7305–30 2-Wire Loop Signaling Repeater, Loop Start Only

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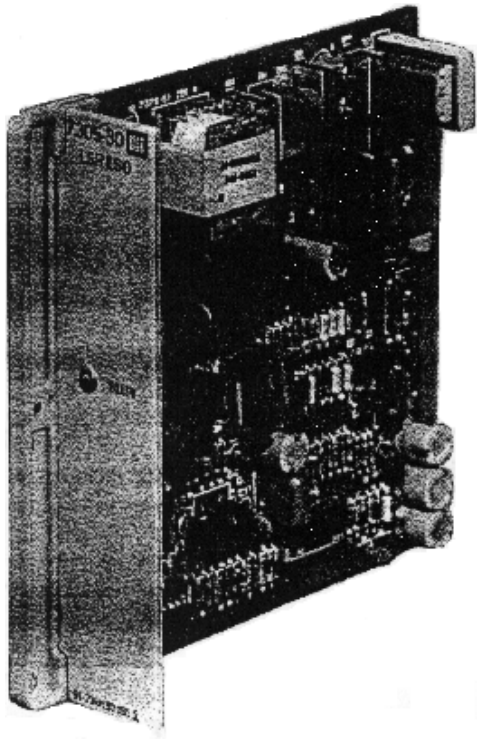


Figure 1. 7305–30 2-Wire Loop Signaling Repeater, Loop Start Only

1. GENERAL

1.1 Document Purpose

This section provides a circuit description, installation, and basic testing information for the Charles Industries 7305–30 2-Wire Loop Signaling Repeater, Loop Start Only, shown in Figure 1.

1.2 Document Status

This document is reprinted to provide a general editorial update.

1.3 Equipment Function

The 7305–30 is a plug-in printed circuit board used to increase the signaling, supervisory, and dial-pulsing ranges on individual 2W lines or CO/PBX trunks. The 7305–30 detects an off-hook condition at the station location and repeats supervisory and dial pulse signals from the station location to the CO. On incoming calls, the module repeats local ringing toward the station or bypasses office ringing around the unit, depending on the position of an option switch. The module provides ring trip during both ringing and silent intervals.

1.4 Equipment Location/Mounting

Mounts in one position in a Charles Industries Type 400 or Type 4000 Mounting Assembly.

1.5 Equipment Features

The 7305–30 provides the following features:

- Electronic ring detection and ring trip.
- Low dial pulse distortion.
- Low current drain.
- Line and drop current limiting.
- Idle line termination.
- Repeater enable relay contacts.
- Switch selectable isolated ring detector inputs; compatible with HORIZON* Key System ring detection requirements.
- Integral pulse corrector equipped with user-selected enable/disable option.
- Ring-stretch option can be arranged to either follow or bridge short ringing intervals.
- Automatic current limiting on the drop side over a wide range of loop lengths.
- High-impedance ringing detector to minimize line loading.
- Ringing supplied either from SWG (switch-gear) or from local ringing generator.
- Local ringing generator (if used) may supply grounded or negative-superimposed ringing.
- Can be equipped with optional 7377–50 Battery Boost Subassembly.

2. APPLICATION GUIDELINES

The 7305–30 is typically used in station applications. Figure 2 shows a typical stand-alone application of the 7305–30.

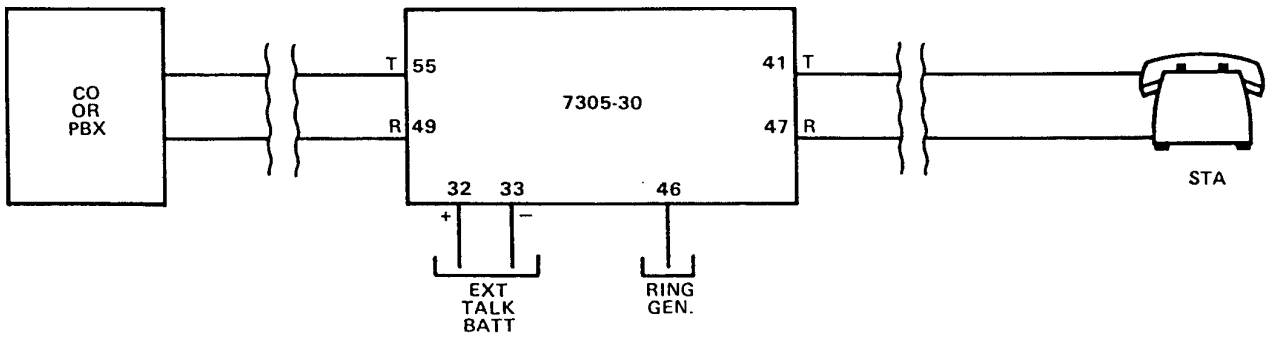


Figure 2. 7305–30 Typical Stand-Alone Application

The 7305–30 can be applied as Network Terminating Equipment (NTE) on special service circuits described by the following FCC Facility Codes: OL13A, OL1 3B, and OL1 3C. The 7305–30 provides all necessary circuit functions to interface a 2-wire Off-Premise Station (OPS) facility to a network jack designated to interface registered terminal equipment including a HORIZON Key System.

