

7306-32 and 7534-01 Adaptive 2W-2W Repeater Modules

 Complies with UL Standard 1459 Second Edition* (7306-32 only)
CLEI™ Code: MT22WF12AB (7306-32 only)

CONTENTS	PAGE
Part 1. GENERAL	2
Part 2. INSPECTION	2
Part 3. APPLICATION GUIDELINES	3
Part 4. CIRCUIT DESCRIPTION	4
Part 5. MOUNTING	6
Part 6. INSTALLER CONNECTIONS	6
Part 7. OPTIONS	7
Part 8. ALIGNMENT	8
Part 9. TESTING	13
Part 10. TECHNICAL ASSISTANCE	13
Part 11. WARRANTY & CUSTOMER SERVICE	13
Part 12. SPECIFICATIONS	15

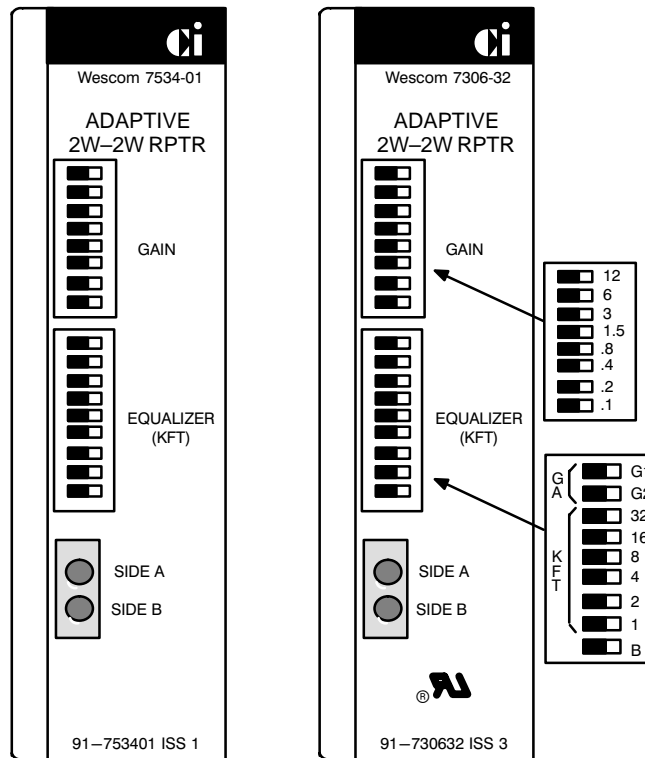


Figure 1. 7306-32 and 7534-01 Front Panels

1. GENERAL

1.1 Document Purpose

This document provides information for the Charles Industries 7534-01 (Equipment Issue 1) and 7306-32 (Equipment Issue 3) Adaptive 2W–2W Voice Frequency Repeater (VFR) modules. The modules are shown in Figure 1.

1.2 Document Status

This document is reprinted to correct the equipment issue number on the first page and to include a general editorial update.

1.3 Equipment Function

The 7306-32 is designed to provide up to 13.5dB of gain on a 2-wire facility comprised of loaded or nonloaded cable. The 7306-32 is a self-adapting repeater with circuitry that automatically and continuously adjusts for optimum return loss. The 7306-32, therefore, requires fewer option settings than a conventional hybrid repeater.

The 7534-01 module is identical to the 7306-32 except for compliance to UL 1459 – Second Edition and the PC board pin assignments. See Figure 4 for details. Throughout the remainder of this document, references and details pertaining to the 7306-32 also include the 7534-01 module, except where otherwise stated.

CAUTION

<p>Field repairs/modifications may void compliance with UL 1459 – Second Edition. 7306-32 compliance with UL 1459 – Second Edition is restricted to inside plant wiring.</p>

1.4 Equipment Location/Mounting

The Charles Industries 7306-32 and 7534-01 Adaptive 2W–2W Voice Frequency Repeater (VFR) modules are plug-in modules designed to mount in the transmission position of a Charles Industries 400-type (or equivalent) mounting assembly.

