

7305-46 Data Channel Interface W/SC Generator

 UL Recognized – Standard 1459 Second Edition*

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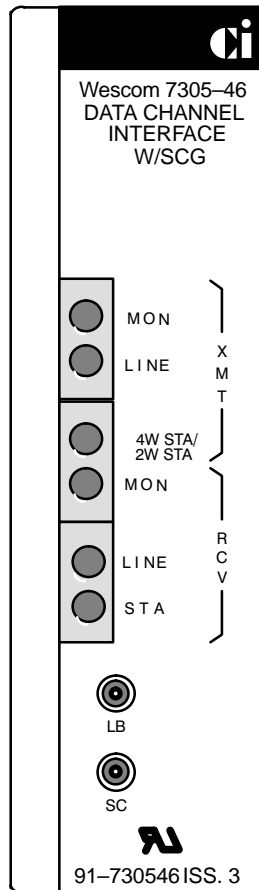


Figure 1. 7305-46 Data Channel Interface

1. GENERAL

1.1 Document Purpose

This document provides general, installation and testing information for the Charles Industries 7305–46 Data Channel Interface (DCI) with Sealing Current Generator, shown in Figure 1.

1.2 Document Status

This document is reprinted to provide a general editorial update.

1.3 Equipment Function

The 7305–46 Data Channel Interface (DCI) with Sealing Current Generator is a 400-type plug-in module that is installed between a 4-wire private line and a 4-wire or 2-wire modem terminating a 4-wire private line voice-band data channel where cable equalization might be required.

CAUTION

Field repairs/modifications may void UL 1459 Second Edition Recognition.

1.4 Equipment Location/Mounting

This unit mounts in 829M*-6 Data Mounting, TL40XX Mounting Assemblies, FlexMount assemblies, or unwired 400-type mounting shelves.

1.5 Equipment Features

305–46 features include the following:

- UL Recognized – Standard 1459 Second Edition
- Switch-selectable line side terminating impedance of 150, 600, or 1200 ohms
- Switch-selectable 4-wire or 2-wire station side transmission interface
- Prescription-adjustable receive gain or attenuation of up to 24dB in 0.1dB increments
- Active prescription-adjustable receive (post) equalization for H88 loaded and/or nonloaded cable
- Prescription-adjustable transmit attenuation of up to 24dB in 0.1dB increments
- Active prescription-adjustable transmit (pre) equalization for nonloaded cable
- Front-panel-mounted RCV LINE, MON (monitor), and STA (station) bantam test jacks
- Front-panel-mounted XMT LINE, MON, and XMT 4W STA/2W STA bantam test jacks
- 2713Hz tone-activated loopback with 15-minute timeout
- Disable Tone Detector (DTD) lead
- Manually-activated loopback option
- Switch-selectable equal level loopback for 8 or 16dB
- TEK 5 and TEK 6 leads that provide loopback status information to the associated modem
- Switch-selectable provision for accepting or generating sealing current
- Front-panel-mounted red LB (loopback) LED and green SC (sealing current) LED
- Power input can be either 24Vac or –22 to –53.5Vdc
- Optional external simplex leads

2. APPLICATION GUIDELINES

The 7305–46 is used to terminate a 4-wire private line voice-band data channel where cable equalization may be required. It is installed between the 4-wire metallic facility and the 4-wire or 2-wire modem. The 7305–46 can be utilized on data channels with a modem interface level of 0dBm data power (+13 TLP) or –8dBm data power (+5 TLP) transmit and –16dBm data power (–3 TLP) receive.

3. CIRCUIT DESCRIPTION

Refer to Figure 2, the 7305–46 DCI Block Diagram (Issue 3), while reading the following circuit description.

