3657–05 2–Wire Foreign Exchange Subscriber/Private Line Automatic Ringdown (2W FXS/PLARD) Channel Unit

CONTENTS PAGE

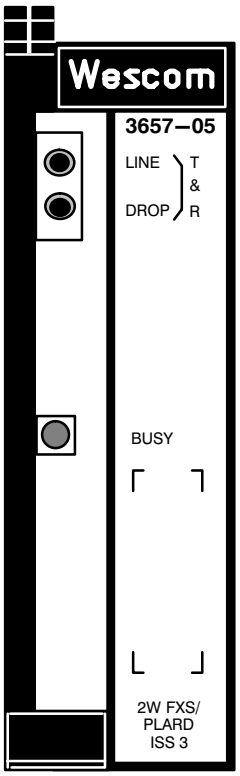

Figure 1. 3657–05 2W FXS/PLARD (Issue 3) Channel Unit

1. GENERAL

1.1 Document Purpose

This document describes and provides installation and operation information for the Wescom 3657–05 2W FXS/PLARD channel unit.

1.2 Document Status

This document is reprinted to include a general editorial update.

1.3 Equipment Function

The Charles Industries 3657–05 2W FXS/PLARD channel unit, shown in Figure 1, is designed to operate in a Wescom Digital Carrier Terminal to provide a variety of subscriber interfaces presently provided by the 3657–00 2W FXS, 3657–04 2W FXS, 3657–02 2W FXS/GT, 3657–70 2W FXS, and the 3660–02 PLARD/MRD.

1.4 Equipment Mounting

The 3657–05 2W FXS PLARD occupies one channel slot of a 360/363 D4 Digital Carrier Terminal.

1.5 Equipment Features

The 3657–05 2W FXS/PLARD includes the following features:

- Compliance with AT&T Publication 43801
- Prescription attenuation (0 to 16.5dB) for the transmit and receive levels
- Compliance with FCC Part 68 and UL1459
- 309D type post-equalization
- On-board comp net and BOC
- Jack for mounting optional 3690–11/12 Precision Balance Network subassemblies
- Switch-selectable 900/600 +2.15μF impedance at the 2W port
- Front-panel bantam jacks for accessing the 2W port
- Front panel BUSY LED
- Switch-selectable signaling for FXS, PLARD, and MEGACOM^{sm} compatibility
- Optional loop-start or ground-start signaling
- Immediate-start and wink-start MEGACOM service for ground-start outgoing calls
- Optional continuous or interrupted ringing in PLARD mode

2. INSPECTION

2.1 Inspect for Damages

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

2.2 Equipment Identification

Charles Industries' equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by 1 and imprinted on subsequent units manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

2.3 Static Concerns

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

STATIC-SENSITIVE

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

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

3. APPLICATION GUIDELINES

The 3657–05 provides the interface between 2W VF extensions of a foreign exchange line, off-premises extensions, or PBX/CO trunks and the common equipment of the 360 channel bank. Some typical applications for the 3657–05 channel unit are shown in Figures 2 through 4.

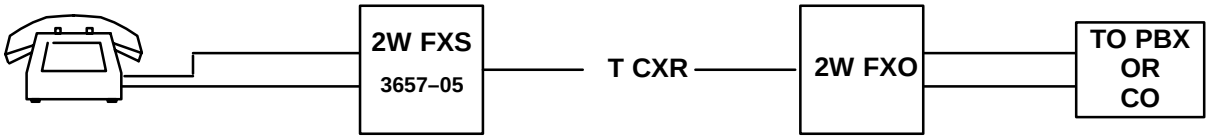

Figure 2. 3657–05 FXS Application

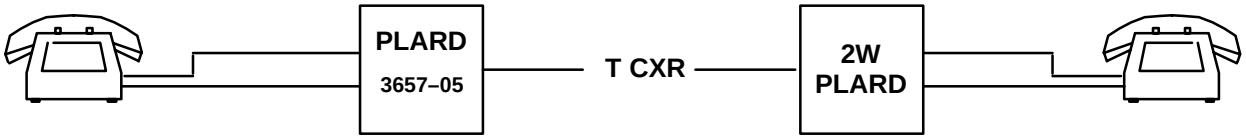

Figure 3. 3657–05 PLARD Application

Figure 4. 3657–05 MEGACOM Application

4. CIRCUIT DESCRIPTION

Refer to Figure 5, the 3657–05 Block Diagram, and to Tables 1, 2 and 3 while reading the following circuit description.

4.1 Transmit VF Path

VF signals applied to T & R are routed through the front-panel DROP and LINE jacks, through the transformer, to the 2W/4W HYBRID circuit. The electronic hybrid circuit converts the balanced 2W input to a 4W interface.