1.5 Equipment Features

The repeater provides the following features:

- Loop current detection
- Fixed side B terminating impedance of 900 ohms in series with 2.15uF
- Switch selectable side A terminating impedance of 900 ohms in series with 2.15uF or 600 ohms in series with 2.15uF (600 ohms + 2.15uF option is for terminal applications only, where cable is on side B)
- Interfaces up to 9dB (14dB total for intermediate applications) of nonloaded cable, H88 or D66 loaded 19, 22, 24, 25(MAT) or 26-gauge cable, or terminal equipment
- Side A and side B can interface up to 9dB 1kHz loss of cable per side, or 15dB total cable length for intermediate applications. Cable may be loaded or nonloaded, 19, 22, 24, 25(MAT) or 26 gauge
- Bypass or external signaling inductors for the A&B leads on side A and side B
- Side A and side B surge protection
- Integral inductors for the A&B leads on side A and side B
- Front-panel-mounted DIP switch for prescription gain of 0 to 13.5dB in 0.1dB steps
- One switch for B TO A and A TO B gain adjustment
- Front-panel-mounted DIP switch for prescription equalization of nonloaded cable, from 0 to 63kft in 1kft increments
- One switch for B TO A and A TO B equalization adjustment
- Bump equalization for loaded cable

- Front-panel-mounted side A and side B monitor jacks
- Switch for RPTR enable or external control via RE lead
- –22 to –56Vdc supply operation
- No precision balance network (PBN) required
- BYP and EXT signaling control switch

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.



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. APPLICATION GUIDELINES

The 7306-32 is designed for use as a 2-wire to 2-wire intermediate or terminal repeater. The side A and side B can interface up to 9dB (14dB total for intermediate applications) of nonloaded cable, H88 or D66 loaded 19, 22, 24, 25(MAT) or 26-gauge cable, or terminal equipment.

The 7306-32 is designed to be used with a companion signaling module as well as in a stand-alone configuration. The BYP, EXT option provides routing control for the A&B leads to the signaling module or a cut-through mode when used in a stand-alone configuration.

When the 7306-32 is used in a terminal application, the cable should be assigned to side B.

Figure 2 and Figure 3 illustrate typical 7306-32 applications.