3.1 Receive Path

VF data transmission from the receive path of the 4-wire facility appears at the RCV LINE pins 7 and 13 (T and R) and is routed through the RCV LINE jack to the impedance-matching transformer T1. Switch S1 LINE Z provides for switch-selectable receive and transmit line side impedance of 150, 600, or 1200 ohms. The GAIN/ATN switch S2 and the RCV LVL switches on S3 provide up to 24dB of gain or attenuation in 0.1dB increments. The RCV EQLR switches on S4 provide active prescription post equalization for H88 loaded and/or nonloaded cable. The BALANCED OUTPUT DRIVER provides the required drive at a fixed 600-ohm impedance. Switch S5 selects the station interface for 4-wire or 2-wire modems. With switch S5 in the 4-wire position, data transmission is routed through the RCV STA jack to connector pins 5 and 15 (DT and DR) for transmission to the receive channel of the 4-wire modem. With switch S5 in the 2W position, data transmission is routed through 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.

3.2 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 the active 2W HYBRID which, in the 4W mode, acts as a buffer; in the 2W mode, the 2W HYBRID limits RCV path energy from being transmitted to the XMT LINE. The XMT ATN switches on S6 provide up to 24dB of transmit attenuation in 0.1dB increments. The XMT EQLR switches on S7 provide active prescription pre-equalization for nonloaded cable. The VF data signals are then coupled to the transmit impedance matching transformer T2 via the LINE Z impedance selection switch S1. The output of transformer T2 is passed through the XMT LINE jack to pins 41 and 47 (T1 and R1) for transmission onto the 4-wire line.

3.3 2713Hz Tone-Activated Loopback

The 7305–46 provides tone-operated loopback toward the 4-wire facility. A continuous 2713 \pm 22Hz loopback control signal applied to the RCV line at –36dBm minimum for at least 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:

- Loops all voice-band signals from the RCV STA to the XMT STA at equal loopback levels for 8 or 16dB data channels.
- Opens the RCV STA and XMT 4W STA/2W STA paths to the modem, preventing transmission.
- Opens the normally closed loop between the TEK 5 and TEK 6 leads.

Loopback release is accomplished by the reapplication of 2713Hz tone to the 7305–46. 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 7305–46 is also equipped with a timeout feature that will automatically end the loopback condition after approximately 15 minutes.

3.4 Disable Tone Detection (DTD)

The DTD lead (pin 31) is provided to disable the tone-operated loopback. When a ground is placed on the DTD lead, tone-operated loopback cannot occur.

3.5 Manual Loopback

The MLB (manual loopback) lead (pin 39) provides a means of locally activating the loopback. To activate the manual loopback, place a ground on pin 39. The 7305–46 will remain looped back as long as the ground is present.

3.6 Sealing Current Generator

The 7305–46 is capable of generating or looping line side sealing current. This feature is provided to prevent transmission impairment, resulting from dry circuit operation of cables joined by nonsoldered connections. With switch S9 placed in the SCG (sealing current generator) position and –48Vdc power applied to the module, the sealing current generator provides an initial sealing current ZAP (surge) of approximately 100mA, decaying to a nominal 18mA. Placing switch S9 in the SCL (sealing current loop) position conditions the module to loop sealing current supplied from the distant location. A green SC (sealing current) LED indicates the presence of sealing current internally generated or provided from the distant location with positive on receive line and negative on transmit line.

3.7 Power Supply

The on-board power supply derives the necessary voltages to operate the 7305–46 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 7305–46 must be powered from a –48Vdc source.

4. INSPECTION

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

CAUTION

Use approved static-preventive measures, such as static-conductive wrist straps and a static-dissipative mat, when handling modules outside of their protective packaging. Do not ship or store modules near strong electrostatic, electromagnetic, or magnetic fields, or in a highly radioactive environment. Use the original static-protective packaging for shipping or storage.

5. MOUNTING

The 7305–46 is a 400-type plug-in module that mounts in the 829M*–6 Data Mounting, TL40XX Mounting Assemblies, FlexMount assemblies, or unwired 400-type mounting shelves. Refer to Sections 829–M*6–201, TL4–0XX–200, and 040–001–002 for further information on these mounting assemblies.

Note: This module is designed to be used with the Charles Industries 829M–6 or TL40XX mountings. If pre-wired mountings from other manufacturers are used, some wiring modification may be necessary.*

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.

