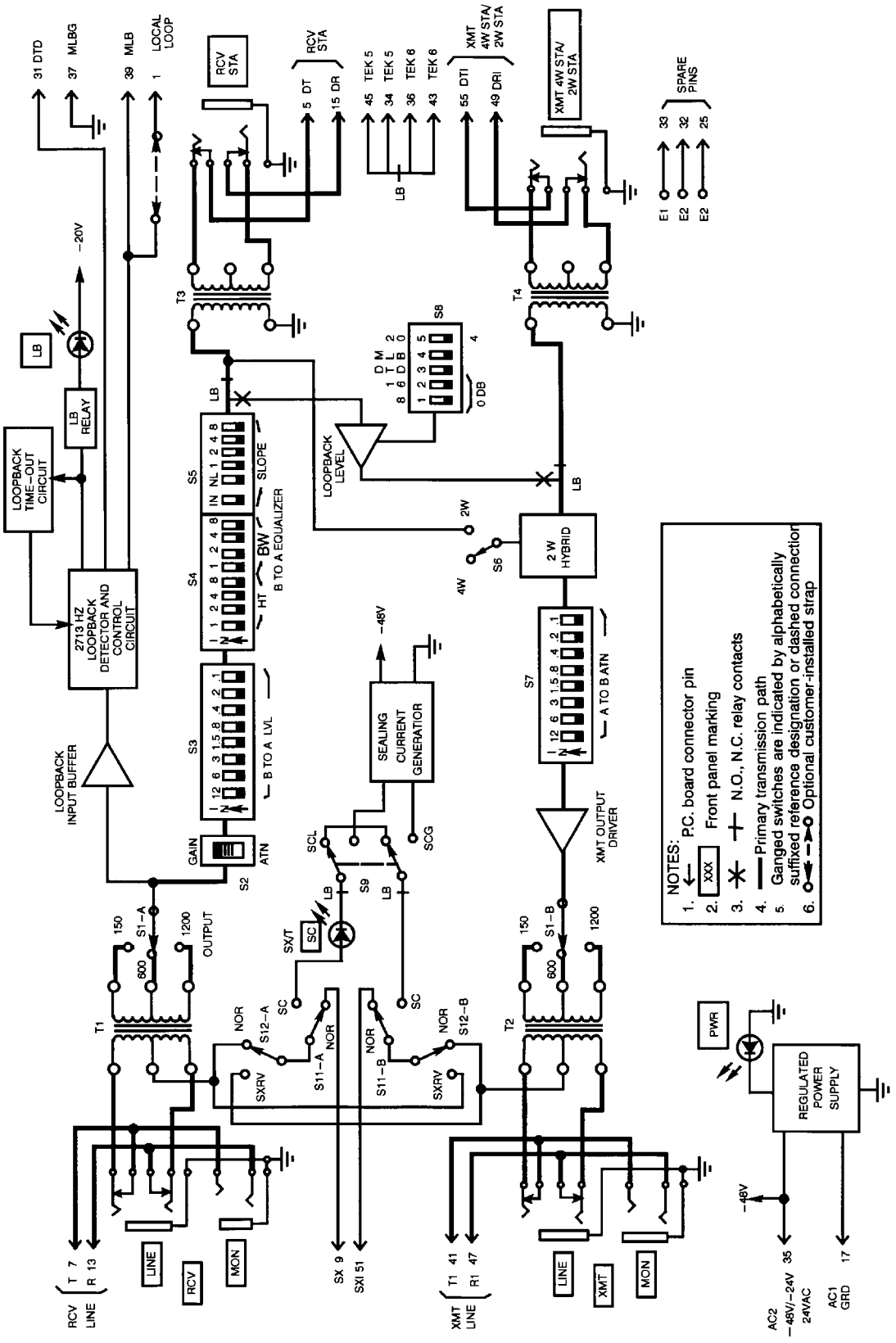

Figure 2. 7305–45 4/2–4 Data Channel Interface Block Diagram

6. INSTALLER CONNECTIONS

When the 7305–45 is installed in Charles Industries mounting shelf, it makes electrical connection to associated equipment through a 56-pin wire-wrap card-edge connector provided as part of the mounting shelf. When using an unwired shelf, make all installer connections to this connector in accordance with Table 1.