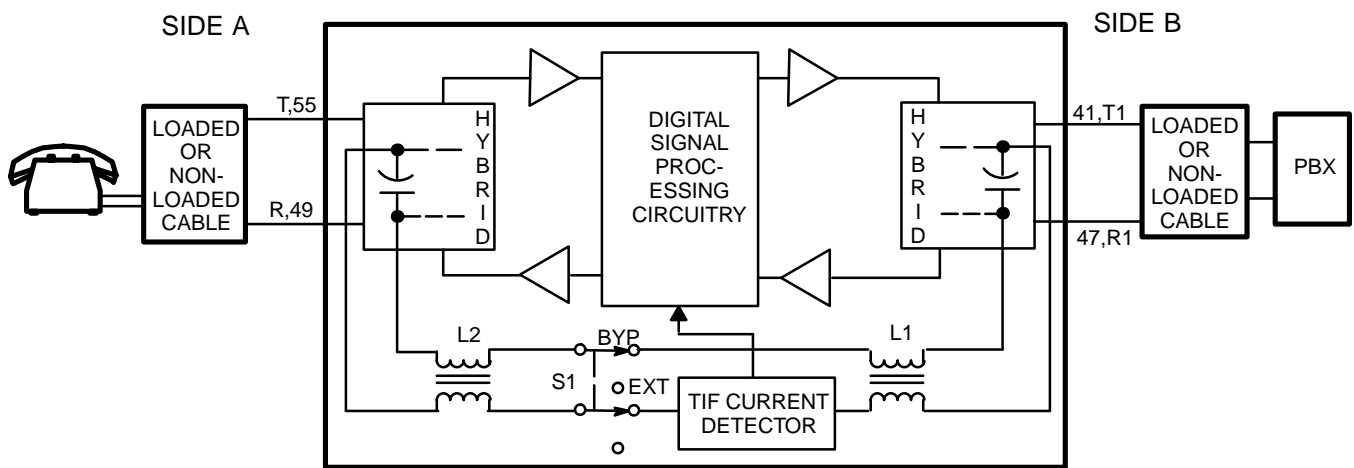


Figure 2. 7306-32 Stand-Alone Configuration as an Intermediate Repeater

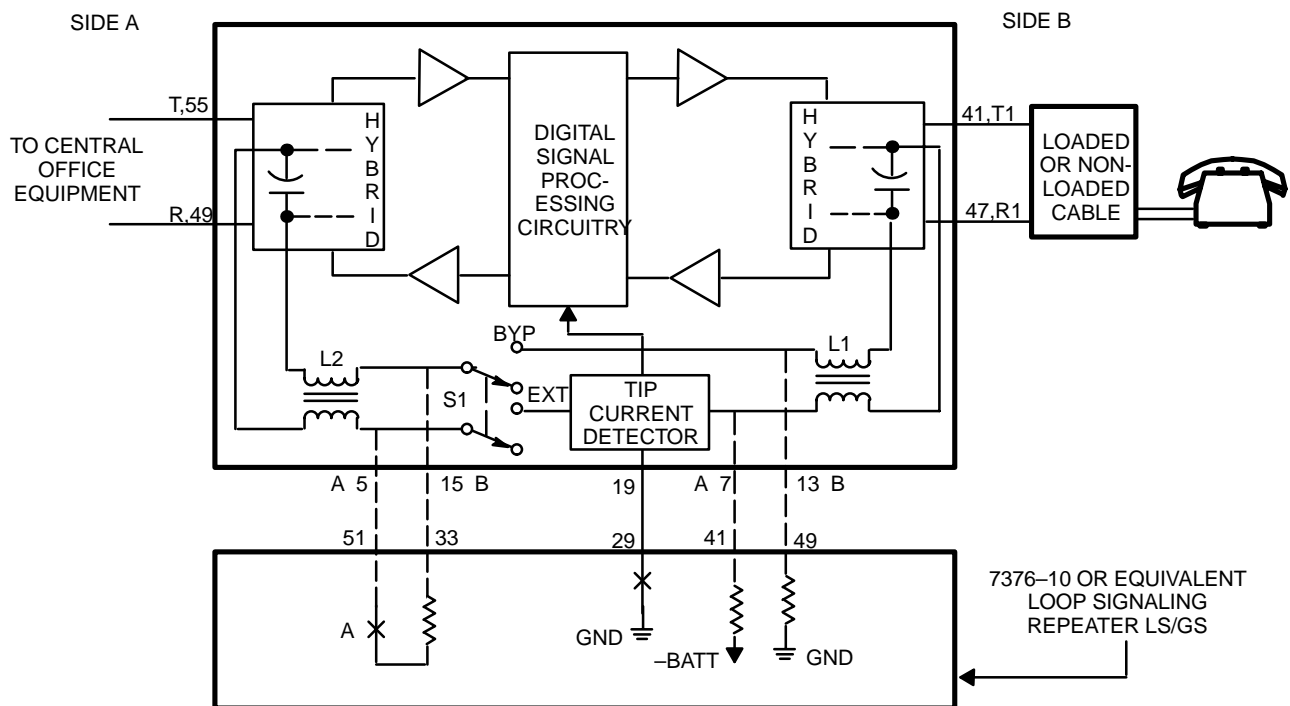


Figure 3. 7306-32 Two Module Arrangement with a Loop Signaling Repeater LS/GS

4. CIRCUIT DESCRIPTION

The 7306-32 provides signaling and transmission interface between a 2-wire facility and a 2-wire circuit. It also provides level control in both the transmit and receive paths. Refer to Figure 4, the 7306-32 block diagram.

4.1 Side A Interface

The Side A voice path of the 7306-32 is connected to the 2W facility at either 900 ohms in series with 2.15uF or 600 ohms in series with 2.15uF impedance. Transformer T2 and its associated electronic circuitry, which form the side A interface, is designed to interface equipment (in a terminal application) or cable (in an intermediate application). The side A A&B lead capacitor C1 and the A&B lead inductor L2 are provided for DC proper isolation.

4.2 Side B Interface

The Side B voice path is connected to the 2W facility at a fixed impedance of 900 ohms in series with 2.15uF. Transformer T1 and its associated electronic circuitry, which form the side B interface, is designed to interface

cable in a terminal application or in an intermediate application. The side B A&B lead capacitor is C2. The A&B lead inductor L1 is provided for additional DC isolation.

4.3 Gain and Equalization

Option switches S5 and S6-1 thru S6-9 on the 7306-32 provide equal amounts of gain and equalization in both the receive and transmit transmission paths. The gain (S5) is adjustable from 0.0 to 13.5dB in 0.1dB increments. Slope equalization from 0.0 to 11.0dB is adjusted by setting switch S6-1 thru S6-8 to the total length and dominant gauge of the nonloaded cable. Cable gauges of 19, 22, 24, 25(MAT), or 26 can be equalized in 1kft increments. A high frequency bump equalizer is also provided. With switch S6-9 in the ON (B) position, a 3dB boost is provided at 2800Hz. This is helpful in equalizing loaded cable that is not perfectly loaded.

4.4 Power Supply

The on-board REGULATED POWER SUPPLY operates from a -22 to -56Vdc (nominal) source connected to pin 35. Power return ground is connected to pin 17.