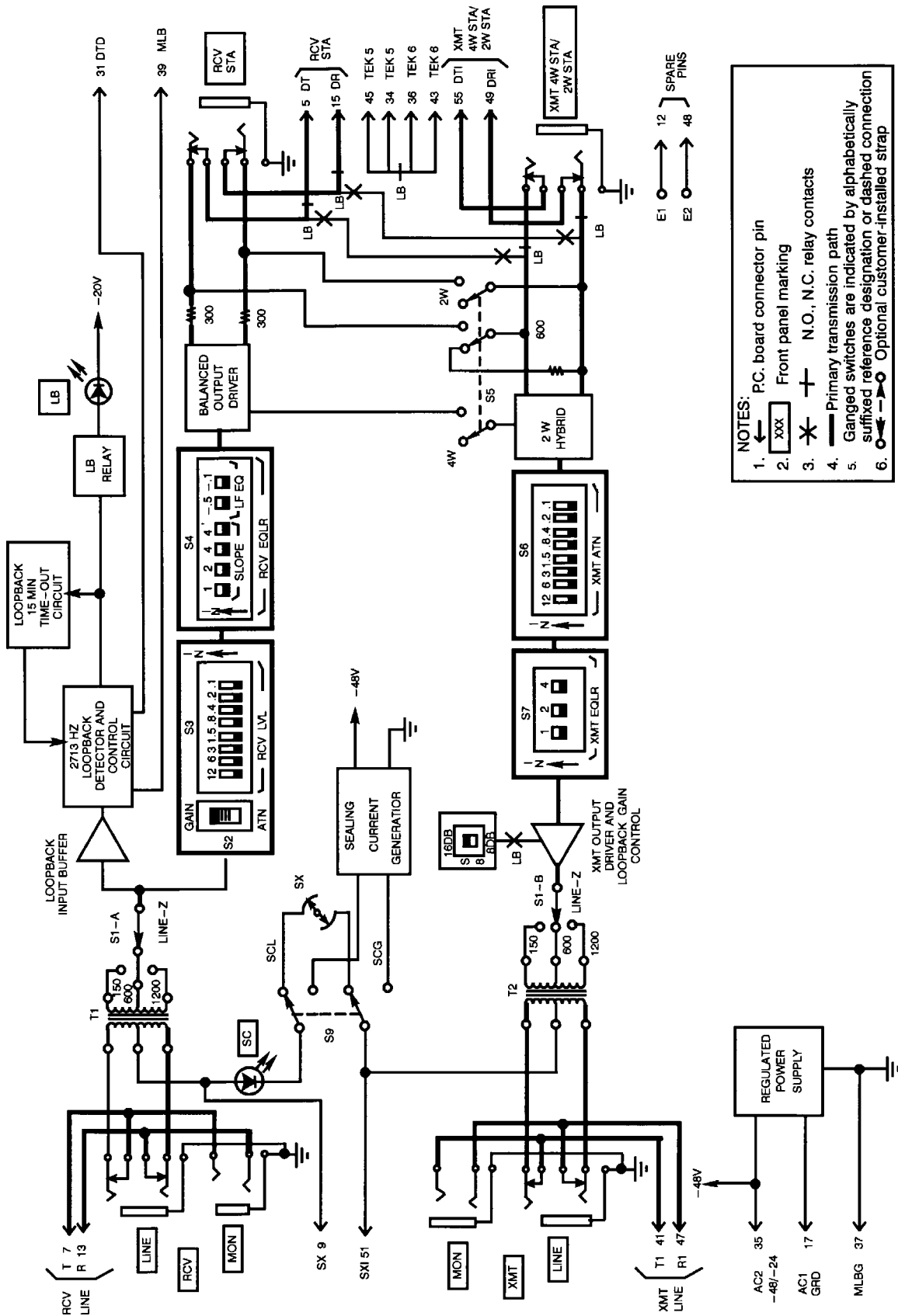


Figure 2. 7305-46 Data Channel Interface with SCG (Issue 3) Block Diagram

6. INSTALLER CONNECTIONS

When the 7305–46 is installed in an unwired 400-type mounting assembly, installer connections are made to a 56-pin, card-edge connector in accordance with Table 1.

