

3652-36 4-Wire E&M with Extended Range and Loopback (4W E&M/ER/LB) Channel Unit

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

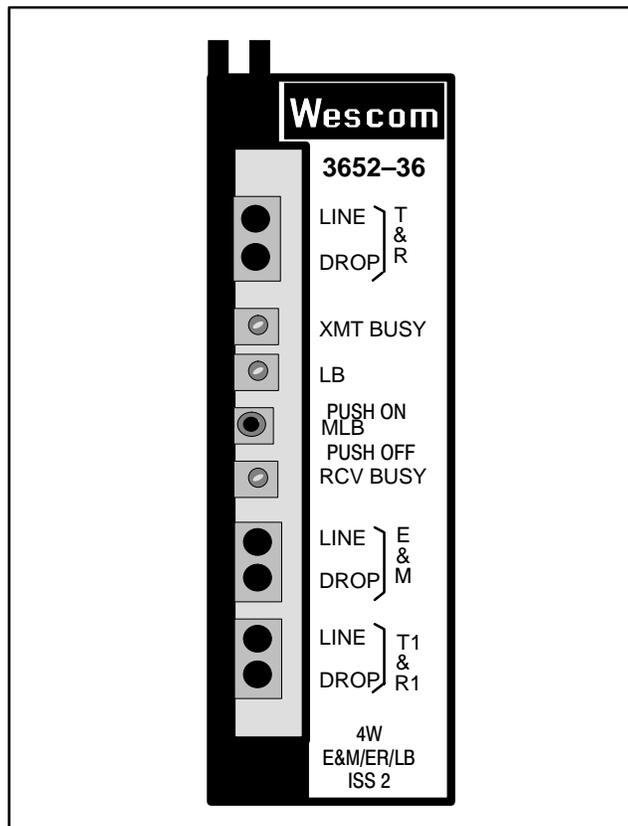


Figure 1. 3652-36 4W E&M/ER/LB Front Panel

1. GENERAL

1.1 Document Purpose

This document provides general, application, circuit, optioning, alignment, installation and testing information for the Charles Industries 3652–36 4-Wire E&M with Extended Range and Loopback (4W E&M/ER/LB) Channel Unit, shown in Figure 1.

1.2 Document Status

This document is reprinted to include a general editorial update.

1.3 Equipment Purpose

The 3652–36 provides a direct interface between 600-ohm 4W E&M circuits and the 360/363 D4 Digital Carrier Terminal common equipment.

1.4 Equipment Location

The 3652–36 mounts in one channel-unit slot of a Charles Industries 360/363 D4 Digital Carrier Terminal.

1.5 Equipment Features

The 3652–36 provides the following features:

- Accommodates 4W transmit and receive TLP levels from –19.5 to +13 dBm
- Prescription attenuation control of up to 32.5 dB in 0.1 dB increments in both the transmit and receive paths
- Provides 600 ohms impedance at the 4W port interface
- Provides 2713 Hz tone-activated loopback for both VF and signaling paths
- Provides selectable 4-min/20-min/none loopback automatic time–out options
- Provides selectable Tone Loopback Disable
- Prescription adjustable loopback level of up to 31.5 dB of gain/attenuation in 0.5 dB increments
- Front-panel Manual Loopback Switch
- Front-panel LED indicating loopback status
- Front-panel-mounted bantam jacks for accessing the transmit and receive ports and the E&M leads. The breaking jacks provided on the T & R, T1 & R1, and E&M leads of the 3652–36 provide access by breaking the line toward the DROP (trunk facility) and LINE (carrier facility).
- Optional sealing current configuration with automatic ZAP
- Compatible with E&M signaling Types I, II, & III

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

To prevent electrostatic charges from damaging static-sensitive units:

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

3. APPLICATION GUIDELINES

The 3652–36 provides an interface between 600-ohm balanced 4-wire E&M trunk circuits and the 360/363 D4 Digital Carrier Terminal. The receive and transmit paths of the 3652–36 provide 0 to 32.5 dB prescription adjustable attenuators to accommodate TLP levels from –19.5 to +13 dBm. The 3652–36 also provides tone- or manually-activated loopback function. See Figure 2 for a typical E&M application.