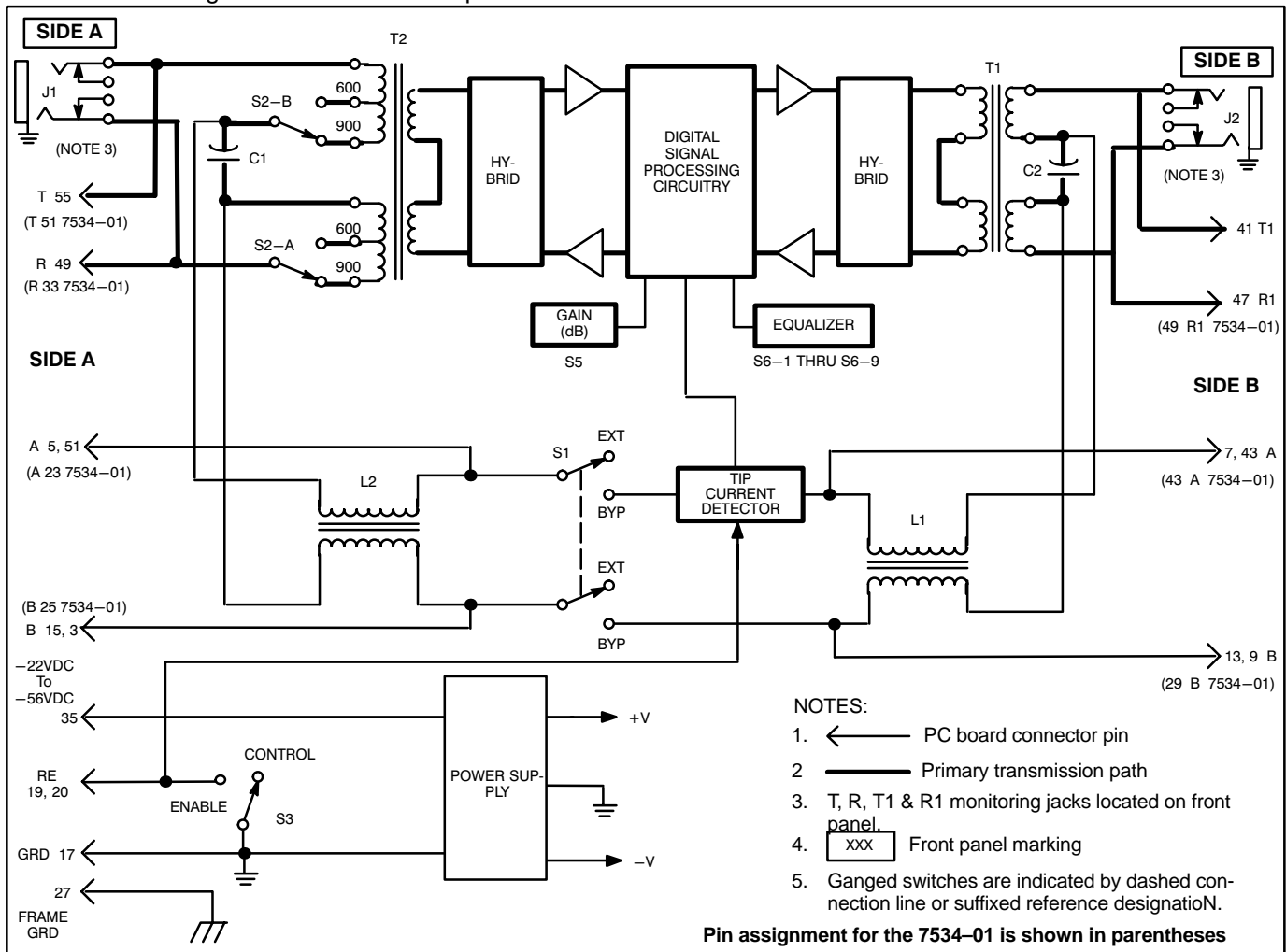


Figure 4. 7306-32 Adaptive 2-2 Repeater Block Diagram

4.5 Repeater Enable

Operation of the 7306-32 can be controlled by loop current or by a companion signaling unit, via leads 19 or 20, by setting S3 to CONTROL (refer to Figure 3). When switch S3 is set to ENABLE, the 7306-32 is permanently enabled.

Note: For intermediate applications **ONLY**, where an extended DC loop range is desired, placing switch S3 in the ENABLE position will extend the signaling range by 150 ohms.

When S3 is in the CONTROL position and the companion signaling unit detects an idle condition, the 7306-32 will go into a stand-by mode. In the stand-by mode no signal is passed and power consumption is reduced. Additionally adaptation is halted and all information is saved. Therefore, when the repeater is enabled again, adaptation will start from its previous state. If the cable characteristics have not changed, the repeater will immediately provide an optimum return loss without performing further adaptation (adjustment).

5. MOUNTING

The 7306-32 is a 400-type plug-in module designed to mount in one position of 400-type mounting assembly.