Table 1. 7305–46 Installer Connections

Lead Designation		Pin
XMT 4W STA/2W STA	DT1	55
	DR1	49
RCV STATION	DT	5
	DR	15
IN-DATA CLOSURE	TEK5	34/45
	TEK6	36/43
XMT LINE	T1	41
	R1	47
RCV LINE	T	7
	R	13
RCV LINE SX	SX	9
XMT LINE SX	SX1	51
DISABLE TONE DETECTOR	DTD	31
MANUAL LOOPBACK	MLB	39
LOOPBACK GROUND	MLBG	37
GRD	AC1	17
–24/–48	AC2	35

Also refer to Section 829–M*6–201 for maximum length between the modem and the 7305–46.

7. OPTIONS

The 7305–46 is equipped with DIP switches, slide switches, and a screw option 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.

7.1 Line Z Impedance Matching (S1)

Switch S1 LINE Z is used to select 150, 600, or 1200 ohms for transmit and receive line-side impedance matching. Option according to Table 2.

Table 2. 4-Wire Facility Impedance Selection

4-Wire Cable	Impedance Selection 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 DCI and first load coil is greater than 9kft.
	150 ohms if distance between the DCI and first load coil is greater than 9kft and if transmit (pre) equalization is required.
	1200 ohms if distance between the DCI and first load coil is less than 9kft.