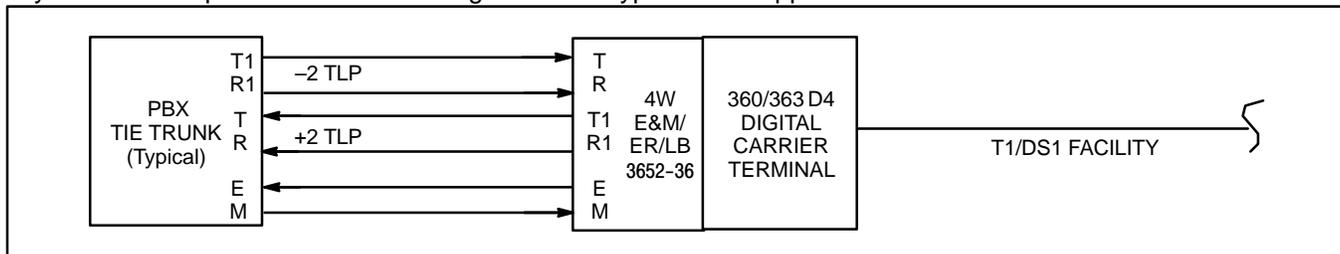


Figure 2. Typical 3652–36 4W E&M Application

4. CIRCUIT DESCRIPTION

Refer to Figure 3, the 3652–36 block diagram, as needed while reading the following circuit description.

4.1 Transmit VF Path

VF signals applied to the input T & R (pins 50 and 48) are routed through the DROP and LINE lifting jacks to transformer T1. Transformer T1 provides a balanced input and dc isolation from the line.

Voice energy from transformer T1 is routed to the XMT GAIN which provides a fixed gain.

The output of the XMT GAIN circuit is applied to the XMT ATTN which provides 0.0 to 32.5 dB of attenuation in 0.1 dB steps. The XMT ATTN allows the input at T & R to range from –19.5 to +13.0 dBm.

The adjusted VF signal is then applied to the XMT FILTER circuit. The filter suppresses frequencies that are outside of the standard voice frequency and prevents them from entering the ENCODER. The ENCODER performs an analog-to-digital (A/D) conversion and sends the resulting PCM signal to the 360/363 common equipment via the XDATA lead.

4.2 Receive VF Path

The PCM digital signal from the far end is received by the 360/363 D4 Digital Carrier Terminal, is routed to the 3652–36 via the RDATA lead, and is applied to the DECODER circuit. The DECODER then performs a digital-to-analog (D/A) conversion of the signal. The analog signal from the DECODER circuit is applied to the RCV FILTER. The RCV FILTER suppresses frequencies that are outside the bandwidth of the standard voice band.