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.

6. INSTALLER CONNECTIONS

When the 7306-32 is installed in a 400-type mounting assembly, it makes electrical connections to associated equipment through a 56-pin, card-edge connector, provided as part of the mounting assembly. Make all installer connections to this connector in accordance with Table 1.

Table 1. 7306-32/7534-01 Installer Connections

Lead Designation		Pin	
		7306-32	7534-01
Side A	T	55	51
	R	49	53
Simplex Side A	A	5, 51	23
	B	15, 3	25
Side B	T1	41	41
	R1	47	49
Simplex Side B	A	7, 43	43
	B	13, 9	29
-22Vdc to -56Vdc		35	35
GRD		17	17
Repeater Enable		19, 20	19, 20
Frame Ground		27	27

7. OPTIONS

The following paragraphs describe the options that are used to condition the 7306-32 for proper application and operation. Refer to Figure 5 and Table 2 for locations and a summary of the options.

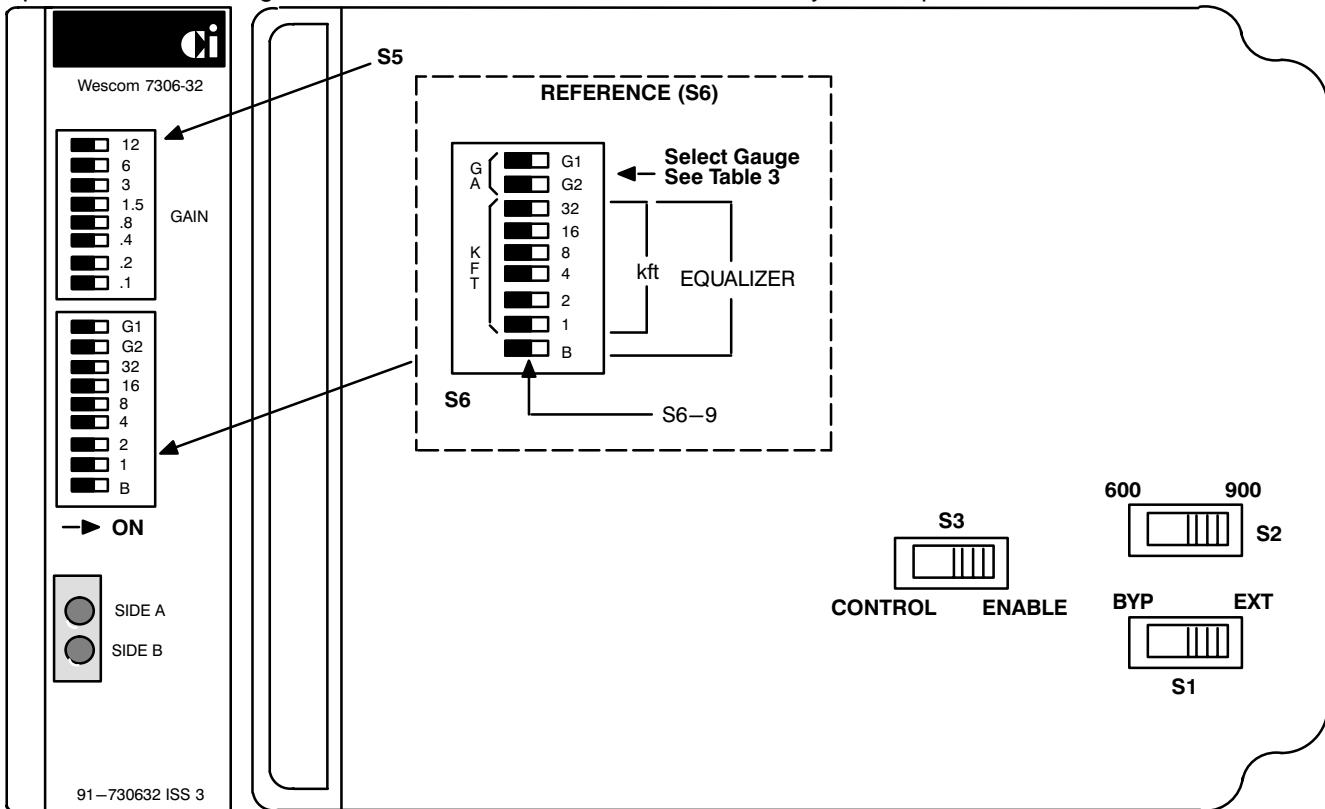


Figure 5. 7306-32 Option Locations

Table 2. Optioning Summary

Label	Position	Function
S1	BYP	Bypass or Cut-thru. Shunts signaling path from side A to side B through L1 and L2. The A&B leads remain connected to pins 5, 51, and 15, 3 (side A), and pins 7,43 and 13,9 (side B).
	EXT	External. Side A A&B leads (pins 5, 51 and 15, 3) through L2 to side A. side B A&B leads (pins 7, 43 and 13, 9) through L1 to side B.
S2	600	600 ohm +2.15uF side A termination impedance. <i>Note: 600 ohm +2.15uF is for terminal applications only, where cable is on side B.</i>
	900	900 ohm +2.15uF side A termination impedance.
S3	Enable	Repeater applications without DC signaling
	Control	Repeater enabled by loop current or a companion signaling unit via pins 19 and 20.
S4	—	Designation not used on this module
S5	See Table 3	Receive and transmit path gain adjustment of up to + 13.5dB in 0.1dB steps
S6-1 thru S6-8	See paragraph 7.5	Provides slope equalization for the receive and transmit paths. Provides up to 63kft, in 1kft increments, for 19, 22, 24, 25(MAT), and 26 gauge nonloaded cable. <i>Note: Place S6-1 thru S6-8 to OFF if only loaded cable is used.</i>
S9	ON	Provides high frequency bump-type equalization for the receive and transmit paths.
	OFF	No bump-type equalization.

7.1 Switches S1 (BYP, EXT) Simplex Lead Control

Switches S1 (BYP, EXT) is used to condition the simplex leads according to Figure 5.

7.2 Switches S2 (600, 900) Side A Termination

Switch S2 is used to select Side A termination impedance of 600 ohms + 2.15uF or 900 ohms + 2.15uF.

7.3 Switch S3 (CONTROL, ENABLE) Repeater Enable

Note: Switch settings are additive up to a maximum of 13.5dB.

Switch S3 in the CONTROL position to allows the 7306-32 to be enabled by DC loop current or from a companion signaling unit through pins 19 and 20. For application without DC signaling, set switch S3 to ENABLE.