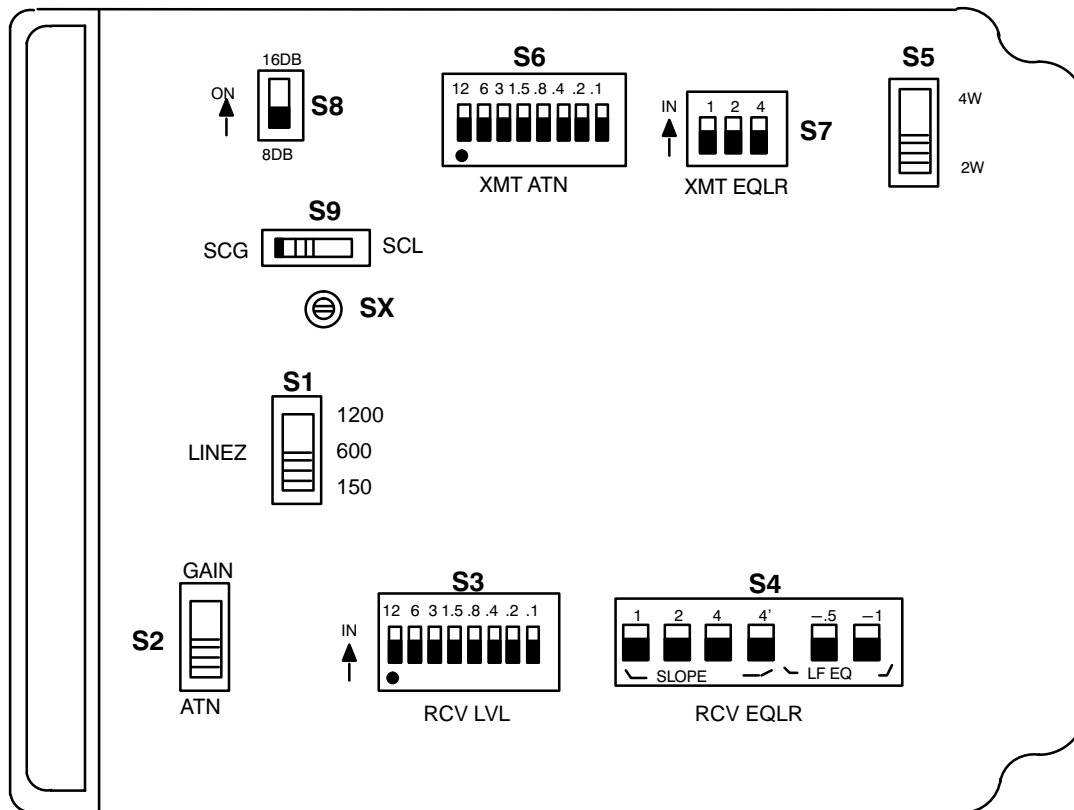


Figure 3. 7305–46 Option Locations

Table 3. 7305–46 Option Summary

Option	Position	Function
S1 LINE Z (Also see Table 2)	150 600 1200	150-ohm transmit and receive line impedance 150-ohm transmit and receive line impedance 150-ohm transmit and receive line impedance
S2 GAIN/ATN S3 RCV LVL	See Table 4	S2 selects gain or attenuation; S3 provides up to 24dB (additive) in 0.1dB increments.
S4 RCV EQLR	See Table 5	Cable equalization, loaded and/or nonloaded. Provides up to 11dB of receive equalization (1000 to 2800Hz) additive in 1dB increments using switches 1, 2, 4, and 4' and up to –1.5dB of receive equalization (1000 to 400Hz) additive in –0.5dB increments using switches –.5 and –.1.
S5 4W/2W	4W 2W	4-wire modem interface 2-wire modem interface
S6 XMT ATN	See Table 6	Up to 24dB of attenuation in 0.1dB increments
S7 XMT EQLR	See Table 7	Cable equalization nonloaded. Provides up to 7dB of transmit equalization (1000 to 2800Hz) additive in 1dB increments using switches 1, 2, and 4.
S8 16dB/8dB	16 dB 8 dB	Selects 16dB of gain. Selects 8dB of gain.
S9 SCL/SCG and Option SX	S9 to SCL SX down (closed) S9 to SCG SX down (closed) S9 to SCL SX up (open)	Sealing current loop Sealing current generator Line side SX leads

7.2 Receive Gain or Attenuation (S2) and Receive Level (S3)

Switches S2 and S3 provide prescription gain or attenuation in 0.1dB increments up to 24dB. Condition the receive level according to Table 4 and the following:

Step	Action
1.	Subtract the RCV LINE transmission level point (TLP) (level received from the line) from the RCV STA TLP (level transmitted to the modem) or from the 2-WIRE STA TLP for 2-wire applications. If the result is negative, attenuation is required.
2.	Set S2 to GAIN or ATN (attenuation) as determined in Step 1; set the RCV LVL switches on S3 for the required amount of gain or attenuation $\pm 0.05\text{dB}$.

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 $\pm 24\text{dB}$.

7.3 Receive Equalization Adjustment (S4)

The RCV EQLR switches on S4 are used to provide up to 11dB of prescription equalization (1000 to 2800Hz) in 1dB increments and up to -1.5dB of low frequency equalization (1000 to 400Hz) in -0.5dB increments. The equalizer pivots around 1000Hz so no RCV LVL readjustment is required. Condition the receive equalizer according to Table 5 and the following:

Step	Action
1.	Determine the 2800Hz and 400Hz losses of the cable with respect to the 1000Hz loss (loss should be expressed as a positive number, gain as a negative number).
2.	Find the line from Table 5 that best matches the facility response and set the switches on S4 as required by that line.

Example

1. Nonloaded cable.
2. 2800Hz cable loss = 13.1dB.
3. 1000Hz cable loss = 5.7dB.
4. 400Hz cable loss = 1.7dB.
5. 2800Hz loss with respect to 1000Hz equals $(+13.1\text{dB}) - (+5.7\text{dB}) = +7.4\text{dB}$.
6. 400Hz loss with respect to 1000Hz equals $(+1.7\text{dB}) - (+5.7\text{dB}) = -4.0\text{dB}$.

7. Choose line from Table 5: 2800Hz = +7.2dB, 400Hz = –4.1dB

8. Set S4 switches 1, 2, 4, and –1 to IN: set 4' and –.5 to OUT.

Note: When no equalization is required, or a flat frequency response of the receive amplifier is desired, place all switches on S4 to OUT.