3. CIRCUIT DESCRIPTION

The 7305–30 is used to increase the signaling, dial pulsing, and ringing range of an individual 2W line or PBX trunk. Refer to Figure 3, the 7305–30 (Issue 2) Block Diagram, while reading the following circuit description.

The 7305–30 operates in the loop-start mode only and may be used in either the signaling or the transmission path, i.e., with or without the integral repeat coil. The voice path is transformer coupled and may be switched out of the circuit so that the A&B leads can be used with an external repeaters

3.1 Call Initiated From SWG Side

When a call is initiated from the SWG side, ringing voltage from the SWG is applied to the T/A and R/B leads (pins 55 and 49, respectively). The ringing is sensed by the RING DETECTOR whose output signal is applied to the RING DETECTOR TIMER. This circuit recognizes a valid ring signal after a nominal delay of 70 milliseconds and releases within a nominal 70 milliseconds after the signal is no longer present. This release delay can be extended to a nominal 900 milliseconds for special applications through the use of the RS option. The output signal of the RING DETECTOR TIMER operates the RING RE LAY through the RING DISABLE NAND gate and the RING RELAY DRIVER. The operated RING RELAY contact closure applies ringing (either locally-generated or from the SWG, depending on the position of S3) to the station side on the tip and ring leads (pins 41 and 47, respectively) through the RING TRIP DET circuit. This applied ringing follows the ringing/silent pattern of the SWG ringing through the action of the RING RELAY and its associated timing circuitry.

When the called station goes off-hook in response to the ringing, the loop closure provides answer supervision in either one of two ways. If the off-hook occurs during ringing, the RING TRIP DET circuitry's output signal is applied to the LOOP TRANSIENT BLANKING circuitry through the closed R relay contact. If the off-hook occurs during the silent interval, the loop current flow is sensed by the LOOP CURRENT DETECTOR through switch S2, screw options A and B, and the ACTIVE CURRENT LIMITER circuitry. The output signal from the LOOP CURRENT DETECTOR is applied to the LOOP TRANSIENT BLANKING circuitry through the alternate position of the same R relay contact. The LOOP TRANSIENT BLANKING signal is applied to the CURRENT DETECTOR TIMER and, after a nominal 15-millisecond delay, to the PULSE CORRECTOR if the push-on jumper is in the PCI position, or directly to the RING DISABLE NAND gate if the jumper is in the PCO position. This signal at the RING DISABLE NAND gate releases the RING RELAY, stopping the ringing. The signal from the CURRENT DETECTOR TIMER also enters the REPEATER ENABLE LOGIC and this circuit provides a ground on the RPTR ENBL lead (pin 20) for the duration of the off-hook. The signal applied to the RING DISABLE NAND gate is also applied to the LOOP PULSE RELAY DRIVER, and its output signal illuminates the BUSY LED and operates the LOOP PULSE A RELAY. The A relay contact closure across the SWG loop is detected by the SWG, which then removes the ringing.

3.2 Call Initiated From Station Side

When the station equipment associated with the 7305–30 goes off-hook, it closes the loop across the tip and ring leads (pins 41 and 47, respectively). The resultant current flow is sensed by the LOOP CURRENT DETECTOR through the ACTIVE CURRENT LIMITER circuitry, the A and B screw options, the station side of transformer Tl, and the station impedance switch, S2. The output signal from the LOOP CURRENT DETECTOR operates the LOOP PULSE A RELAY through the LOOP TRANSIENT BLANKING, CURRENT DETECTOR TIMER, PULSE CORRECTOR, LOOP PULSE RELAY DRIVER, and the BUSY LED.

When the LOOP PULSE A RELAY operates, it closes the loop toward the SWG. The SWG interprets this loop closure as a request for service and returns dial tone to the 7305–30, which enters the card on pins 55 and 49. Dial tone is sent to the station equipment on pins 41 and 47. Dial pulsing from the station equipment is adjusted to a 58 $\pm$5 percent break ratio by the PULSE CORRECTOR and applied to the LOOP PULSE A RELAY, which pulses the loop toward the SWG. At the same time, the signal from the PULSE CORRECTOR is also applied to the RING DISABLE NAND gate to prevent the dial pulses from ringing the station equipment when the station gear is off-hook. DTMF tones from the station equipment (if equipped for DTMF) pass from pins 41 and 47 to pins 55 and 49 where they are sent toward the SWG. After the address signaling is complete, ringback tone is supplied from the SWG. When the called party goes off-hook in response to the ringing, the SWG removes the ringing to the called party and ringback tone to the station equipment: talk paths are now complete in both directions.