7.4 Switch S5 [(Gain dB) (Front Panel)] Transmit and Receive Transmission Paths

Switch S5 provides up to +13.5dB of prescription gain in 0.1dB increments. Switch S5 selects the gain for both directions of transmission. Option per Table 3.

Example No. 1: Switches 1.5 and .8 to the ON = 2.3dB gain.

Example No. 2: Switches 12 and 3 to the ON = 13.5dB (maximum) gain.

Table 3. Receive and Transmit Path Gain Adjustment (S5-Front Panel)




Switch ON	Gain (dB)
12	12
6	6
3	3
1.5	1.5
.8	.8
.4	.4
.2	.2
.1	.1


Note: Switch settings are additive up to a maximum of 13.5dB.

7.5 Switch S6-NL Equalizer, Transmit and Receive Transmission Paths

Switch S6 provides slope equalization of up to +11dB for both directions of transmission by adjusting for the total length of the nonloaded cable as shown in Table 4. For mixed-gauge cable application, set switch S6 for the dominant cable. For near- or far-end bridge taps, add the lengths of bridge tap to the total cable length. For a completely loaded facility, place switches on S6-1 thru S6-8 to OFF. The bump equalizer (S6-9) can be used in loaded cable applications with too much high frequency rolloff. It provides approximately 3dB gain at 2800Hz without affecting low end response. In applications where cable length is not known, equalization can be set by slope using Table 6.

Table 4. NL Cable Equalization Adjustment (When Cable Length and Gauge are Known)

Gauge Selection				Equalization Selection	
Select Gauge	S6-1	S6-2	Example	Select	Switch On
19	OFF	OFF		32 kft	S6-3
22	OFF	ON		16 kft	S6-4
24, 25 (MAT)	ON	OFF		8 kft	S6-5

Gauge Selection				Equalization Selection	
Select Gauge	S6-1	S6-2	Example	Select	Switch On
26	ON	ON		4 kft	S6-6
				2 kft	S6-7
				1 kft	S6-8

Note: Switch settings are additive up to 63kft. Example: Switches S6-1 OFF, and S6-2, S6-4, and S6-8 ON = 17kft of 22 gauge cable.

Table 5. Conversion Scaler for Effective Cable Lengths

Application	Impedance (Ohms)		Total Cable Length	Scaler
	Side A	Side B		
Terminal	900	900	All Lengths	1.00
Terminal	900	600	24kft or less	0.80
			35kft or more	1.00
Terminal	600	900	All Lengths	1.00
Terminal	600	600	24kft or less	0.80
			35kft or more	1.00
Intermediate	900	900	24kft or less	0.80
			25kft to 34kft	1.00
			35kft or more	1.20
Intermediate	900	600	24kft or less	0.70
			25kft to 34kft	0.90
			35kft or more	1.10
Intermediate	600	900	24kft or less	0.70
			25kft to 34kft	0.90
			35kft or more	1.10
Intermediate	600	600	24kft or less	0.60
			25kft to 34kft	0.80
			35kft or more	1.00

Note: Intermediate applications are those with more than 25% of the total cable length on the shortest cable side.