Table 5. Loaded/Nonloaded Cable Equalization

S2 Switches 'IN' (X)						Equalizer Gain dB*		S2 SWITCHES 'IN' (X)						Equalizer Gain dB*	
Slope				LF EQ		2800Hz	400Hz	Slope				LF EQ		2800Hz	400Hz
1	2	4	4'	-.5	-1			1	2	4	4'	-.5	-1		
						0.0	–0.4			X	X			+6.0	–2.5
				X		+0.2	–0.9			X	X		X	+6.1	–3.0
					X	+0.2	–1.4			X	X		X	+6.2	–3.6
				X	X	+0.3	–2.2			X	X		X	+6.3	–4.4
X						+1.0	–0.9	X	X	X				+7.0	–3.1
X				X		+1.1	–1.4	X	X	X		X		+7.1	–3.6
X					X	+1.2	–1.9	X	X	X			X	+7.2	–4.1
X				X	X	+1.3	–2.3	X	X	X		X	X	+7.3	–4.9
	X					+2.0	–1.1				X	X		+8.0	–4.3
	X			X		+2.1	–1.6				X	X	X	+8.1	–4.8
	X				X	+2.2	–2.1				X	X		+8.2	–5.2
	X			X	X	+2.3	–2.9				X	X	X	+8.3	–5.8
X	X					+3.0	–1.7	X			X	X		+9.0	–4.8
X	X			X		+3.1	–2.1	X			X	X	X	+9.1	–5.3
X	X				X	+3.2	–2.7	X			X	X		+9.2	–5.9
X	X			X	X	+3.3	–3.5	X			X	X	X	+9.3	–6.6
		X				+4.0	–1.9			X	X	X		+10.0	–5.0
		X		X		+4.1	–2.3			X	X	X	X	+10.1	–5.5
		X			X	+4.2	–2.9			X	X	X		+10.2	–6.0
		X		X	X	+4.3	–3.6			X	X	X	X	+10.3	–6.8
X		X				+5.0	–2.4	X	X	X	X			+11.0	–5.6
X		X		X		+5.1	–2.9	X	X	X	X	X		+11.1	–6.0
X		X			X	+5.2	–3.4	X	X	X	X		X	+11.2	–6.6
X		X		X	X	+5.3	–4.2	X	X	X	X	X	X	+11.3	–7.3

*Referenced to 1000Hz level (1000Hz gain is 0dB for all equalization settings).

Note: Choose a response from Table 5 such that both the 2800Hz level difference and the 400Hz level difference are closest to the levels in Table 5.

7.4 4W/2W Modem Interface (S5)

Place switch S5 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 (S6)

The XMT ATN prescription attenuation switches on S6 are used to provide up to 24dB of loss in 0.1dB increments. Condition the transmit level according to Table 6 and the following:

Step	Action
1.	Determine the loss required by subtracting the XMT LINE TLP from the XMT 4W STA/2W STA TLP.
2.	Program the required transmit level by setting the XMT ATN switches on S6 equal to the required attenuation ± 0.05 dB.

Table 6. Transmit Attenuation Adjustment

XMT ATN S6 Switch IN	XMT Attenuation (dB)
12	12.0
6	6.00
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 Transmit Equalization Adjustment (S7)

The prescription transmit (pre) equalizer provides up to 7dB of slope equalization in 1dB increments for equalizing nonloaded cable. The equalizer response pivots around 1000Hz so no XMT ATN readjustment is required. Condition the XMT EQLR switches on S7 according to Table 7 and the following:

Step	Action
1.	Determine the 2800Hz loss of the cable facility with respect to the 1000Hz loss (express loss as a positive number). The required transmit slope equalization equals 2800Hz loss relative to 1000Hz.
2.	Program the required equalization by setting the XMT EQLR switches on S7 to the computed equalization ± 0.5 dB.

Note: Transmit (pre) equalization is only required when insufficient receive (post) equalization is available at the distant end.

Table 7. XMT Nonloaded Cable Equalization

XMT Equalizer S7 Switch "IN" X			2800 Hz GAIN dB
1	2	4	
			0
X			1
	X		2
X	X		3
		X	4
X		X	5
	X	X	6
X	X	X	7

Note: 2800 Hz gain dB referenced to 1000Hz level.

Example

1. Nonloaded cable.
2. 2800Hz cable facility loss: 13.1dB.
3. 1000Hz cable facility loss: 6.1dB.
4. 2800Hz loss relative to 1000Hz loss: (+13.1dB) – (+6.1dB) = 7dB.
5. Set XMT EQLR switches 4, 2, and 1 on S7 to the IN (ON) position.

Note: When no equalization is required or a flat frequency response of the XMT amplifier is desired, place all XMT EQLR switches on S7 to the OUT (OFF) position.