The output of the 2W/4W HYBRID is applied to the POST EQUALIZER, which provides slope adjustment to counter the loss due to lengths of loaded or non–loaded cable connected to the 2W port.

The output of the POST EQUALIZER is applied to the XMT ATTN, which provides 0 to 16.5dB of attenuation in 0.1dB increments. The XMT ATTN combines with the XMT GAIN circuit, which provides a 15.7dB of gain in 0.1dB increments, which allows the input at T & R to range from –10.5 to +6.0dBm.

The adjusted VF signal is then applied to the XMT FILTER for suppression of frequencies which are outside the bandwidth for the standard voice frequency. The signal is then applied to the ENCODER which provides the A/D conversion and sends the resulting PCM signal to the 360/363 common equipment via the XDATA lead. A level of +5.2dBm at the ENCODER input is equivalent to a 0dB level on the digital line.

4.2 Receive VF Path

The PCM digital signal from the far end is received by the 360/363 common equipment and is routed to the channel unit via the RDATA lead. The DECODER then performs a digital-to-analog conversion on this data and outputs an analog signal. The output of the DECODER is fed to the RCV FILTER to suppress frequencies that are outside the standard voice frequency bandwidth. A level of +5.2dBm at the DECODER output is equivalent to a 0dB level on the digital line.

The filtered analog output of the RCV FILTER is then applied to the RCV ATTN circuit, which provides 0 to 16.5dB of attenuation in 0.1dB increments. This circuit, together with the 1.3dB gain from the RCV GAIN circuit, allows the output level at T & R to be adjusted from +6.5 to –10.0dBm.

The output of the RCV ATTN is applied to the 2W/4W HYBRID circuit and through the front-panel DROP and LINE jacks to provide a VF output at T & R. The electronic hybrid circuit converts the unbalanced 4W input to a balanced 2W output at T & R.

4.3 XMT Signaling

4.3.1. FXS Mode

Loop Closure (LC) and Ring Ground (RG) information is multiplexed onto the T1 line by the ENCODER. Loop closure/open loop and ring ground/no ring ground conditions of the T & R leads are detected by the BATTERY FEED & CURRENT DETECTOR circuit, together with the RING TRIP circuit. The output of these circuits are sent to the microprocessor, which, in turn, sends the LC and the RG information to the ENCODER circuit to be transmitted on the A & B signaling highways, respectively (See Table 1).

4.3.2. PLARD Mode

Loop Closure (LC) information is multiplexed onto the T1 line by the ENCODER. Loop closure/open loop conditions of the T & R leads are detected by the BATTERY FEED & CURRENT DETECTOR circuit, together with the RING TRIP circuit. The output of these circuits is sent to the microprocessor, which, in turn, sends the LC information to the ENCODER circuit to be transmitted on the A&B signaling highways (See Table 2).

4.3.3. MEGA Mode

Loop Closure (LC) and Ring Ground (RG) information is multiplexed onto the T1 line by the ENCODER. Loop closure/open loop and ring ground/no ring ground conditions of the T & R leads are detected by the BATTERY FEED & CURRENT DETECTOR circuit, together with the RING TRIP circuit. The output of these circuits is sent to the microprocessor, which, in turn, sends the LC and the RG information to the ENCODER circuit to be transmitted on the A+B signaling highways (See Table 3).

4.4 RCV Signaling

4.4.1. FXS Mode

Signaling information is received by the DECODER circuit, and the A&B signaling highway information is passed to the microprocessor to control the TG and R relays. When optioned for loop-start signaling, the TG relay is always activated.

Tip ground information is received from the far end via the A signaling highway. When the TG relay is activated, filtered battery-ground is applied to the tip lead of the channel unit.

Ringing information from the far end is received via the B signaling highway. When the R relay is activated, ringing is applied to the R lead through the RING TRIP circuit. If loop current is detected by either the RING TRIP circuit or by the BATTERY FEED & CURRENT DETECTOR, the R relay will be deactivated and will be inhibited from operating while loop current is being detected.

4.4.2. PLARD Mode

Signaling information is received by the DECODER circuit, and the A signaling highway information is passed to the microprocessor to control the R relay. When optioned for PLARD signaling, the TG relay is always activated.

Loop closure/open loop information from the far end is received via the A signaling highway. When a far-end loop closure is received, the R relay is activated for 2 seconds and then inhibited for 4 seconds. This 2/4-second pattern is repeated until the A highway returns to its idle condition or until a loop closure is detected by the BATTERY FEED & CURRENT DETECTOR or by the RING TRIP circuit. During the ringing cycle, ringback tone is generated and injected into the ENCODER circuit.