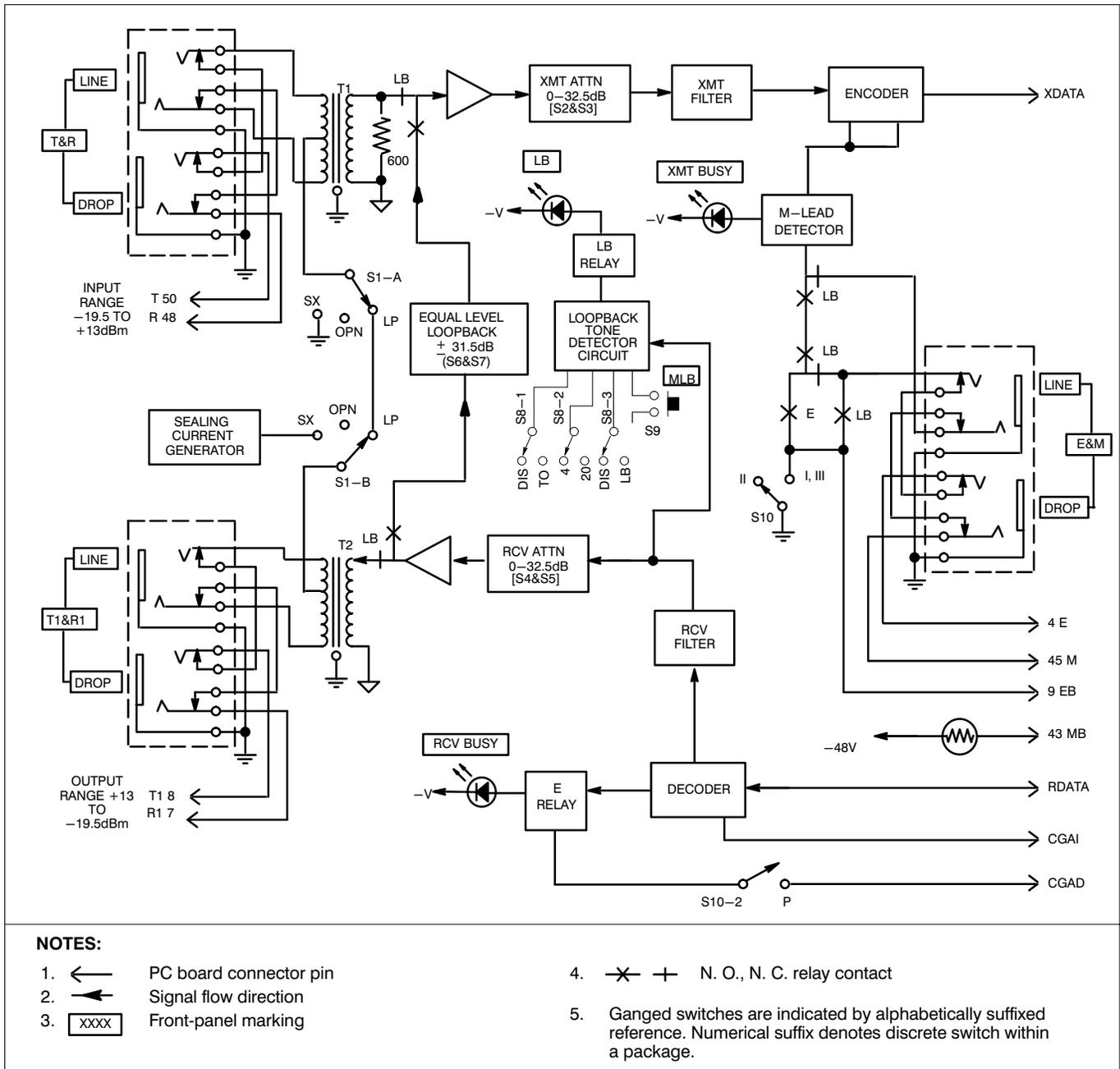


Figure 3. 3652–36 4W E&M/ER/LB Channel Unit Block Diagram

The output of the RCV FILTER is applied to the RCV ATTN circuit which provides 0.0 to 32.5 dB of attenuation in 0.1dB steps. The RCV ATTN and the fixed gain of the RCV GAIN circuit allow the output level at T1 & R1 to be adjusted from +13.0 to -19.5 dBm.

The adjusted VF signal is then buffered via the RCV GAIN circuit and routed through transformer T2 which provides dc isolation from the line and a balanced output level. The signal is then fed to the T1 & R1 leads (pins 8 and 7) via the LINE and DROP jacks.

4.3 Sealing Current

Three different configurations of sealing current are provided and are selected by option Switch S1.

The SX (Simplex) position supplies ground to leads T and R and -48 Vdc, through a 750-ohm thermistor, to leads T1 and R1. When the module is first plugged in, the current surges to approximately 100 mA and decreases quickly to a steady simplex current of approximately 30 mA. This low value of dc current being applied to the 4W cable pairs, on a simplex basis, will break down any resistance film which may build up at nonsoldered splices.

Continued application of this dc sealing current sustains the normal resistance of the cable pairs and prevents degradation of transmission performance.

In the LP (Loop) position, the simplex leads of T1 and T2 are shorted together. Sealing current from the other end of the analog facility will be looped by the channel unit.

The OPN (Open) position is used when no sealing current is required.

4.4 Signaling

The 3652–36 signaling path interfaces with the trunk circuit via the E&M leads. In the transmit direction, signaling is applied to the M-LEAD DETECTOR. When an off-hook condition (–48 V) is applied to the M-lead, a logic 1 is transmitted by the ENCODER circuit on both A & B signaling highways, indicating a busy condition and illuminating the XMT BUSY LED. A ground/open condition on the M-lead will result in a logic 0 to be transmitted on the A & B highways, extinguishing the XMT BUSY LED.

In the receive direction, a logic 1 (off-hook) on the RCV A signaling highway, will activate the E RELAY, shorting the E-lead to the EB-lead and illuminating the RCV BUSY LED. An on-hook condition from the far end, a logic 0 on the RCV A signaling highway, will deactivate the E RELAY, extinguishing the RCV BUSY LED. Option switch S10 provides a ground on the EB lead for Type I and III signaling compatibility.