7.7 Equal Level Loopback Adjustment (S8)

The equal level loopback switch S8 provides for 8dB or 16dB of gain. Condition the equal level loopback according to the following:

Step	Action
1.	The required equal level loop gain settings for data channels equal XMT STA TLP minus RCV STA TLP, which should equal either 8dB or 16dB.
2.	Program the required gain by setting switch 8 to 8 dB or 16 dB.

7.8 Sealing Current (S9) and Simplex Leads (SX)

Place switch S9 in the SCG position when sealing current generation is desired from the 7305–46. Place S9 in the SCL position when sealing current is looped for the distant end; screw option SX must be down (closed). When external line side simplex leads are required, place switch S9 in the SCL position and raise (open) screw option SX.

Note: 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 until it seats.

8. ALIGNMENT

Be certain that all options have been properly conditioned for the application in accordance with Part 7 before beginning the alignment procedure.

The following test equipment is required to properly align the 7305–46:

- 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.

The alignment procedures for the receive and transmit paths follow.

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 Receive Alignment Procedure

Step	Action
1.	RCV Line Verification Arrange the TMS for terminated measurement at the same impedance as S1. Connect the TMS to the RCV MON jack on the front panel of the 7305–46. Insert an open bantam plug into the RCV LINE jack on the 7305–46 to disconnect the receive amplifier circuit from the receive pair.
2.	Instruct the distant terminal to send a 1000Hz, a 400Hz, and then a 2800Hz test tone at the required level and impedance. Record the levels from the TMS.
3.	If no equalization is required, ensure that all the RCV EQLR switches on S4 are OUT. Proceed to step 6.
4.	Cable Equalization Calculate the required equalization by subtracting the 2800Hz and 400Hz levels recorded in Step 2 from the 1000Hz level recorded in Step 2.
5.	Find the line from Table 5 that provides the flattest frequency response and set the RCV EQLR switches on S4 as specified by that line.
6.	RCV Level Adjustment Program the required receive level by setting the RCV LVL switches on S3. If the required gain is positive, place the RCV GAIN/ATN switch S2 to the GAIN position. If negative, place the GAIN/ATN switch to the ATN position.
7.	RCV STA Verification Arrange the TMS for 600-ohm terminated measurement. Connect the TMS to the RCV STA jack with S5 in the 4W position; or, connect the TMS to the XMT 4W STA/2W STA jack with S5 in the 2W position.
8.	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 correct.
9.	Remove all test cords and perform the transmit alignment procedure.

8.2 Transmit Alignment Procedure

Step	Action
1.	Condition the local VFO to apply a 1000Hz test tone at data power (0dBm or –8dBm). Connect the VFO to the XMT 4W STA/2W STA jack on the 7305–46.
2.	Arrange the TMS for terminated measurement at the same impedance as S1. Connect the TMS to the XMT LINE jack on the 7305–46.
3.	Program the required transmit attenuation by setting the XMT ATN switches on S6 for the proper transmit data level.
4.	If the distant terminal requires transmit (pre) equalization, program the XMT EQLR switches on S7 equal to the required slope $\pm 0.5\text{dB}$ (7dB maximum).
5.	Verify that the data power level measured on the TMS is correct.
6.	Remove the TMS from the XMT LINE jack on the 7305–46 and have the distant terminal measure the 1000Hz test tone.
7.	Distant terminal verifies proper data power level.
8.	This completes the transmit alignment procedure; remove all test connections.

9. TESTING

If trouble is encountered with the operation of the 7305–46, 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.

