3654-01 4W Universal SF (USF) Channel Unit Installation Guide

CONTENTS **PAGE**

1. GENERAL

1.1 Document Purpose

This document provides general, application and installation information for the Charles Industries 3654–01 4W Universal SF (USF) channel unit.

1.2 Document Status

This document is reprinted to include a general editorial update.

1.3 Equipment Function

The Charles Industries 3654–01 4W Universal SF (USF) Channel Unit is used in Charles 360/363 D4 Digital Carrier Terminals to terminate a PCM channel and convert the A and B highway signaling states of the channel to inband tone (2600Hz) signaling states for transmission via the voice paths of an SF signaling facility.

1.4 Equipment Location/Mounting

The 3654–01 occupies one channel unit slot of a Charles 360/363 D4 Channel Bank.

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. MOUNTING

The 3654–01 mounts in one channel unit slot of a 360/363 D4 terminal and is equipped with an insert/eject lever which facilitates removal and installation of the unit.

CAUTION

Removal and installation 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 guide and connector to verify proper alignment and the absence of foreign material.

Step	Action
1.	Align the channel unit with the appropriate card-guided slot of the terminal.
2.	Slide the unit into the slot with the front panel in a horizontal (up) position. When the top portion of the hinged front panel is under the front lip of the terminal, push down on the front panel until it is in the vertical position. The channel unit's card-edge connector will begin to make contact with the inner portion of the backplane connector.
3.	Continue applying light pressure to the bottom edge of the front panel until the unit snaps into place.

4. INSTALLER CONNECTIONS

Installer connections are made to the T, R and T1, R1 leads at the 3654–01 card-edge connector on the backplane of the 360/363 D4 terminal. The 3654–01 pinout assignments are shown in Table 1. If an external sealing current source is used, connections can be made to the E and M leads (pins 4 and 45, respectively).

Table 1. 3654–01 Installer Connections

Lead	Lead Designation	Pin
T R	[Transmit Pair From SF Facility]	50 48
T1 R1	[Transmit Pair To SF Facility]	8 7
E M	[External Sealing Current Source]	4 45

5. OPTIONS

The 3654–01 is equipped with DIP switches and slide switches that are used to condition the module for proper application and operation. Refer to Figure 1 for the location and description of the options.

The 3654–01 option switches are provided for mode selection (FXO, FXS, or E&M), line impedance selection for matching the SF facility interface, loop-start or ground-start operation in the FXO or FXS mode, CGA alarm signaling selection, sealing current selection, and prescription gain adjustments for the transmit and receive paths. A jack (J3) is provided to accept an optional 3691–00/01 Cable Equalizer.