When a carrier failure occurs, the CGAI bus will idle the E RELAY immediately. If option S10–2 is in the ON (P) position, the E RELAY will go from idle to busy approximately 2.5 seconds later, preventing the 3652–36 from being seized.

4.5 2713Hz Tone-Activated Loopback

The 3652–36 provides tone-operated loopback toward the digital facility. A continuous 2713 Hz loopback control signal applied from the far end for a minimum of 2.2 seconds and then removed will result in the operation and latching of the LB RELAY and the illumination of the front-panel LB LED. While operated, the LB RELAY performs the following functions:

- Opens the 4W port to the 4W equipment preventing transmission.
- Loops all voice-band signals from the RCV output to the XMT path, enabling all active components to be verified.
- Applies a busy condition on the E-lead toward the station equipment.
- Loops the E-lead signaling to the M-LEAD DETECTOR.

The EQUAL LEVEL LOOPBACK circuit provides prescription level adjustment of ± 31.5 dB in 0.5 dB steps to match the RCV output to the XMT path input.

Loopback release is accomplished by the reapplication of 2713 Hz tone (for 1.1 seconds) to the 3652–36. After the 2713Hz tone has been received, the LB RELAY releases, and the LB LED extinguishes, ending the loopback condition.

The LOOPBACK CONTROL CIRCUIT provides several control options as selected by switch S8. The tone activated loopback feature can be disabled or enabled. In addition, when the unit has been looped via a 2713 Hz tone, the circuit can be optioned to have a 4-min, 20-min, or no time-out and automatic release.

4.6 Manual Loopback

The 3652–36 can be manually placed in the loopback mode by momentarily operating the front-panel MLB push button switch (S–9). The module will remain in the manual loopback mode regardless of the settings of S8. To release the manual loopback mode, the MLB switch is again momentarily operated.

5. MOUNTING

The 3652–36 is equipped with an insert/eject lever in the form of a hinged front panel which ensures a positive connection of the channel unit's card-edge connector to the backplane connector when the unit is installed. The insert/eject lever also facilitates removal of the unit.

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.

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.
3.	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.
4.	Continue applying light pressure onto the bottom edge of the front panel until the unit snaps into place.

6. INSTALLER CONNECTIONS

Installer connections are made to the channel unit via connectorized cable connectors that are part of the channel bank assembly. Refer to the appropriate channel bank installer documentation for pin assignments.

7. OPTIONS

The 3652–36 is equipped with push button, DIP, and slide switch options that are used to condition the module for proper application and operation. Refer to Figure 4 for the location of these options while reading the following instructions.

7.1 Slide-Switch S1 – Sealing Current Control

When S1 is placed in the SX (Simplex) positions the 3652–36 provides sealing current to leads T and R (ground) and leads T1 and R1 (–48 Vdc). In the SX position, the module also provides an automatic ZAP when it is first plugged in. When switch S1 is placed in the LP (Loop) position, the simplex leads of T1 and T2 are shorted together; this allows the channel unit to loop sealing current applied from the other end of the analog facility. The OPN (Open) position is used when no sealing current is required.