When installing the unit in a prewired mounting assembly, refer to the appropriate mounting assembly documents.

Table 1. 7305—45 Installer Connections

Lead Designation		Pin
4W STA/2W STA	DT1 DR1	55 40
RCV Station	DT DR	5 15
XMT Line	T1 R1	41 47
RCV Line	T R	7 13
RCV Line SX	SX	9
XMT Line SX	SX1	51
GRD	AC1	17
–24/–48	AC2	35
DTD	Disable Tone Detector	31
MLB	Manual Loopback	39
MLBG	Loopback Ground	37
Local Loop		1
TEK5		34, 45
TEK6		36,43
Spares	E1 E2 E3	33 32 25

7. OPTIONS

The 7305–45 is equipped with DIP switches and slide switches to condition the module for proper operation in the application. Refer to Figure 3 for the locations of these options while reading the following optioning instructions.

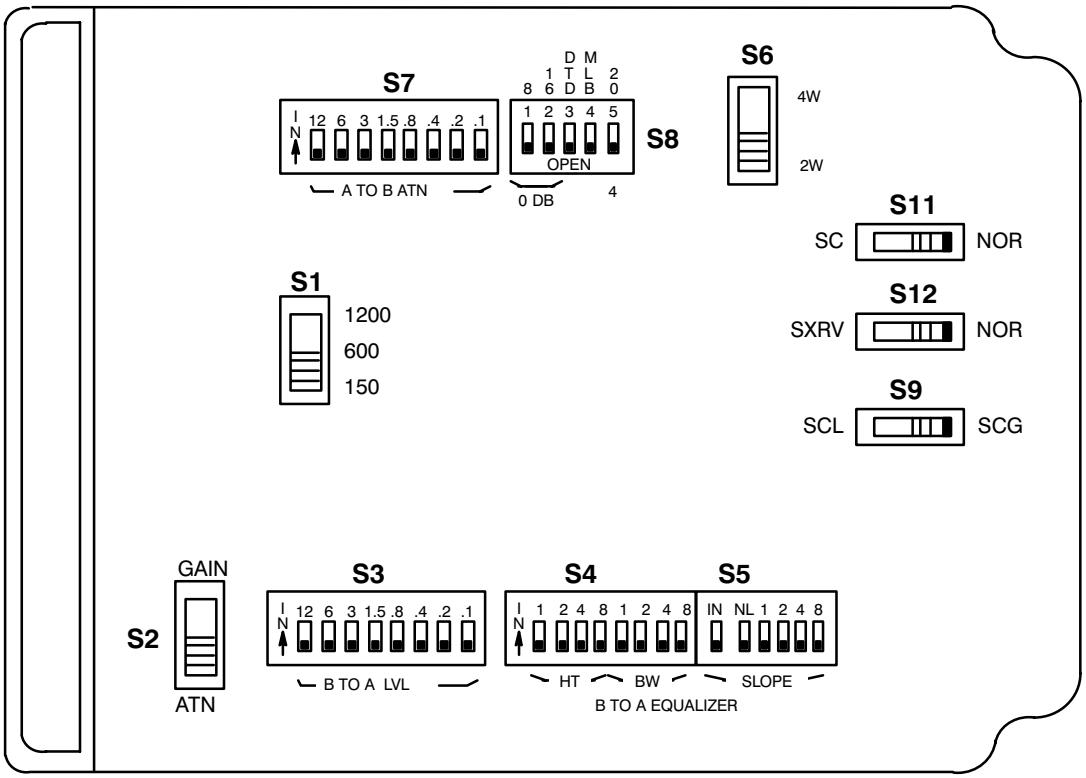

Figure 3. 7305—45 Option Locations

Table 2. 7305—45 Option Summary

Option	Position	Function
S1 (also see Table 3)	150 600 1200	150 ohm transmit & receive side B impedance matching 600 ohm transmit & receive side B impedance matching 1200 ohm transmit & receive side B impedance matching
S2 GAIN/ATN and S3 B to A LVL	See Table 3, Table 4 and Table 5	S2 selects gain or attenuation S3 provides up to 24 dB (additive) in 0.1 dB increments for the receive channel.
S4 and S5 B to A EQLR	Prescription settings for the Western Electric 309B-type equalizer are covered in BSP 332–912–232; manual set-up procedures are covered in BSP 332–912–231.	Western Electric 309B-type receive (posT) equalization for 19, 22, 24, 25 (MAT), and 26 gauge loaded and/or nonloaded cable.
S5 slope	In	Enables equalizer
S56 4W/2W	4W 2W	4-wire modem interface 2-wire modem interface
S7 A to B ATN	See Table 6	Up to 24 dB of attenuation in 0.1 dB increments for the transmit channel.