4.4.3. MEGA Mode

Signaling information is received by the DECODER circuit, and the A signaling highway information is passed to the microprocessor to control the TG RELAY and R RELAY. When optioned for loop-start signaling, the TG RELAY is always activated. When the TG RELAY is activated, filtered battery-ground is applied to the tip lead of the channel unit.

For outgoing calls, two modes of operation are available: immediate-start and wink-start. When option switch S5–1 in the ‘1’ position (mode 1), the TG RELAY will operate upon detection of a ring ground on the 2W port, providing immediate start service. When S5–1 is in the ‘2’ (mode 2) position, the TG RELAY will not activate until 100– to 350–milliseconds wink is detected on the RCV A highway.

For incoming calls, when a TG (Tip Ground) is detected from the far end via the RCV A signaling highway, the TG RELAY is activated, resulting in a ringing output for 2 seconds and then inhibited for 4 seconds. This 2/4-second pattern is repeated until the A highway returns to its idle condition or until a loop closure is detected by the BATTERY FEED & CURRENT DETECTOR or by the RING TRIP circuit. During the ringing cycle, ringback tone is generated and injected into the ENCODER circuit.

4.5 Trunk Processing

When a carrier failure occurs, the CGA bus goes to ground, disabling the TG and R relays. If S5–5 is optioned ON, the TG relay will be activated approximately 2.5 seconds after the carrier failure.