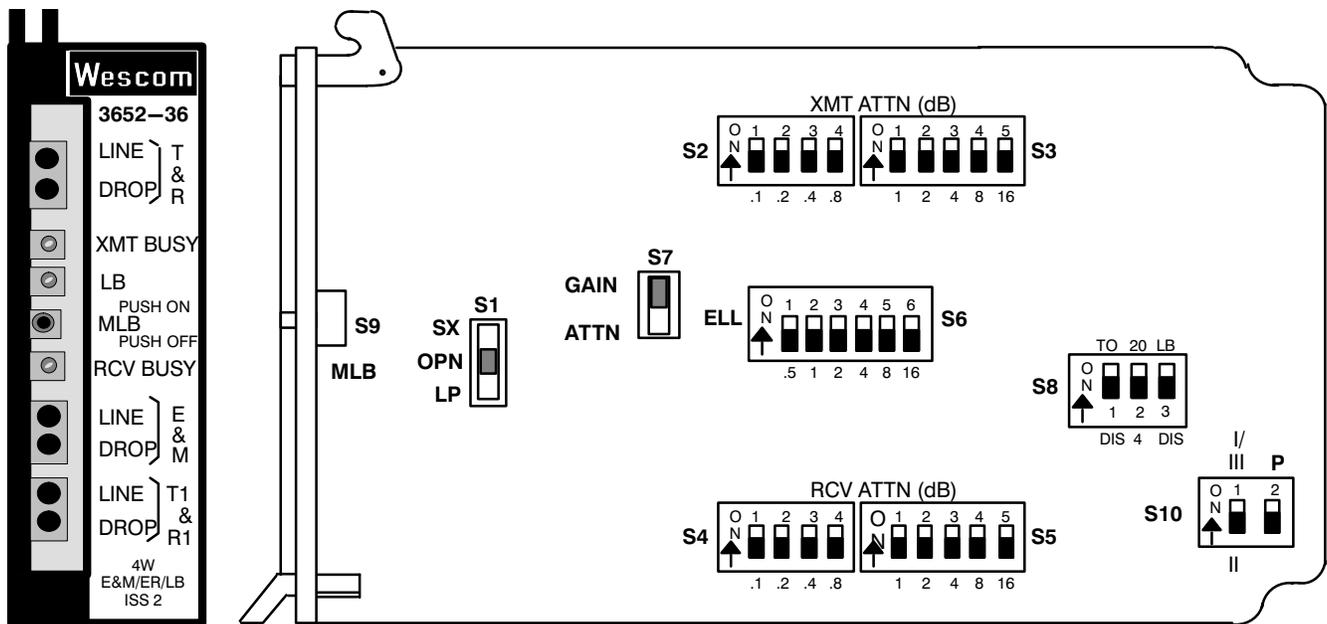


Figure 4. 3652–36 4W E&M/ER/LB Channel Unit Option Locations

Table 1. 3652–36 4W E&M/ER/LB Channel Unit Option Description

Option	Position	Function
S1	SX (Simplex)	Sealing current is generated by the channel unit with automatic ZAP when the module is first plugged in.
	OPN (Open)	No sealing current is required.
	LP(Looping)	Sealing current supplied from the other end of the analog facility is looped by the channel unit via the simplex leads of transformers T1 and T2.
S2, S3 XMT ATTN	ON/OFF as required. Refer to Transmit Alignment	Switches S2 and S3 form a 9-section DIP switch that provides up to 32.5dB of attenuation, in 0.1dB steps, for adjusting the transmit path to the proper operating level at the ENCODER input.
S4, S5 RCV ATTN	ON/OFF as required. Refer to Receive Alignment	Switches S4 and S5 form a 9-section DIP switch that provides up to 32.5dB of attenuation, in 0.1dB steps, for adjusting the receive path to the proper operating level output at leads T1 & R1.
S6, S7 ELL	ON/OFF as required. Refer to Equal Level Loopback Alignment	Switch S6 is a 6-section DIP switch that provides up to 31.5dB of equal level loopback in 0.5dB steps. S7 is a 2-position slide switch that provides gain or attenuation.
S8–1	TO (ON)	For automatic loopback time–out.
	DIS (OFF)	For no loopback time–out.
S8–2	20 (ON)	For 20-minute loopback time–out.
	4 (OFF)	For 4-minute loopback time–out.
S8–3	LB (ON)	For tone-activated loopback enable.
	DIS (OFF)	To disable tone-activated loopback.
S9 (MLB) Front-panel pushbutton	See Paragraph 7.7	To enable Manual Loopback (MLB).
	See Paragraph 7.7	To disable Manual Loopback (MLB).
S10–1 I III/II	I/III	Provides Type I or Type III signaling interface (See Figure 5).
	II	Provides Type II signaling interface (See Figure 5).
S10–2 P	OFF	Provides continuous idle condition during CGA.
	ON (P)	Provides busy condition, after 2-second idle, during CGA.

7.2 Switches S2 and S3 – XMT ATTN (Transmit Prescription Attenuation)

Switches S2 and S3 form a 9-segment DIP switch that provides up to 32.5 dB of attenuation, in 0.1 dB steps, to accommodate various input TLPs. Refer to Transmit Alignment in Part 8.

7.3 Switches S4 and S5 – RCV ATTN (Receive Prescription Attenuation)

Switches S4 and S5 form a 9-segment DIP switch that provides up to 32.5 dB of attenuation, in 0.1 dB steps, to accommodate various output TLPs. Refer to Receive Alignment in Part 8.