Table 6. NL Cable Equalization Adjustment (When Cable Length and Gauge Are Not Known)

Required Equalization (1000–2800 Hz)	Switch On
1 dB	S6-1, -2, -6, -7, -8
2 dB	S6-1, -2, -5, -8
3 dB	S6-1, -2, -5, -7, -8
4 dB	S6-1, -2, -5, -6, -8
5 dB	S6-1, -2, -4
6 dB	S6-1, -2, -4, -7, -8

Required Equalization (1000–2800 Hz)	Switch On
7 dB	S6-1, -2, -4, -6, -7
8 dB	S6-1, -2, -4, -5
9 dB	S6-1, -2, -4, -5, -7, -8
10 dB	S6-1, -2, -4, -5, -6, -8
11 dB	S6-1, -2, -3, -8

Note: The required equalization selected should be 1 to 2dB less than the actual 1000 to 2800Hz attenuation.

Table 7. Actual Cable Length to Effective Cable Length Conversion

Actual Cable Length (kft)	Effective Cable Length						
	Scaler 0.6	Scaler 0.7	Scaler 0.8	Scaler 0.9	Scaler 1.0	Scaler 1.1	Scaler 1.2
1	1	1	1	1	1	1	1
2	1	1	2	2	2	2	2
3	2	2	2	3	3	3	4
4	2	3	3	4	4	4	5
5	3	4	4	5	5	6	6
6	4	4	5	5	6	7	7
7	4	5	6	6	7	8	8
8	5	6	6	7	8	9	10
9	5	6	7	8	9	10	11
10	6	7	8	9	10	11	12
11	7	8	9	10	11	12	13
12	7	8	10	11	12	13	14
13	8	9	10	12	13	14	16
14	8	10	11	13	14	15	17
15	9	11	12	14	15	17	18
16	10	11	13	14	16	18	19
17	10	12	14	15	17	19	20
18	11	13	14	16	18	20	22
19	11	13	15	17	19	21	23
20	12	14	16	18	20	22	24
21	13	15	17	19	21	23	25
22	13	15	18	20	22	24	26
23	14	16	18	21	23	25	28
24	14	17	19	22	24	26	29
25	15	18	20	23	25	28	30
26	16	18	21	23	26	29	31
27	16	19	22	24	27	30	32
28	17	20	22	25	28	31	34
29	17	20	23	26	29	32	35

Actual Cable Length (kft)	Effective Cable Length						
	Scaler 0.6	Scaler 0.7	Scaler 0.8	Scaler 0.9	Scaler 1.0	Scaler 1.1	Scaler 1.2
30	18	21	24	27	30	33	36
31	19	22	25	28	31	34	37
32	19	22	26	29	32	35	38
33	20	23	26	30	33	36	40
34	20	24	27	31	34	37	41
35	21	25	28	32	35	39	42
36	22	25	29	32	36	40	43
37	22	26	30	33	37	41	44
38	23	27	30	34	38	42	46
39	23	27	31	35	39	43	47
40	24	28	32	36	40	44	48
41	25	29	33	37	41	45	49
42	25	29	34	38	42	46	50
43	26	30	34	39	43	47	52
44	26	31	35	40	44	48	53
45	27	32	36	41	45	50	54
46	28	32	37	41	46	51	55
47	28	33	38	42	47	52	56
48	29	34	38	43	48	53	58
49	29	34	39	44	49	54	59
50	30	35	40	45	50	55	60
51	31	36	41	46	51	56	61
52	31	36	42	47	52	57	62
53	32	37	42	48	53	58	64
54	32	38	43	49	54	59	65
55	33	39	44	50	55	61	66
56	34	39	45	50	56	62	67
57	34	40	46	51	57	63	68
58	35	41	46	52	58	64	70
59	35	41	47	53	59	65	71
60	36	42	48	54	60	66	72

7.5.1. Cable Equalization Settings

Perform the cable equalization settings as follows:

Step	Action
1.	For cable equalization settings based on length and gauge, proceed to step 3.
2.	For cable equalization settings where cable length and gauge is unknown, proceed to step 4.