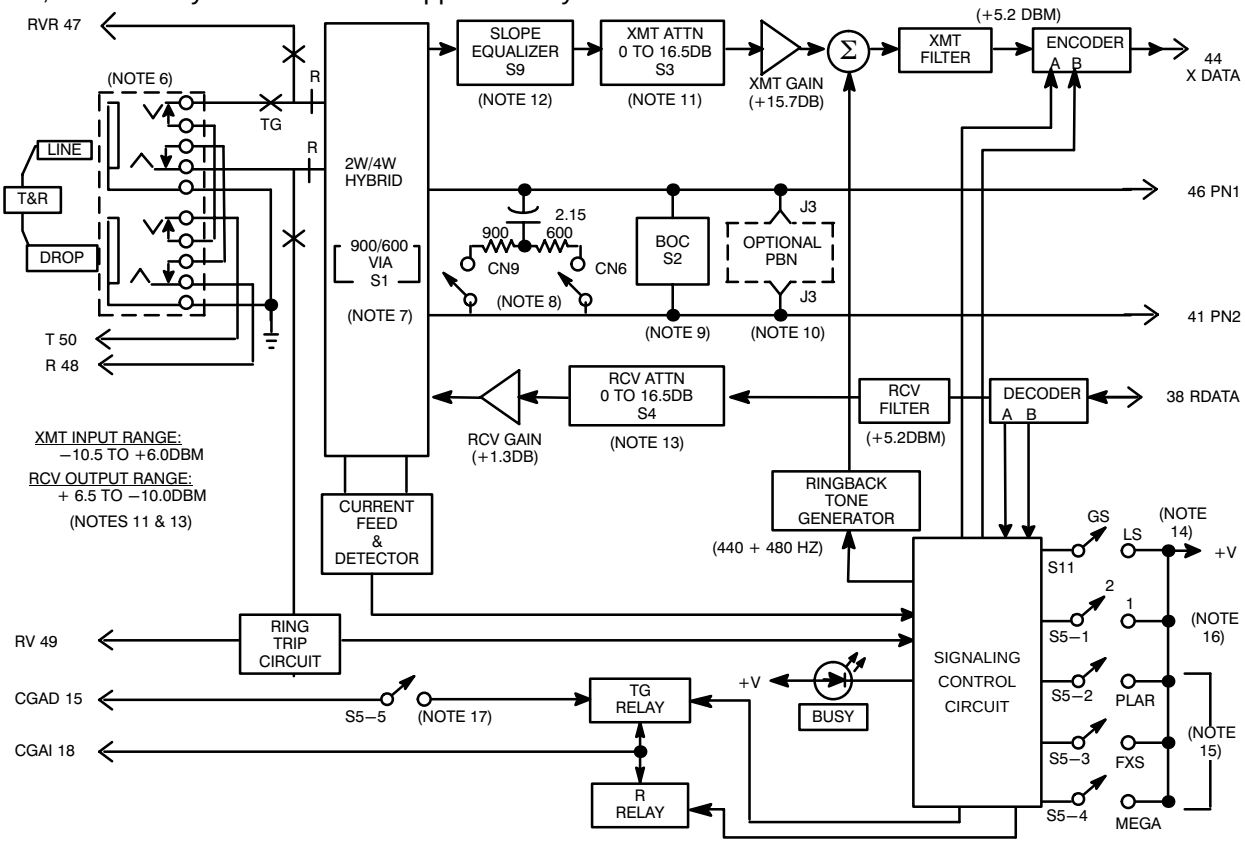

Figure 5. 2W FXS/PLARD Channel Unit (Issue 3) Block Diagram

Notes for Figure 5	
1.	← PCB Connector pin
2.	[XXXXXX] Front-panel marking
3.	→ Signal flow direction
4.	⊣ ⊢ N.O., N.C. Relay contact
5.	Ganged switches are indicated by alphabetically suffixed reference designations. The numerical suffix denotes a discrete switch within a package.
6.	Front panel test jacks: Marking — Function T & R Line — Access towards channel unit T & R Drop — Access towards office equipment
7.	Port impedance selection of 900 +2.15μF or 600 +2.15μF is accomplished via option switch S1.
8.	An internal comp net can be selected by optioning CN9 or CN6 to the ON position. CN9 selects a 900-ohm comp net, and CN6 selects a 600-ohm comp net. If an external comp net or optional PBN is used, CN6 and CN9 should be in the "OFF" position.
9.	S2–1 through S2–6 option the BOC for hybrid balancing. The BOC provides up to .13μF in .002μF increments. If an external BOC or optional PBN is used, S2–1 through S2–6 should be in the OFF position.
10.	The optional 3690–1X PBN can be ordered separately and inserted in Connector J3 when more precise hybrid balancing is required. Refer to Figure 6.
11.	The XMT INPUT range at T&R is –10.5 to 6.0dBm. The XMT ATTN provides from 0 to 16.5dB of attenuation in 0.1dB increments to compensate for input level variations. For a +6.0dBm input at T&R, the XMT ATTN should be set for 16.5dB of attenuation.
12.	Post equalization is selected by optioning S9–1 to the IN position. The slope equalization settings are in accordance with BSP 855–351–105.
13.	The RCV OUTPUT range at T&R is +6.5 to –10.0dBm. The RCV ATTN provides from 0 to 16.5dB of attenuation in 0.1dB increments to compensate for output level variations. For a –10.0dBm output at T&R, the RCV ATTN should be set for 16.5dB of attenuation.
14.	For loop-start signaling functions, set S11 for LS. For ground-start applications, set S11 for GS.
15.	Selection of FXS, PLAR or MEGACOM signaling compatibility is done via S5–2 through S5–4. Only one mode can be selected at a given time. If more than one mode is selected, the channel unit will be idled, and the BUSY LED will blink indicating an error condition.
16.	Option S5–1 selects the signaling mode for MEGACOM and PLAR signaling. For PLAR signaling S5–1 in the 1 position selects interrupted (mode 1) ringing upon far-end seizure. S5–1 in the 2 position selects continuous (mode 2) ringing upon far-end seizure. For MEGACOM signaling S5–1 in the 1 position selects immediate start (mode 1) for ground-start outgoing calls. S5–1 in the 2 position selects wink-start (mode 2) for ground-start outgoing calls.
17.	Upon carrier group alarm, the TG and R relays are immediately idled. With Option S5–5 (P) in the ON position, the TG relay will be activated approximately 2.5 seconds later.

5. MOUNTING

The 3657–05 mounts in one channel unit slot of a 360/363 D4 Channel Bank. The 3657–05 is equipped with an insert/eject lever, in the form of a top-hinged front panel, which ensures positive connection of the channel unit's card-edge connector to the backplane connector. The insert/eject lever also facilitates channel unit removal.

CAUTION

Installation and removal of channel units should be done with care. Use static-preventive measures when handling. Do not force a unit into place. If excessive resistance is encountered during installation, remove the unit, and check the card guides and connector to verify proper alignment and the absence of foreign material.

Table 1. FXS Signaling Logic

VF INPUT	XMT A	XMT B	RCV A	RCV B	VF OUTPUT
GROUND START — incoming to station					
On hook, no ring ground	0	1	1	1	No tip ground, no ringing
On hook, no ring ground	0	1	0	1	Tip ground
On hook, no ring ground	0	1	0	0	Ringing
Off hook	1	1	0	1	No ringing
On hook	0	1	1	1	No tip ground
GROUND START — outgoing from station					
On hook, no ring ground	0	1	1	1	No tip ground, no ringing
Ring ground	0	0	1	1	No tip ground, no ringing
Ring ground	0	0	0	1	Tip ground
Off hook, no ring ground	1	1	0	1	Tip ground
On hook	0	1	1	1	No tip ground
LOOP START — incoming to station					
On hook	0	1	0	1	No ringing
On hook	0	1	0	0	Ringing
Off hook	1	1	0	1	No ringing
On hook	0	1	0	1	No ringing
LOOP START — outgoing from station					
On hook	0	1	0	1	No ringing
Off hook	1	1	0	1	No ringing
On hook	0	1	0	1	No ringing