Option	Position	Function
S8	S8–1 S8–2 to 0 dB	0 dB level difference
	S8–1 to 8	8 dB level difference
	S8–2 to 16	16 dB level difference
	S8–3 to DTD	Disable tone detector (DTD)
	S8–4 to MLB	Manual loopback (MLB)
	S8–5 to 4	4 minute loopback timeout
	S8–5 to 20	20 minute loopback timeout
S9, S11, and S12	See Table 7	Selects the simplex leads and sealing current options.

7.1 Side B Impedance Matching (S1)

Switch S1 selects 150, 600, or 1200 ohms for transmit and receive Side B impedance matching. Option according to Table 3.

Table 3. 4-Wire Facility Impedance Selection

4-Wire Cable	Impedance Selection (ohms) S1 Position
Nonloaded	600 ohms
	150 ohms if transmit (pre) equalization is required
H88 Loaded	1200 ohms
Mixed Loaded and Nonloaded	600 ohms if distance between the interface and first load coil is greater than 9kft.
	150 ohms if distance between the interface and first load coil is greater than 9kft and if transmit (pre) equalization is required.
	1200 ohms if distance between the interface and first load coil is less than 9kft.

7.2 Post-Equalization Adjustment (S4 And S5)

The B TO A EQUALIZER consists of switches S4, which controls the height (HT) and bandwidth (BW), and S5, which controls the slope equalization and equalizer bypass. Except of the IN position on S5, these switches are functionally identical to the 309B equalizer found on many Western Electric transmission modules. When B to A equalization is required, place the left-most switch on S5 to the IN position. Prescription settings for the Western Electric 309B-type equalizer are contained in Bell System Practice (BSP) 332–912–232; manual set-up procedures is covered in BSP 332–912–231.

Note: The 309B-type equalizer introduces low frequency rolloff. When no equalization is required or a flat frequency response of the B to A (receive) amplifier is desired, place the left-most switch on S5 to the IN position, bypassing the equalizer

7.3 B TO A Gain/Attenuation (S2) And B TO A Level (S3)

The B TO A Gain/Attenuation slide switch S2 and B to A level prescription gain DIP switches on S3 provide up to 24dB of gain or attenuation in 0.1dB increments. Condition the B to A level according to Table 4 and the following:

Step	Action
1.	Determine the total 1kHz gain or attenuation required by subtracting the RCV LINE TLP (transmission level point) from the RCV STA TLP. *Note: RCV LINE TLP equals the facility's transmitted TLP minus the 1kHz loss of cable facility (loss is expressed as a positive number).*
2.	If enabled, the active equalizer introduces 1Khz gain as the result of the HT and BW (S4) and/or SLOPE (S5) switch settings. To determine the correct settings for the B to A amplifier, subtract the additional 1kHz gain in dB as a result of HT and BW and/or SLOPE settings from the total required 1kHz gain or attenuation derived in Step 1. *Note: Total 1kHz gain as a result of equalizer switch settings is determined from Paragraph 7.3 and Table 5 and Table 6.*
3.	Program the required level by setting the B TO A LVL switches on S3 equal to the 1kHz gain calculated in step 1 + step 2 $\pm$0.05dB. Set the gain/attenuation switch S2 to the GAIN position if the result of step 1 + step 2 is positive; set switch S2 to the ATN position if the result of step 1 + step 2 is negative.

Table 4. Receive Level Adjustment

S3 Switch IN	S2 Position	
	Gain (dB)	ATN (dB)
12	+12.0	–12.0
6	+6.0	–6.0
3	+3.0	–3.0
1.5	+1.5	–1.5
.8	+0.8	–0.8
.4	+0.4	–0.4
.2	+0.2	–0.2
.1	+0.1	–0.1

Note: Switch settings are additive, up to $\pm$24dB.