7.4 Switches S6 and S7 – ELL GAIN/ATTN (Equal Level Loopback Prescription Gain/Attenuation)

Switch S6 is a 6-segment DIP switch that provides up to 31.5 dB of equal level loopback in 0.5 dB steps. S7 is a 2-position slide switch to set equal level loopback for gain or attenuation. Refer to Equal Level Loopback Alignment in Part 8.

7.5 Switch S8 – Loopback Controls

S8 is a 3-segment dip switch that controls the loopback features of the unit. To disable the tone-activated loopback feature completely, set S8–3 to DIS; to enable the tone-activated loopback feature, set S8–3 to LB. To allow for a 4-minute automatic loopback time–out, set S8–2 to 4; to allow for a 20-minute time–out, set S8–2 to 20. To allow for no (infinite) loopback release time–out, set S8–1 to DIS; to allow for a 4 or 20-minute automatic time–out, set S8–1 to TO.

7.6 Switch S9 – MLB (Manual Loopback)

The MLB front panel switch (S9) is a ‘push-on/push-off’ push button switch. With each actuation of the MLB switch, the channel unit will alternate between the manual loopback mode and the normal operating mode. When in the manual loopback mode, the channel unit will remain in the loopback state, regardless of the optioning of S8.

7.7 Switch S10–1 – Type I/III Or Type II Signaling

Switch S10–1 is used to condition the 3652–36 for E&M signaling Types I, II or III. Refer to Figure 5 for appropriate optioning of S10–1 for E&M Type I, II or III compatibility.

7.8 Switch S10–2 (P) – Carrier Failure (CGA)

With S10–2 in the OFF position, the 3652–36 will respond immediately to a carrier failure by forcing the E RELAY idle. With S10–2 in the ON (P) position, the E RELAY will go to an idle condition and then to a busy condition approximately 2.5 seconds later. This will prevent the 3652–36 from being seized during a CGA condition.