Table 2. PLARD Signaling Logic

NEAR-END PHONE	XMT A	XMT B	RCV A	RCV B	FAR-END PHONE
INCOMING — far end initiated call					
On hook	1	1	1	1	On hook
Ringing	1	1	0	0	Off hook
Off hook	0	0	0	0	Off hook
On hook	1	1	1	1	On hook
OUTGOING — near end initiated call					
On hook	1	1	1	1	On hook
Off hook	0	0	1	1	Ringing
Off hook	0	0	0	0	Off hook
On hook	1	1	1	1	On hook

Table 3. MEGACOM Signaling Logic

VF INPUT	XMT A	XMT B	RCV A	RCV B	VF OUTPUT
GROUND START — immediate — incoming					
No ring ground, on hook	0	0	0	0	No tip ground, no ringing
No ring ground, on hook	0	0	1	1	Tip ground, ringing
Off hook, no ring ground	1	1	1	1	Tip ground, no ringing
On hook, no ring ground	0	0	0	0	No tip ground, no ringing
GROUND START — immediate — outgoing					
No ring ground, on hook	0	0	0	0	No tip ground, no ringing
Ring ground	1	1	0	0	No tip ground, no ringing
Off hook	1	1	1	1	Tip ground, no ringing
On hook	0	0	0	0	No tip ground, no ringing
GROUND START — wink — incoming					
No tip ground, on hook	0	0	0	0	No tip ground, no ringing
Tip ground, ringing	0	0	1	1	Tip ground, ringing
Off hook	1	1	1	1	Tip ground, no ringing
On hook	0	0	0	0	No tip ground, no ringing
GROUND START — wink — outgoing					
No ring ground, on hook	0	0	0	0	No tip ground, no ringing
Ring ground, off hook	1	1	0	0	No tip ground, no ringing
Off hook, no ring ground	1	1	0/1/0	0/1/0	Tip ground, no ringing (off hook wink)
Off hook, no ring ground	1	1	1	1	Tip ground, no ringing (far end answer)
On hook, no ring ground	0	0	0	0	No tip ground, no ringing
LOOP START MODE — incoming					
On hook	0	0	0	0	No ringing
On hook	0	0	1	1	Ringing
Off hook	1	1	1	1	No ringing
On hook	0	0	0	0	No ringing
LOOP START MODE — outgoing					
On hook	0	0	0	0	No ringing
Off hook	1	1	0	0	Far end ringing
Off hook	1	1	1	1	(Far end answer) No ringing
On hook	0	0	0	0	Far end on hook

6. INSTALLER CONNECTIONS

On connectorized channel banks, connections are made via 25-pair female connectorized cable assemblies (cinch 222–22–50–023 or equivalent) to the appropriate 25-pair male connectors on the channel bank. Refer to the particular channel bank's installation procedures for wiring information.

On channel banks that allow access to the rear 50-pin wire wrap connector of the channel unit, installer connections to the channel unit can be made by wire–wrapping leads to the associated 50-pin connecter, pins 50 and 48.

7. OPTIONS

Refer to Figure 6 for option locations and conditioning requirements.

7.1 Jack J3

A Wescom 3690–11 Non-loaded Cable PBN (Precision Balance Network) or a 3690–12 H88 Loaded Cable PBN can be ordered separately and inserted into Jack J3 to provided hybrid balancing. For detail description of the 3690–11 and 3690–12 PBNs, refer to Sections 369–011–201 and 369–012–201 respectively. An external PBN can also be connected via leads PN1 and PN2 (pins 46 and 41 respectively).

7.2 Switch S1 (600/ 900) Port Impedance

Slide switch S1 selects either a 900 ohm + 2.15μF or a 600 ohm + 2.15μF port impedance at T & R to match the 2W facility.

7.3 Switch S6 (CN6/CN9) Compromise Network

DIP switch S6 is used to select either a 900 or 600 ohm in series with 2.15μF compromise network for balancing the hybrid circuit. If an external PBN or a 3690–1X subassembly is inserted into J3, set both sections of S6 to the OFF position.

7.4 Switch S2 (BOC) Build-out Capacitance

DIP switch S2 provides up to 0.126μF build-out capacitance for balancing the hybrid circuitry relative to the line connected to the 2W port. By placing individual sections of S2 to the ON position, the required amount of capacitance can be added in approximately 0.002μF increments. If an external PBN or a 3690–1X subassembly is inserted into J3, set all sections of S2 to the OFF position.