Table 5. Additional 1kHz In dB As A Result Of Slope Settings

Slope Setting	NL/L Switch (S3–2)	
	NL	L
0	0.0	0.0
1	0.4	1.4
2	0.9	2.6
3	1.4	3.7
4	1.8	4.7
5	2.3	5.5
6	2.8	6.3
7	3.4	7.2
8	3.7	7.8
9	4.2	8.4
10	4.6	9.0
11	5.0	9.5
12	5.4	10.0
13	5.8	10.5
14	6.2	11.0
15	6.6	11.4

Table 6. Additional 1kHz Gain In dB As A Result Of HT And BW Settings

		HT Setting															
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
BW Setting	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1
	5	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1
	6	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.2
	7	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3
	8	0	0	0	0	0	0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4
	9	0	0	0	0	0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.5
	10	0	0	0	0	0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.7
	11	0	0	0	0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.6	0.7	0.9
	12	0	0	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.8	0.9	1.2
	13	0	0	0.1	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.1	1.3	1.7
	14	0	0	0.1	0.1	0.2	0.3	0.4	0.5	0.7	0.8	1.0	1.2	1.4	1.7	2.0	2.5
	15	0	0	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.5	1.7	2.0	2.4	2.8	3.3	3.9

Note: HT setting '0' disables the bump unit for all BW settings.

7.4 4W/2W Modem Interface (S6)

Place switch S6 in the 4W position when a 4-wire modem interface is required. Place switch S5 in the 2W position when a 2-wire modem interface is required.

7.5 Transmit Attenuation Adjustment (S7)

The prescription A TO B ATN switches on S7 provide up to 24dB of attenuation in 0.1dB increments. Condition the according to Table 7 and the following:

Step	Action
1.	Determine the the attenuation required by subtracting the XMT LINE TLP from the XMT 4W STA/2W TLP.
2.	Program the required transmit attenuation by setting the switches on S7 to the computed equalization ±0.5dB.

Table 7. Transmit Attenuation Adjustment

XMT ATN S6 Switch In	XMT Attenuation (dB)
12	12.0
6	6.0
3	3.0
1.5	1.5
.8	0.8
.4	0.4
.2	0.2
.1	0.1

Note: Switch settings are additive, up to 24dB of attenuation.

7.6 Equal Level Loopback Control (S8)

The loopback control switches S8–1 and S8–2 control the equal level loopback gain. Switch S8–3 (DTD) disables the tone-activated loopback, switch S8–4 (MLB) enables the manual loopback, and switch S8–5 (20/4) provides 4- or 20-minute loopback time-out.

- If the difference between the receive and transmit levels is 8dB, place S8–1 to the 8 position. If the difference is 16dB, place S8–2 to the 16 position. If the difference is 0dB, place S8–1 and S8–2 to the 0dB position.
- To disable the tone-operated loopback, place switch S8–3 to the DTD position.
- To enable the manual loopback, place switch S8–4 to the MLB position. The manual loopback will then be activated regardless of the position of switch S8–3 (DTD) and will not time out until S8–4 is returned to normal (open).
- To enable the 4-minute loopback time-out, place switch S8–5 to the 4 position. To enable the 20-minute loopback time-out, place switch S8–5 to the 20 position. The tone-activated loopback will automatically time out after the period selected by S8–5.

7.7 Simplex Leads And Sealing Current Control (S9, S11, and S12)

Switches S9 (SC–SCG), S11 (NOR–SC), and S12 (NOR–SXRV) control the simplex leads and sealing current options. Condition switches S9, S11, and S12 according to Table 8 and Figure 3.

Table 8. XMT Nonloaded Cable Equalization

Switch Position			Switch Function
S9	**S11**	**S12**	
SCL	NOR	NOR	Normal Side B simplex leads
SCL	NOR	SXRV	Reverse Side B simplex leads
SCL	SC	NOR	Side B sealing current loop
SCG	SC	NOR	Side B sealing current generator

Note: If reverse polarity of sealing current is required, place S12 to the SXRV position.