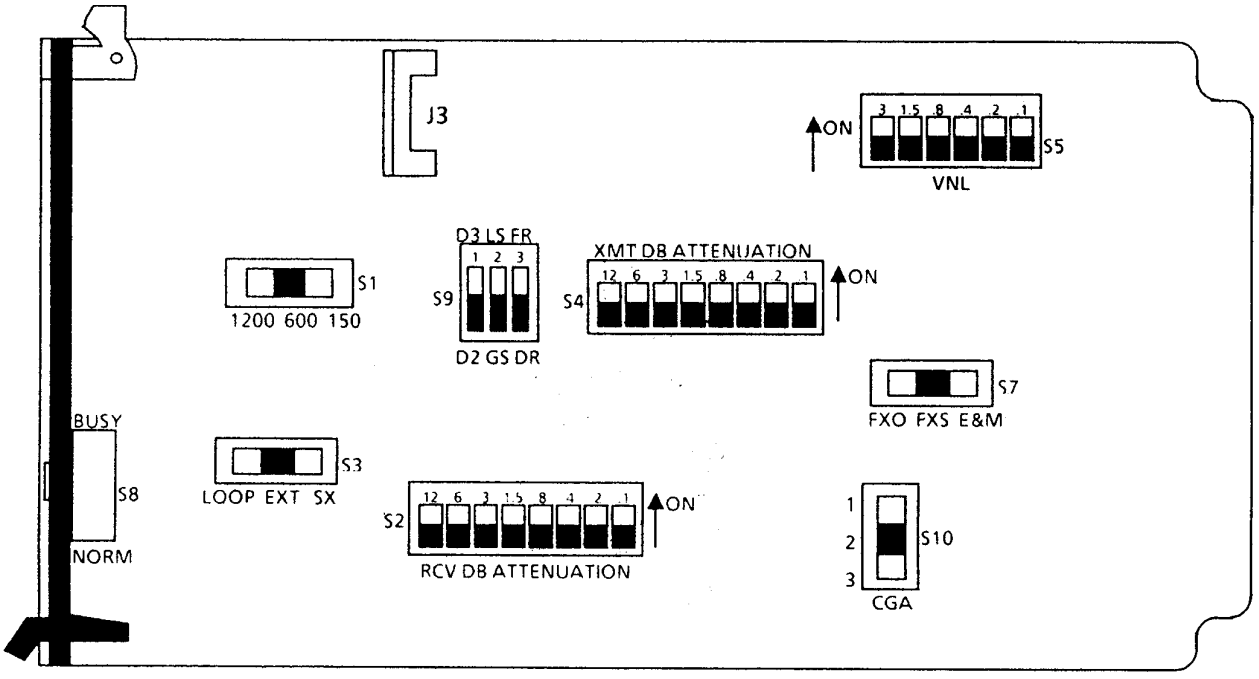

Figure 1. 3654–01 Option Locations

Option	Position	Function
S1	150/600/1200	Selects the required termination impedance of the 3654–01 to match the impedance of the facility.
S2 RCV GAIN	ON/OFF	8-section DIP switch used to adjust the receive path to the proper operating level. Gain can be selected from 0 to 24dB in 0.1dB increments.
S3	SX	To enable SEALING CURRENT GENERATOR.
	EXT	To disable SEALING CURRENT GENERATOR and provide connection for external sealing current to be connected to pins 4 and 45.
	LOOP	To loopback incoming sealing current by connecting the A&B simplex leads together.
S4 XMT GAIN	ON/OFF	8-section DIP switch used to adjust the transmit path to the proper operating level. Gain can be selected from 0 to 24dB in 0.1dB increments
S5	ON/OFF	6-section DIP switch to adjust the VNL circuit which provides up to 6dB of attenuation in 0.1dB steps in the transmit path to facilitate interconnection loss.
S7	E&M/FXO/ FXS	Selects operation mode of the 3654–01 to interface properly with the far-end channel unit.
S8	B (BUSY)	Busy out channel during testing.
S9–1	D2	Interfacing a D2 T carrier.
	D3	Interfacing a D1 D/D3 or D4 carrier.
S9–2	LS	FX loop-start operation.
	GS	FX ground-start operation.
S9–3	DR	Interfacing distinctive ringing.
	FR	Interfacing 2/4 ringing.
S10	1	Busy immediately upon CGA.
	2	Idle immediately upon CGA.
	3	Idle immediately upon CGA and busy 2.5 seconds later.

6. ALIGNMENT

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

6.1 Transmit Alignment

The XMT PRESCRIPTION GAIN switch S4 provides 0.0 to 24.0dB gain in 0.1dB increments to accommodate an input TLP range from – 17.0 to +7.0dBm. To adjust the transmit path to the proper operating level, the difference between + 7.0dB and the transmit TLP must be determined (+7– [TLP] =XMTgain).

EXAMPLE: For a transmit TLP of – 11 dBm; + 7.0 – (– 11.0) = 18.0

Set switches S4–1 (12) and S4–2 (6) to the ON (IN) position.

6.2 Receive Alignment

The RCV PRESCRIPTION GAIN switch S2 provides 0.0 to 24.0dB gain in 0.1dB increments to accommodate an input TLP range from – 17.0 to + 7.0dBm. To adjust the receive path to the proper operating level, the difference between – 17.0dB and the receive output TLP must be determined (TLP – [– 17] = RCV gain).

EXAMPLE: For a receive output TLP of + 7dBm; + 7.0 – (– 17.0) = 24.0

Set all switches on S2 to the ON (IN) position.

Condition S5 (VNL) as required for 0.0 to 6.0dB Via Net Loss In the transmit path. EXAMPLE: If 5.0dB loss is required, operate sections 3, 1.5, .4, and .1 of S5 to the ON (IN) position.

If the SF port of the 3654–01 interfaces with an analog carrier facility either directly or through a short cable, amplitude equalization is not required. If the SF port interfaces with a long metallic facility, an amplitude equalization subassembly (3691–00 for nonloaded cable or 3691–01 for H88 loaded cable) must be used (inserted into jack J3 of the 3654–01). Align the 3691–00 or 3691–01 as outlined in 6.2.1. or 6.2.2.. Refer to Section 369–100–201 for additional information on the 3691–00/01.

If the frequency distortion characteristics of a metallic are unknown, the cable loss should be measured using tones of 1000Hz and 2800Hz. Access to the transmit pair of the SF facility is provided through the T & R LINE and DROP jacks, while the receive pair is through the Tl & Rl LINE and DROP jacks.