Step	Action
3.	For data transmission applications, the impedance mismatch between the 600 ohm modem and the 900 + 2.15uF repeater often results in over equalization. Conversion factors (scalers) have been provided to correct any over equalization. Refer to Table 5 and find the appropriate scaler for each application. Use Table 7 to convert actual cable length to effective cable length by finding the actual length in column one and effective cable length in the same row under the appropriate scaler.
4.	For a completely loaded facility, place all switches on S6 to OFF. In applications where cable length is not known, equalization can be set using Table 6. For loaded cable applications, with too much high frequency roll-off, the Bump equalizer (S6–9) provides approximately 3dB gain at 2800Hz without affecting the low end response.

EXAMPLE:

- (a) Application = Terminal
- (b) Impedance = Side A, 900 ohms; Side B, 600 ohms
- (c) Actual cable length = 22kft
- (d) Scaler = 0.80
- (e) Effective cable length = 18kft (per Table 7)
- (f) Set equalization per Table 4.

8. ALIGNMENT

The following test equipment may be required to properly align the 7306-32.

- Transmission Measuring Set (TMS)
- WECO 23A, Hewlett-Packard 3551A, or equivalent with self-contained variable frequency oscillator (VFO)

Gain in the 7306-32 is adjusted to overcome cable losses. To determine the required gain, the 1000Hz cable loss must be known. This can be obtained from the CLR (circuit layout record) if provided. If a CLR is not provided, the 1000Hz cable loss must be measured. All cable measurements should be done with the 7306-32 removed from the shelf.

To measure the 1000Hz cable loss set the variable frequency oscillator (VFO) to 1000Hz, 900 ohms send impedance and 0dB output. With the VFO connected to tip and ring of the cable, have the far end measure the cable with a meter set for 900-ohm terminated measurements.

To calculate the required gain, subtract the VNL (Via Net Loss) from the cable loss (expressed as a positive number). Round off the result to the nearest 0.1dB.

EXAMPLE:

$$\begin{aligned} \text{Cable loss} &= 6.46\text{dB} \\ \text{VNL} &= 3\text{dB} \\ 6.4 - 3 &= 3.46\text{dB} \end{aligned}$$

Set the front panel switch S5 for 3.5dB gain according to Table 3.

Equalization on the 7306-32 is set using cable gauge and length setting as shown in Table 4. For multi-gauge applications, use the dominant cable gauge and total cable length. For equalization where the length and gauge of cable is not known, use Table 6.

When the 7306-32 is used in a terminal application, the cable should be assigned to side B.

9. TESTING

If trouble is encountered with the operation of the 7306-32, verify that all installer connections (Table 1) have been properly made, 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 that the module is making good connection with the mounting assembly card connector; remove and reinsert the module.

10. 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)

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

The electrical and physical characteristics of the 7306-32 are as follows:

12.1 Electrical

- (a) POWER REQUIREMENTS: Voltage Range, –22.0 to –56.0Vdc; maximum current requirements, 65mA at 24Vdc, 35mA at 48Vdc.

12.1.1. Transmission

- (b) 2-WIRE STATION IMPEDANCE: 600 or 900 ohms +2.15uF.
- (c) TRANSMIT AND RECEIVE GAIN: 0 to 13.5dB, in 0.1dB increments adjustable from the front panel.
- (d) EQUALIZATION: 0 to to 63kft of nonloaded cable in 1kft increments. Bump equalization for loaded cable applications.
- (e) IDLE NOISE: 13dBmC.
- (f) LONGITUDINAL BALANCE: 58dB.
- (g) MAXIMUM INPUT LEVEL: 0dBm (+3dBm overload).
- (h) MAXIMUM OUTPUT LEVEL: +6dBm (+9dBm overload)
- (i) RETURN LOSS: 18dB ERL; 12dB SRL LO; 15dB SRL HI (up to 18kft nonloaded cable or up to 30kft of loaded cable).
- (j) CABLE TYPES: Up to 9dB 1kHz loss each side or 15dB total loss intermediate of 19, 22, 24, 25(MAT), or 26 gauge of loaded or nonloaded cable.
- (k) DC LOOP RESISTANCE:
 1. External Signaling Mode; Side A, 120 ohms, Side B, 120 ohms.
 2. Bypass Signaling Mode; 390 ohms with S3 in CONTROL position; 240 ohms with S3 in ENABLE position.
- (l) SIGNAL/DISTORTION RATIO: Minimum 33dB, 0dBm to –30dBm.
- (m) P/AR: ≥ 97 .

12.2 Physical

See Table 8 for the physical characteristics of the unit.

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 (nominal)	20 ounces	567 grams
Temperature	32° to 122°F	0° to 50°C