The 7305–46 contains loopback circuitry for off-premises 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 7305–46 a continuous 2713 \pm 22Hz test tone at the proper level and impedance for a minimum of 1.8 seconds, then remove tone.	Upon removal of 2713Hz test tone, the LB LED on the front panel of the 7305–46 illuminates, verifying the unit is in the loopback mode.
2.	From the STC, transmit a 1000Hz test tone at the required level and impedance. Connect a transmission test set (TTS), arranged for bridging measurement, to the RCV LINE of the corresponding 4W repeater at the STC.	TTS indicates at the STC the proper transmission level through the unit (gain, impedance, and equal level loopback) is correct for the application.
3.	Repeat Step 2 of the procedure using 400Hz and 2800Hz, respectively.	Equalization provided by the 7305–46 is correct for the application.
4.	From the STC, send a 2713Hz test tone for a minimum of 0.9 seconds at the proper level and impedance. Connect a TTS for bridging measurement to the RCV LINE of the corresponding 4W repeater at the STC.	Upon reception of 2713Hz test tone, the LB LED on the front panel of the 7305–46 stops illuminating, and the STC stops receiving 2713Hz transmission from the 7305–46, verifying the unit is no longer in the loopback mode. If loopback release tone is not received within 15 minutes, the 7305–46 will automatically release the loopback condition.
5.	This concludes the remote verification of circuit operation.	The 7305–46 module operates properly.

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
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

12.1 Electrical

The electrical characteristics of the 7305–46 are as follows:

- (a) **POWER REQUIREMENTS:** –22Vdc to –53.5Vdc; Idle Current, 42mA (max); Busy Current, 46mA (max); Busy Current Loopback Mode, 65mA (max); 18mA (nominal) additional current required when generating sealing current.
Unit can be powered from a 24Vac 7.5VA source.
Internal Sealing Current Generator requires –48Vdc operation.
- (b) **RECEIVE LEVEL:** ± 24 dB in 0.1dB increments prescription-set from the printed circuit board.
- (c) **TRANSMIT ATTENUATION:** 24dB in 0.1dB increments prescription-set from the printed circuit board.
- (d) **RECEIVE EQUALIZATION:** Loaded and/or nonloaded cable equalization provides up to 11dB of receive equalization (1000 to 2800Hz) additive in 1dB increments, using S4 switches 1, 2, 4, and 4', and up to –1.5dB of receive equalization (1000 to 400Hz) additive in –0.5dB increments, using S4 switches –.5 and –1.
- (e) **TRANSMIT EQUALIZATION:** Provides up to 7dB of transmit equalization (1000 to 2800Hz) additive in 1dB increments using switches 1, 2, and 4 on S7.
- (f) **4W OR 2W STATION IMPEDANCE:** 600 ohms.
- (g) **4-WIRE LINE IMPEDANCES:** 150, 600, or 1200 ohms, set via slide switch.
- (h) **MAXIMUM INPUT AND OUTPUT:** +8dBm.
- (i) **HARMONIC DISTORTION:** Less than 1 percent (300 to 3400Hz).
- (j) **FREQUENCY RESPONSE:** ± 1 dB from 300 to 3400Hz relative to 1000Hz, no equalization.
- (k) **IDLE NOISE:** Less than 13dBmC at maximum gain.
- (l) **CROSSTALK IMMUNITY:** Greater than 70dB isolation between channels or adjacent units 300 to 3400Hz.
- (m) **LONGITUDINAL BALANCE:** Greater than 60dB 300 to 3400Hz.
- (n) **ENVELOPE DELAY DISTORTION:** Less than 220 microseconds 300 to 3400Hz.
- (o) **LOOPBACK CONTROL TONE SIGNAL REQUIREMENTS:** Frequency, 2713 ± 22 Hz; level, greater than –36dBm; tone duration (operate), 1.8 seconds, minimum; tone duration (release), 0.9 seconds.
- (p) **EQUAL LEVEL LOOPBACK GAIN:** 8dB or 16dB adjusted from printed circuit board.
- (q) **RETURN LOSS:** 4W, greater than 20dB ERL; 2W, greater than 30dB ERL.
- (r) **TRANS-HYBRID LOSS:** Greater than 42dB ERL (applies to 2W mode only).
- (s) **SEALING CURRENT:** Initial surge nominally of 100mA, decaying to a nominal 18mA (0 ohm loop). Sealing current 0 to 2k ohm loop, 15 to 23mA.

12.2 Physical

See Table 8 for the physical characteristics of the 7305–46:

Note: This module is intended for use with Charles Industries mountings. If prewired mountings from other manufacturers are used, some wiring modification may be necessary.

Table 8. 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	0.9 pound	408 grams
Temperature	32 to 120°F	0 to 49°C