7.5 Switch S3 (XMT ATTN) Transmit Attenuation

Switch S3 is an eight-section DIP switch that can be set for 0 to 16.5dB of attenuation, in 0.1dB increments for adjusting the transmit path to the proper operating level at the encoder input.

7.6 Switch S4 (RCV ATTN) Receive Attenuation

S4 is an eight-section DIP switch that can be set for 0 to 16.5dB of attenuation in 0.1dB increments for adjusting the receive path to the proper operating level output at T & R.

7.7 Switch S9 (SLOPE) Post-Equalizer

DIP switch S9 contains seven sections for controlling the post equalizer. S9–1 permits elimination of the low-end frequency roll-off when no equalization is required. S9–2 through S9–7 control the equalization for all gauges of non–loaded and H88 loaded cables with up to 15dB at 1KHz loss.

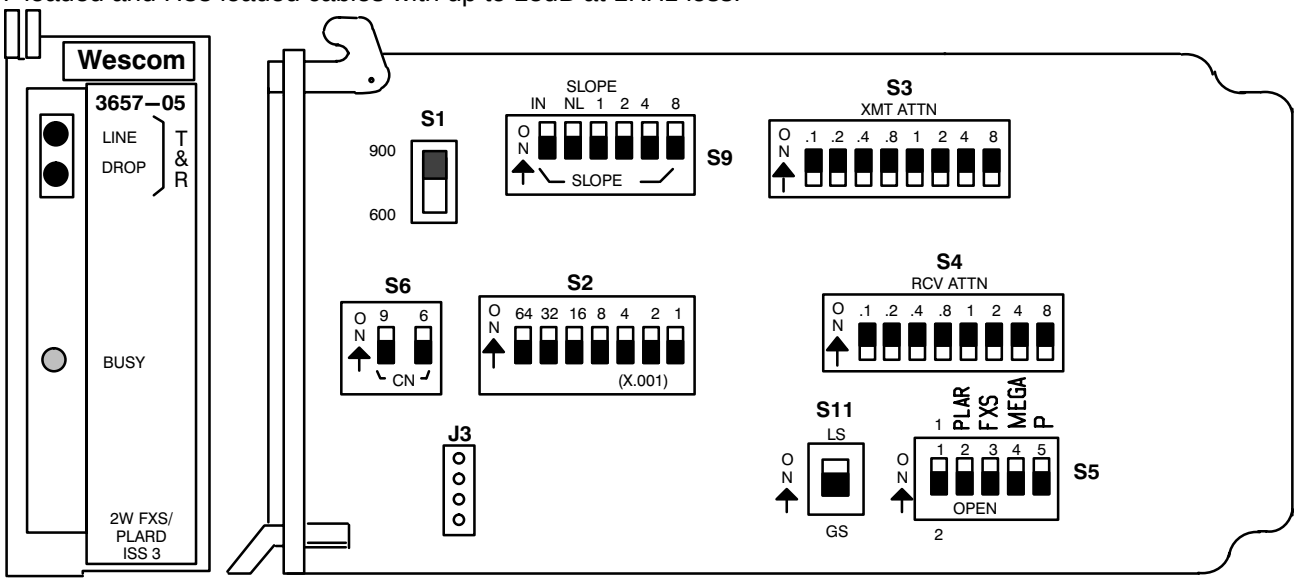

Figure 6. 3657–05 2W FXS/PLARD (Issue 3) Option Locations

Table 4. Description of Option Locations

OPTION	FUNCTION	POSITION
J3	Jack for mounting optional PBN 3690–11 (non–loaded Cable) or PBN 3690–12 (Loaded Cable)	See paragraph 7.1
S1	For 900 ohm + 2.15μF port impedance	900
	For 600 ohm + 2.15μF port impedance	600
S6–1 and S6–2 (CN9/CN6)	To select 900 + 2.15μF compromise network	CN9
	To select 600 + 2.15μF compromise network	CN6
S2–1 through S2–6	To match trunk capacitance to the nearest .002μF	Option as required
	If optional subassembly is used	OFF
S3 XMT ATTN	Prescription control for setting the XMT path to the input level	See alignment procedure, page 11
S4 RCV ATTN	Prescription control for setting the RCV path to the output level	
S11 LS/GS	For loop start operation	ON
	For ground start operation	OFF
S5–1 1/2	To select Mode 1 operation (see page 10)	1
	To select Mode 2 operation (see page 10)	2
S5–2 (PLAR)	For PLARD signaling	ON
S5–3 (FXS)	For FXS signaling	ON
S5–4 (MEGA)	For MEGACOM signaling	ON
Note: Only one of the three signaling select switches (S5–2, –3, or –4) can be optioned to the ON position. If more than one is in the ON position, the BUSY LED will blink, denoting an error.		
S5–5 (P)	For continuous idle during CGA	OFF
	For delayed busy during CGA	ON
S9–1 (EQ–IN)	For equalization	ON
	For no equalization	OFF
Note: S9 controls the post-equalizer. For no equalization, option all of S9 to the OFF position.		
S9–2 (EQ–NL)	For non-loaded cable	ON
	For loaded cable	OFF
S9–3 through S9–6 (EQ–1, 2, 4, 8)	Prescription setting for the post-equalizer	See the alignment procedure, page 11