8. ALIGNMENT

Be certain that all options have been properly conditioned for the application in accordance with Part 7 before beginning the alignment procedure. Following are the alignment procedures for the receive and transmit paths.

The following test equipment is required to properly align the 7305–45:

- Transmission Measuring Set (TMS): Western Electric 23A, Hewlett-Packard 3551 or 3552, or equivalent with self-contained Variable Frequency Oscillator (VFO).
- One open bantam plug.
- Three-conductor test cords having one end terminated in bantam plugs and the other end suitable for connecting to the TMS and VFO.

Note: If TMS- or VFO-connecting cords are terminated in Type 310 plugs, they can be adapted for connecting into bantam jacks by attaching a Charles Industries 003−210367 Type 310 to Bantam Jack Adapter (14 inch).

8.1 B To A (Receive) Alignment Procedure

Step	Action
1.	**Facility Verification** Arrange the TMS for terminated measurement at the impedance specified on the Circuit Layout Record (CLR). Connect the TMS to the B TO A (RCV LINE) MON jack on the front panel of the 7305–45. Insert an open bantam plug into the B TO A LINE jack on the 7305–45 to disconnect the receive amplifier circuit from the receive pair.
2.	Instruct the distant terminal to send a 1000Hz test tone at the required level and impedance specified on the CLR. Verify that the levels measured on the TMS are those specified on the CLR.
3.	If no equalization is required, ensure that all the B TO A EQLR switches on S4 and S5 are OUT. Proceed to Step 5.
4.	**B to A Equalization Adjustment** Program the required B To A equalization by setting the B TO A EQLR switches on S4 and S5 equal to the switch settings specified on the CLR. Refer to Paragraph 7.3. Verify that the left-most position of switch S5 is in the IN position.
5.	**B to A Level Adjustment** Program the required B To A level by setting the B TO A LVL switches on S3 to the level specified on the CLR $\pm$0.05dB. If the required gain is positive, place the B TO A GAIN/ATN switch S2 to the GAIN position. If negative, place the B TO A GAIN/ATN switch to the ATN position. Refer to Paragraph 7.4.

Step	Action
6.	**Receive Side Verification** Arrange the TMS for 600-ohm terminated measurement. Connect the TMS to the B TO A RCV STA jack for 4-wire operation or to the XMT 4W STA/2W STA jack for 2-wire operation. Instruct the distant terminal to send a 1000Hz, a 2800Hz, and then a 400Hz test tone at the required level and impedance. Verify that the levels measured on the TMS are those specified on the CLR.
7.	Remove all test cords and perform the A to B (Transmit) Alignment Procedure.

8.2 A TO B (Transmit) Alignment Procedure

Step	Action
1.	Condition the local VFO to apply a 1000Hz test tone at the required level and impedance specified on the CLR. Connect the VFO to the A TO B XMT 4W STA/2W STA jack on the 7305–45.
2.	Arrange the TMS for terminated measurement at the impedance specified on the CLR. Connect the TMS to the A TO B LINE (XMT LINE) jack on the 7305–45.
3.	Program the required A to B attenuation by setting the A TO B ATN switches on S7 to the level specified on the CLR $\pm$0.05dB. Refer to Paragraph 7.6.
4.	Verify that the level measured on the TMS is that specified on the CLR.
5.	Remove the TMS from the A TO B LINE jack on the 7305–45 and have the distant terminal measure the 1000Hz test tone.
6.	Distant terminal verifies proper power level as specified on the CLR.
7.	This completes the A To B (Transmit) Alignment Procedure. Remove all test connections.

9. TESTING

If trouble is encountered with the operation of the 7305–45, verify that all installer connections have been made in accordance with Part 6, that all options have been arranged as required in Part 7, and that the alignment procedure in Part 8 has been properly performed. Make certain the module is making good connection with the mounting assembly card-edge connector; remove and reinsert the module.

9.1 Remote Verification of Circuit Operation Using Loopback

The 7305–45 contains loopback circuitry for off-premise testing of the transmission circuitry. Use the following procedure to verify circuit operation after installation and for fault diagnosis if problems occur after the module is in service.