6.2.1. Equalizer Alignment for Nonloaded and D66 Loaded Cable

Step	Action
1.	Insert a 3691–00 Nonloaded Cable Equalizer into J3 of the 3654–01.
2.	If equalization is to be provided for D66 loaded cable, set the DIP switch on the 3691–00 for 1dB. If equalization is to be provided for non-loaded cable, proceed to Step 3.
3.	Measure or compute and record the transmit path end-to-end loss at 1kHz and 2.8kHz of the SF facility to be equalized.
4.	Compute the required equalization by using the figures obtained in Step 3 and the following formula: LOSS@ 2.8kHz – LOSS@ 1khz – 2dB = REQUIRED EQUALIZATION
5.	Set the DIP switch of the 3691–00 for the value obtained in Step 4 +/–1dB.

6.2.2. Equalizer Alignment For Loaded Cable

Step	Action
1.	Insert a 3691–01 H88 Loaded Cable Equalizer into J3 of the 3654–01.
2.	Set the appropriate DIP switch section of the 3691–01 to the ON(IN) position according to the length and gauge of H88 loaded cable as follows: 19 gauge and 22 gauge (any length) Section 1(1dB) 22 gauge (any length) Section 2(2dB) 26 gauge (up to 30 kilofeet) Section 3(3dB) 36 gauge (up to 30 kilofeet or longer) Section 4(4dB)