7.8 Switch S5–2, –3, –4 (PLAR/FXS/MEGA) Signaling Selection

Switch options S5–2 (PLAR), S5–3 (FXS), and S5–4 (MEGA) select the signaling mode of the channel unit, based on far-end compatibility. Only one signaling mode can be optioned at a time.

Note: Only one of the three signaling select switches (S5–2, –3, or –4) can be optioned to the ON position. If more than one is in the ON position, the BUSY LED will blink, denoting an error.

7.9 Switch S5–1 (1/2) Mode 1, Mode 2 Signaling

Option S5–1 selects Mode 1 or Mode 2 signaling for PLAR and MEGACOM signaling.

7.9.1. PLAR Signaling (S5–2 ON)

With option S5–1 in the 1 (ON) position, Mode 1 signaling is selected and the PLAR will provide 2/4 second interrupted ringing to the far-end. With option S5–1 in the 2 (OFF) position Mode 2 signaling is selected and the PLAR will provide continuous ringing to the far-end.

7.9.2. MEGA Signaling (S5–4 ON)

With option S5–1 in the 1 (ON) position, Mode 1 signaling is selected and the MEGACOM will provide immediate start ground-start operation. When a ring ground is detected on the 2W interface, the 3657–05 will activate the TG RELAY ground. With option S5–1 in the 2 (OFF) position Mode 2 signaling is selected and the MEGACOM will provide ground-start wink signaling. When a ring ground is applied to the 2W interface, the 3657–05 will await a TG wink on the A highway before activating the TG RELAY.

Note: The 3657–05 does not provide on-board dial tone generator. If required, dial tone must be provided by the #4 ESS.

Note: Option S5–1 has no effect when the module is option for FXS signaling (S5–3 ON).

7.10 Switch S5–5 (P) Carrier Failure

With S5–5 in the OFF position, the channel unit will respond immediately to a carrier failure by deactivating the TG and R relays. With S5–5 optioned in the ON position, the TG & R relays will be idled immediately upon the CGA, but the TG relay will be activated approximately 2.5 seconds after the CGA to force the trunk busy and prevent seizures.

7.11 Switch S11 (LS/GS) Loop Start/Ground Start

The LS/GS option selects the proper mode of operation. For loop start signaling compatibility, set S11 to the LS position. For ground start signaling compatibility, set S11 to the GS position.

8. ALIGNMENT

8.1 Transmit Alignment

The XMT ATTN switch S3 is a prescription control that provides attenuation from 0 to 16.5dB, in increments of 0.1dB, to accommodate an input TLP range from –10.5 to +6.0dBm. To adjust the transmit path to the proper operating level, the difference between –10.5dBm and the transmit TLP at T & R must be obtained.

XMT ATTN = TLP – (–10.5)

For an input TLP of –7dBm, the XMT ATTN = –7 – (–10.5) = 3.5dB. Set the sum of the S3 switch settings to 3.5.

Note: If post-equalization is inserted, gain variances must be noted and adjusted for by the XMT ATTN settings. Refer to Table 4 for a list of these variances.

Option switches S9–2 through S9–6 control the post-equalizer. Use the following steps to align the post-equalizer:

Step	Action
1.	Attach a transmission test set to the drop jack of the 3657–05, and arrange for test tones of 400Hz and 1004Hz to be sent from the distant end, at the level specified by the Circuit Layout Record (CLR).
2.	If the cable facility is loaded, set the NL switch to the OFF position. If the cable facility is non-loaded, set the NL switch to the ON position.
3.	Measure and record the signal level at 1004Hz and 400Hz. Calculate and record the difference between the two readings.
4.	From Table 5, find the column that contains the difference calculated in Step 3. If the difference is greater than 3dB, set the NL switch to the ON position, and use the non-loaded section of the table, even if the cable facility is loaded.
5.	From the 1kHz Gain Table shown in Table 5, adjust the XMT ATTN switch (S3) accordingly.