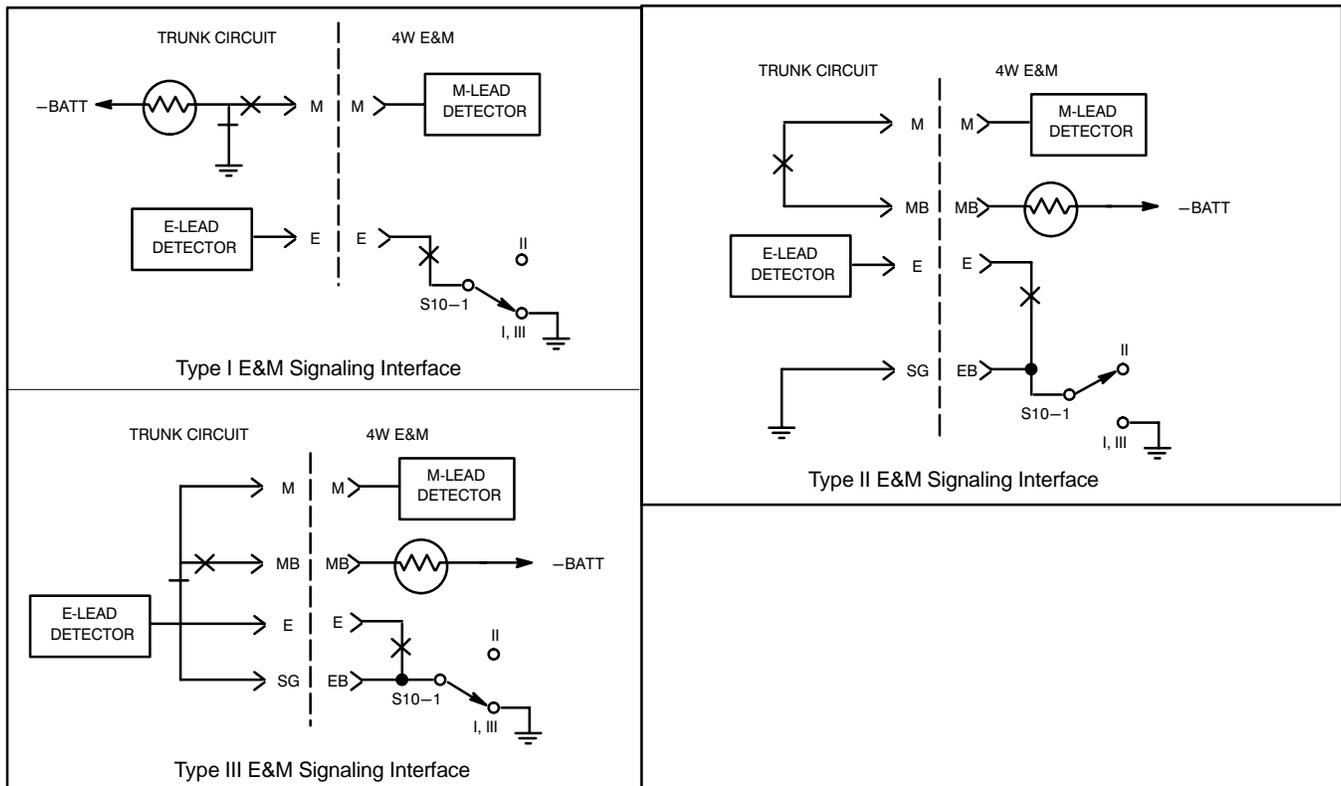


Figure 5. 3652–35 E&M Type I, II, and III Signaling Interface

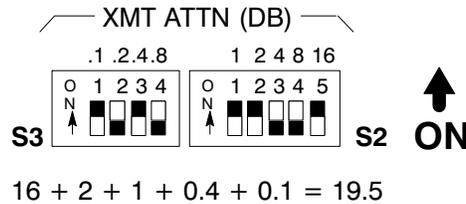
8. ALIGNMENT

8.1 Transmit Alignment

The XMT ATTN switches S2 and S3 are prescription controls that provide attenuation from 0.0 to 32.5 dB, in increments of 0.1 dB, to accommodate an input TLP range from –19.5 to 13.0 dBm. To adjust the transmit path to the proper operation level, the difference between –19.5 and the transmit TLP at T & R must be obtained using the following formula:

$$\text{XMT ATTN} = \text{TLP} - (-19.5)$$

For example, for a 0 dB transmit TLP, set the sum of S2 and S3 to 19.5 by placing the switch sections shown below in the ON position.



Use Table 2 for common TLP values.

Table 2. Common Transmit TLP Values

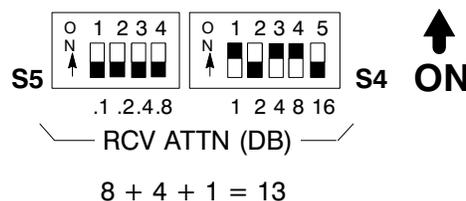
Desired TLP	Set S3 and S2	Desired TLP	Set S3 and S2
+13	32.5	-3	16.5
+12	31.5	-4	15.5
+11	30.5	-5	14.5
+10	29.5	-6	13.5
+9	28.5	-7	12.5
+8	27.5	-8	11.5
+7	26.5	-9	10.5
+6	25.5	-10	9.5
+5	24.5	-11	8.5
+4	23.5	-12	7.5
+3	22.5	-13	6.5
+2	21.5	-14	5.5
+1	20.5	-15	4.5
+0.5	20	-16	3.5
0	19.5	-17	2.5
-0.5	19	-18	1.5
-1	18.5	-19.5	0
-2	17.5		

8.2 Receive Alignment

The RCV ATTN switches S4 and S5 are prescription controls that provide attenuation from 0.0 to 32.5 dB, in increments of 0.1 dB, to accommodate an output TLP range from +13.0 to -19.5 dBm. To adjust the receive path to the proper operation level, the difference between +13.0 and the receive TLP at T1 & R1 must be obtained using the following formula:

$$\text{RCV ATTN} = 13.0 - \text{TLP}$$

For example, for a 0dB receive TLP, set the sum of S4 and S5 to 13 by placing the switch sections shown below in the ON position.



Use Table 3 for common TLP values.

Table 3. Common Receive TLP Values

Desired TLP	Set S3 and S2	Desired TLP	Set S3 and S2
+13	0	–3	16
+12	1	–4	17
+11	2	–5	18
+10	3	–6	19
+9	4	–7	20
+8	5	–8	21
+7	6	–9	22
+6	7	–10	23
+5	8	–11	24
+4	9	–12	25
+3	10	–13	26
+2	11	–14	27
+1	12	–15	28
+0.5	12.5	–16	29
0	13	–17	30
–0.5	13.5	–18	31
–1	14	–19.5	32.5
–2	15		

8.3 Equal Level Loopback (ELL) Alignment

The ELL switches S6 and S7 are prescription controls that provide adjustment to match the RCV path output to the XMT path input. Perform the ELL alignment as follows:

Step	Action
5.	Determine the required ELL by adding the setting for the XMT ATTN and RCV ATTN settings and subtracting 32.5. $ELL = XMT\ ATTN + RCV\ ATTN - 32.5$
6.	Set switch S6 to the required ELL to the nearest 0.5dB.
7.	If the ELL is a negative number, set switch S7 to ATTN position; if the ELL is a positive number, set switch S7 to the GAIN position.