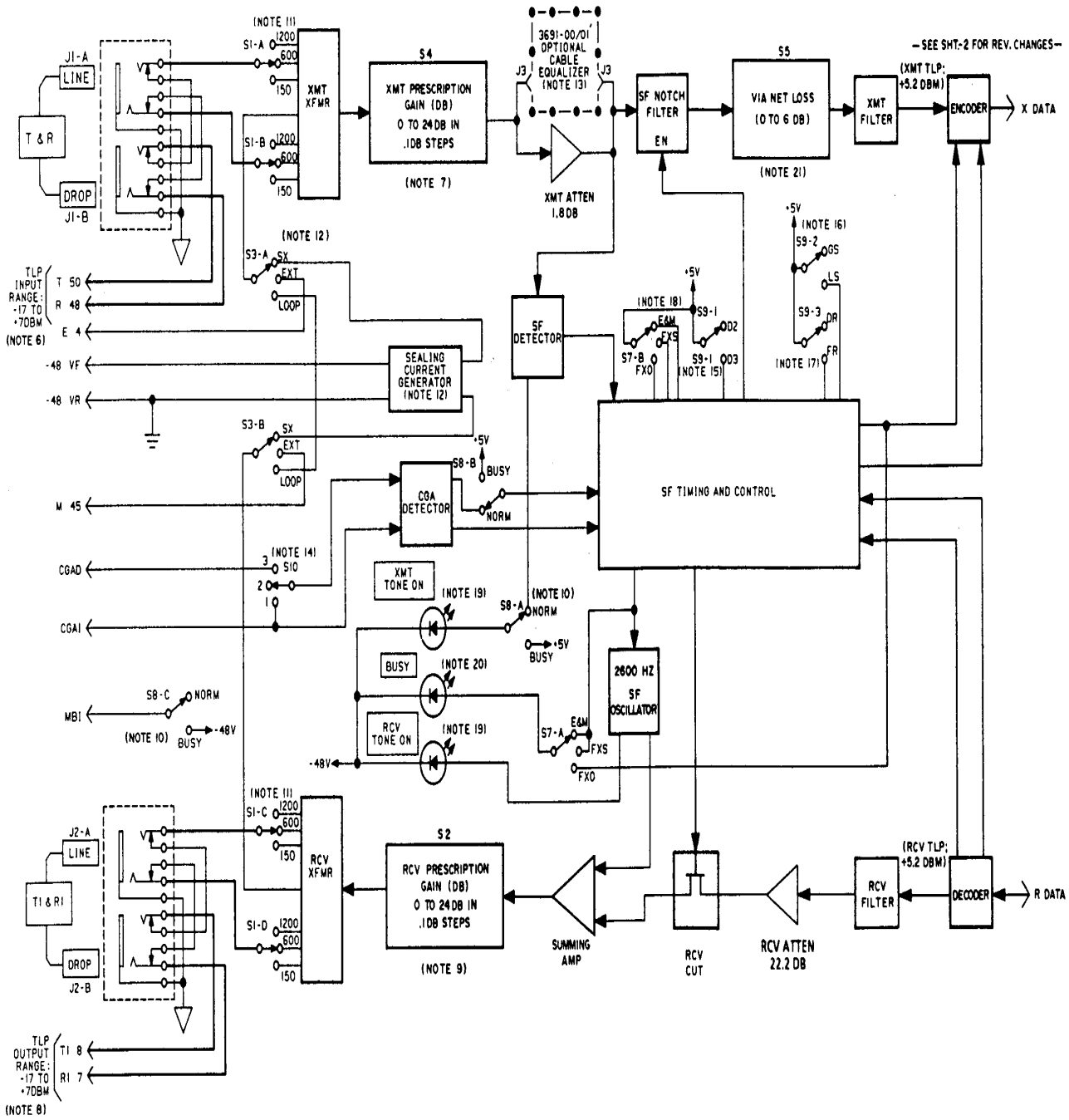

Figure 2. 3654–01 Block Diagram

Table 2. Notes for Figure 2

#	Note	#	Note
1.	← P.C. board connector pin	11.	XMT & RCV port impedance optioning of 150/600/1200 ohms balanced is selectable via switch S1
2.	[XXXX] Front panel marking		
3.	— Primary transmission path ◄— Signal flow direction	12.	Sealing current via switch S3 is optionable for internal source (SX), external source (EXT) or loopback (LOOP).
4.	Ganged switches are indicated by alphabetically suffixed reference designations. A numerical suffix denotes a discrete switch within a package.	13.	Connector J3 is provided for optional 3691-00/01 cable equalizer for nonloaded/loaded cables.

<table>
<tr><th>#</th><th>Note</th><th>#</th><th>Note</th></tr>
<tr><td>5.</td><td>PC mount test jacks
Marking | Access
T&R Line, J1–A | Toward channel unit
T&R DROP, J1–B | Toward office equipment
T1&R1 Line, J2–A | Toward channel unit
T1&R1 Drop, J2–B | Toward office equipment</td><td>14.</td><td>Trunk processing during a CGA alarm can be selected via switch S10 for the following operating mode.
Position | CGA Mode
1 | Immediate busy
2 | Immediate idle
3 | Immediate idle for approximately 2.5 seconds, followed by continuous busy</td></tr>
<tr><td>6.</td><td>The XMT INPUT range at T&R: –17 dBm to +7 dBm. The unit is factory adjusted for –16dBm input with XMT GAIN set to 23 dB.</td><td>15.</td><td>D2/D3 signaling compatibility is provided by switch S1.</td></tr>
<tr><td>7.</td><td>The XMT PRESCRIPTION circuit provides 24 dB gain in 0.1dB steps to compensate for office wiring loss and input level variations. Refer to the following:
INPUT Level (DBM) | XMT Gain (DB)
+7 | 0
0 | 7
–16 | 23
–17 | 24</td><td>16.</td><td>Loop start/ground start optioning for FXS and FXO mode is selectable via switch S9-2.</td></tr>
<tr><td></td><td></td><td>17.</td><td>Distinctive or 2/4 second ringing optioning for FXS and FXO modes is selectable via switch S9-3. 2/4 second ringing (FR) can be used for both loop start and ground start operations. Distinctive ringing (DR) is used only on loop start operation.</td></tr>
<tr><td>8.</td><td>The RCV OUTPUT range at T1&R1: –17 dBm to +7 dBm. The unit is factory adjusted for +7dBm output with the RCV GAIN set to 24 dB.</td><td>18.</td><td>Mode selection E&M/FXO/FXS is optionable via switch S7. E&M mode also functions as DP/DX/ARD signaling. The operatiing mode of the unit must always be set to the mode used by the far-end PCM channel unit.</td></tr>
<tr><td>9.</td><td>The RCV PRESCRIPTION circuit provides 24 dB gain in 0.1dB steps to compensate for office wiring loss and output level variations. Refer to the following:
Output (DBM) | RCV Gain (DB)
+7 | 24
0 | 17
–16 | 1
–17 | 0</td><td>19.</td><td>XMT TONE ON and RCV TONE ON LEDs allow monitoring when tone is either received at T&R or when tone is sent out at T1&R1.</td></tr>
<tr><td></td><td></td><td>20.</td><td>The BUSY LED lights when—
a. The switch is in the BUSY position.
b. SF-E&M: A busy signal is decoded on the RCV path
c. SF-FXS: Loop closure is decoded on the RCV path
d. SF-FXO: Ring ground or loop closure is signaled on the XMT path.</td></tr>
<tr><td>10.</td><td>Busy switch:
Switch handle down is NORM (normal) position.
Switch handle up is BUSY (busy) position.
Busy switch performs the following functions:

Turn on BUSY LED on front panel of units.
Removes SF tone from RCV path (T1 and R1).
Sends a busy signal to the far end.
Provides a manual busy indication to alarm and logic units.</td><td>21.</td><td>The via net loss (VNL) circuit provides 6 dB of attenuation in 0.1 dB steps in the XMT path to facilitate interconnect loss.</td></tr>
</table>

7. 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)