Table 5. Slope Settings per 404Hz – 1004Hz Difference & 1kHz Gain

Slope Setting	NL=ON (Non-loaded)	NL=OFF (Loaded)	1 kHz Gain	
			NL=ON	NL=OFF
0	0.00 to 0.49	0.00 to 0.34	0.0	0.0
1	0.50 to 0.99	0.35 to 0.84	0.4	1.4
2	1.00 to 1.34	0.85 to 1.34	0.9	2.6
3	1.35 to 1.79	1.35 to 1.64	1.4	3.7
4	1.80 to 2.09	1.65 to 1.9	1.8	4.7
5	2.10 to 2.59	1.90 to 2.04	2.3	5.5
6	2.60 to 2.89	2.05 to 2.19	2.8	6. 3
7	2.90 to 3.09	2.20 to 2.34	3.4	7.2
8	3.10 to 3.24	2.35 to 2.49	3.7	7.8
9	3.25 to 3.59	2.50 to 2.59	4.2	8.4
10	3.60 to 3.99	2.60 to 2.64	4.6	9.0
11	4.00 to 4.14	2.65 to 2.69	5.0	9.5
12	4.15 to 4.29	2.70 to 2.74	5.4	10.0
13	4.30 to 4.44	2.75 to 2.79	5.8	10.5
14	4.45 to 4.59	2.80 to 2.84	6.2	11.0
15	4.60 and up	2.85 to 3.00	6.6	11.4

8.2 Receive Alignment

The RCV ATTN switch S4 is a prescription control that provides attenuation from 0 to 16.5dB, in increments of 0.1dB, to accommodate an output TLP range from +6.5 to –10.0dBm. To adjust the receive path for the proper operating level, the difference between +6.5dBm and the receive TLP at T & R must be obtained.

RCV ATTN = 6.5 – TLP

For an output TLP of –2dBm, the RCV ATTN = +6.5 – (–2) = 8.5dB. Set the sum of the S4 switch settings to 8.5.

9. TESTING

After completing Parts 4 through 8, place a call end-to-end through the facility to verify proper operation. If trouble is encountered, recheck all installer connections, options and alignment settings, and verify that the channel unit is making positive connection to the backplane connector. If trouble persists, replace the unit with a similar unit, known to be in proper operating order, and retest the facility. Channel unit testing for fault diagnosis or verification of circuit operation is provided in Section 360–001–205.

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 preaddressed 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 3657–05 2-Wire FXS Channel Unit are as follows:

12.1 Electrical

(a) XMT INPUT TLP RANGE: –10.5 to +6.0dBm

(b) XMT FIXED GAIN: 15.7dB

(c) RCV OUTPUT TLP RANGE: 6.5 to –10.0dBm

(d) RCV FIXED GAIN: 1.3dB

(e) XMT AND RCV PRESCRIPTION ATTN: 0 to 16.5dB in increments of 0.1dB

(f) PORT IMPEDANCE: 900/600 ohms + 2.15μF

(g) XMT SLOPE EQUALIZATION: 309D type equivalent

(h) FREQUENCY RESPONSE: (Referenced at 1kHz; no equalization)

FREQ (Hz)	XMT (dBm0)	RCV (dBm0)
60	–14 max	–
200	–3 to 0.15	–2 to 0.15
300 to 3K	–0.5 to 0.25	–0.5 to 0.25
3400	–1.5 to 0.25	–1.5 to 0.25
4000	–14 max	–14 max

(i) LONGITUDINAL BALANCE: 58dB minimum at 200Hz to 1KHz; 53dB minimum at 3kHz

(j) SIGNAL TO DISTORTION: 35dB minimum from 0 to –30dBm0; 29dB minimum at –40dBm0; 25dB minimum at –45dBm0

(k) TRANS-HYBRID LOSS: 34dB minimum ERL; 20dB minimum SRL

(l) RETURN LOSS: 28dB minimum ERL; 17dB minimum SRL LO; 20dB minimum SRL HI

(m) XMT/RCV IDLE CHANNEL NOISE: 20dBrnC0 max

(n) POWER REQUIREMENTS: Operating range, –44 to –56Vdc; current drain, 60mA maximum at –48Vdc (30mA maximum loop current/30mA maximum module current).

12.2 Signaling

(o) SUPERVISION RANGE: 2000 ohm loop

(p) RING TRIP RANGE: 2000 ohm loop

(q) 20 Hz RINGING RANGE: 2000 ohm loop

(r) RINGBACK TONE FREQUENCY: 440 + 480 Hz

(s) RINGBACK TONE LEVEL: –16dBm0 (nominal)

12.3 Physical

Feature	U.S.	Metric
Weight	8.3 ounces	236 grams
Height	4.25 inches	10.9 centimeters
Width	1.31 inches	3.5 centimeters
Depth	10.31 inches	26.4 centimeters