Step	Action	Verification
1.	From the Serving Test Center (STC) transmit to the 7305–45 a continuous 2713Hz test tone at the specified level and impedance for a minimum of 1.8 seconds, then remove tone.	During loopback the 7305–45 transmits to the STC all VF energy received from the receive facility at an equal level. (Upon removal of 2713Hz test tone, the LB LED on the front panel of the 7305–45 illuminates, verifying the unit is in the loopback mode.)
2.	From the STC, transmit a 1000Hz test tone at the required level and impedance specified on the CLR. Connect a transmission test set (TMS), arranged for bridging measurement, to the STC's receive line port.	TMS indicates to the STC THAT the transmission (i.e. level) is the level specified on the CLR.

Step	Action	Verification
3.	From the STC, send a 2713Hz test tone at the required level and impedance.	STC stops receiving 2713Hz transmission from the 7305–45, verifying the unit is no longer in the loopback mode. (If loopback release tone is not received within 4 or 20 minutes, as selected on switch S8–5, the 7305–45 will automatically release the loopback condition.) Upon reception of 2713Hz test tone for approximately 0.9 seconds, the LB LED, on the front panel of the 7305–45, will extinguish.
4.	This concludes the remote verification of circuit operation.	The 7305–45 module provides proper operation.

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 pre-

addressed 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

The electrical and physical characteristics of the 7305–45 are as follows:

12.1 Electrical

(a) POWER REQUIREMENTS: Voltage range, –22Vdc to –53.5Vdc or 24Vac (nominal); Current Requirements at –48Vdc*; Idle, less than 50mA; Busy, less than 55mA; Loopback activated; less than 85mA (*Sealing current not included).

Note: Internal sealing current generator requires –48Vdc operation.

12.1.1. Transmission

(a) B TO A REPEATER GAIN: ±24dB.

(b) A TO B REPEATER GAIN: –24dB.

(c) GAIN OR ATTENUATION ADJUSTMENT GRANULARITY: 0.1dB.

(d) B TO A RECEIVE (POST) EQUALIZATION: Western Electric 309B-type equalizer for 19, 22, 24, 25(MAT), and 26 gauge loaded and/or nonloaded cable.

(e) 4-WIRE SIDE B IMPEDANCES: 150, 600, or 1200 ohms.

(f) 4W SIDE A IMPEDANCE: 600 ohms.

(g) 4-WIRE OR 2-WIRE SIDE A INTERFACE.

(h) LONGITUDINAL BALANCE: Greater than 60dB 200 to 3000Hz.

(i) IDLE CHANNEL NOISE: Less than 17dBrnC.

(j) LINE SIDE MAXIMUM (B SIDE) INPUT AND OUTPUT: +8dBm.

(k) HARMONIC DISTORTION: Less than 1 percent (200 to 3400Hz).

(l) TRANS-HYBRID LOSS (2W ONLY): Greater than 35dB ERL.

(m) FREQUENCY RESPONSE: +0.3 to –0.4dB maximum from 300 to 3400Hz relative to 1000Hz, no equalization.

(n) CROSSTALK IMMUNITY: Greater than 75dB isolation between channels or adjacent units 200 to 3400Hz.

(o) PEAK TO AVERAGE DISTORTION: Greater than or equal to 97.

(p) SEALING CURRENT: (1) Polarity controllable, (2) 18mA nominal, (3) Amber SC (sealing current) LED.

12.1.2. Loopback

(q) DETECTOR FREQUENCY: Will detect within 2713 $\pm$7Hz; will not detect outside of 2713 $\pm$35Hz.

(r) DETECTOR AMPLITUDE: Will detect 0 to –30dBm; will not detect less than –40dBm.

(s) DETECTOR TIMING: Activate, 2.5 seconds; deactivate, 1.2 seconds.

(t) EQUAL LEVEL LOOPBACK: 0dB, 8dB or 16dB.

(u) CONTROL OPTIONS: Manual loopback (MLB), Disable Tone Detector (DTD), and 4– or 20–Minute Time-Out (20/4).

12.2 Physical

See Table 9 for the physical characteristics of the unit.

Table 9. Physical Specifications

Feature	U.S.	Metric
Height	5.6 inches	14.2 centimeters
Width	1.4 inches	3.5 centimeters
Depth	6.0 inches	15.2 centimeters
Weight	11 ounces	312 grams
Temperature	32 to 120°F	0 to 49°C