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 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 Agency Compliance

The following agency approvals apply to the 3652–36.

- (a) Tested and complies with Underwriters Laboratories Standard 1459, Second Edition. Compliance is restricted to inside plant wiring. Field repairs may void compliance.
- (b) Complies with AT&T Publication 43801 Specifications
- (c) Complies with AT&T Publication 43004 Loopback Specifications

12.2 Electrical Specifications

The electrical characteristics of the 3652–36 are as follows:

12.2.1. Power Requirements

- (a) Power is supplied via the 3609–XX PSU which is part of the 360/363 Channel Bank common equipment.
- (b) Power consumption: Idle, 1.2 watts; Busy, 1.5 watts; Loopback, 2.5 watts (plus sealing current if provided).

12.2.2. Transmission

- (a) XMT INPUT TLP RANGE: +13.0 to –19.5 dB.
- (b) RCV OUTPUT TLP RANGE: +13.0 to –19.5 dB.
- (c) TRANSMIT AND RECEIVE PRESCRIPTION ATTENUATION: 0.0 to 32.5 dB in 0.1 dB steps.
- (d) LONGITUDINAL BALANCE (REFERENCED TO –16 dBm TLP): 74 dB minimum at 200 Hz to 1 kHz; 69 dB minimum at 3 kHz.
- (e) SIGNAL TO DISTORTION RATIO: 35dB minimum at zero to –30 dBm₀; 29 dB minimum at –40 dBm₀; 25 dB minimum at –45 dBm₀.
- (f) RETURN LOSS: 23 dB minimum at 300 Hz to 3 kHz; 28 dB minimum at 1 kHz.
- (g) TRANSMIT/RECEIVE IDLE CHANNEL NOISE: 20 dB_{BrnC0} maximum.
- (h) TRANSMIT AND RECEIVE PATH FREQUENCY RESPONSE: (Referenced at 1 kHz). See Table 4.

Table 4. Frequency Response

FREQ (Hz)	XMT (dB)	RCV (dB)
60	Less than –14.0	—————
200	+0.15 to –2.0	+0.15 to –1.0
300	+0.15 to –0.15	+0.15 to –0.15
1000	0 (REF)	0 (REF)
3000	+0.15 to –0.15	+0.15 to –0.15
3400	0 to –1.5	0 to –1.5
4000	Less than –14.0	Less than –14.0

- (i) CROSSTALK: 61 dBm0 minimum at 400 Hz; 71 dBm0 minimum at 700 Hz to 1 kHz; 70 dBm0 minimum at 3 kHz.
- (j) LEVEL TRACKING SINGLE-ENDED AT 1020 Hz: ± 0.25 dB from +3 to –37 dBm0, ± 0.5 dB from –38 to –50 dBm0.

12.2.3. Signaling

- (a) DIAL PULSE DISTORTION: $\pm 2\%$ single ended; $\pm 4\%$ end-to-end.

12.2.4. Loopback

- (a) DETECTOR FREQUENCY: Will detect within 2713 ± 7 Hz; will not detect outside of 2713 ± 35 Hz.
- (b) DETECTOR AMPLITUDE: Will detect 0.0 to –30 dBm0; will not detect less than –40 dBm0.
- (c) DETECTOR TIMING: Activate, 2.2 seconds; deactivate, 1.1 seconds.
- (d) ELL GAIN/ATTENUATION RANGE: 0.0 to 31.5 dB in 0.5 dB increments.

12.3 Physical Specifications

The physical characteristics of the 3652–36 are shown in Table 5.

Table 5. Physical Specifications

Feature	U.S.	Metric
Height	4.25 inches	10.8 centimeters
Width	1.31 inches	3.3 centimeters
Depth	10.31 inches	26.2 centimeters
Weight	9.25 ounces	263 grams
Temperature	32 to 122°F	0 to 50°C
Humidity	To 95% (no condensation)	