3.3 Disconnect

As the mode of operation is loop-start, disconnect can only be initiated by the station side. When the station equipment goes on-hook, the lack of current flow in the station loop is detected by the LOOP CURRENT DETECTOR, which then causes the release of the LOOP PULSE A RELAY through the circuitry described in Paragraph 3.2. The release of the A relay results in the opening of the loop toward the SWG, which then releases the connection. The 7305–30 is now in an idle condition.

4. INSPECTION

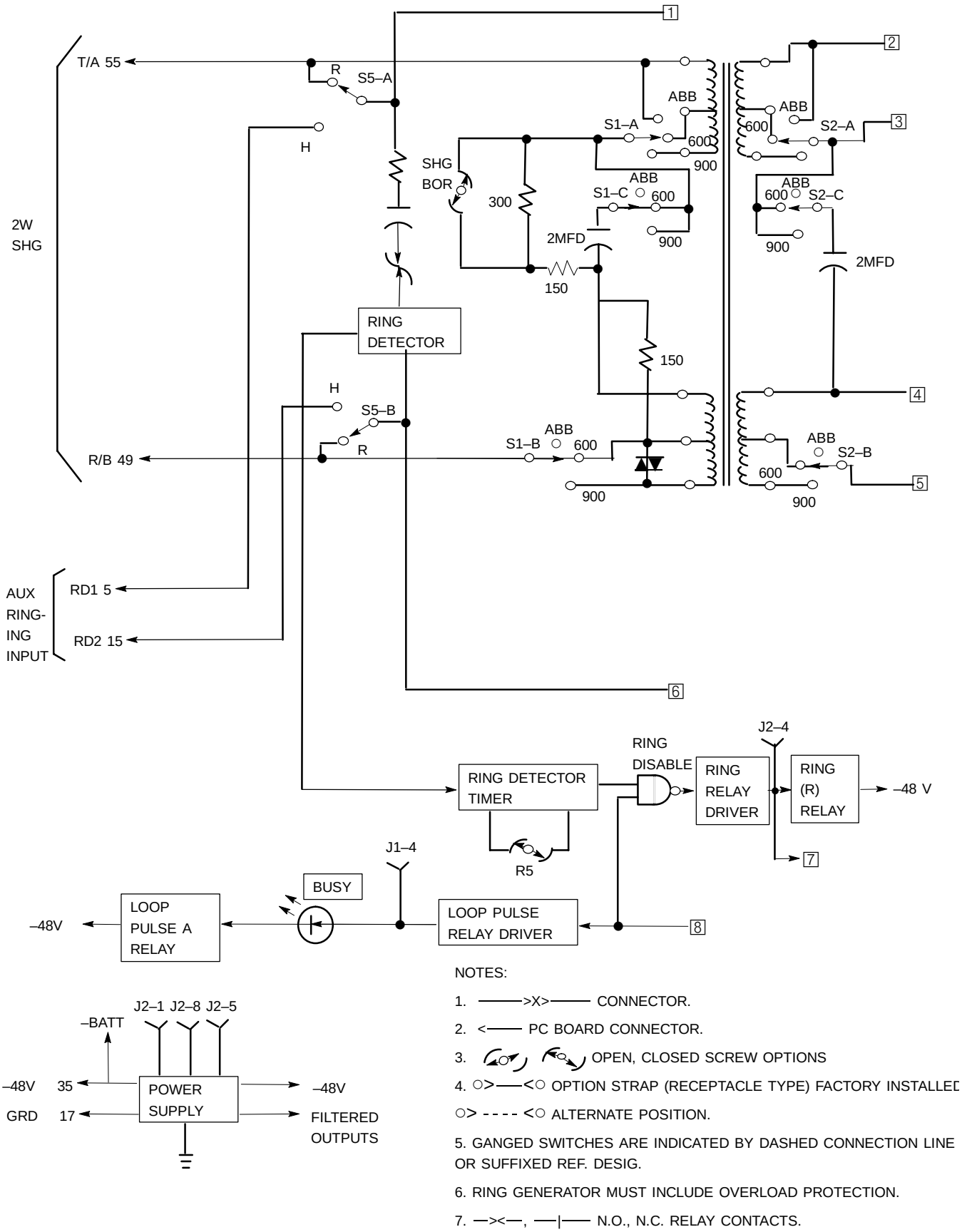
Inspect the equipment thoroughly as soon as possible after delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

Wescom equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by one number on any following models that are manufactured. Therefore, be sure to include the issue number along with the model number when making inquiries about the equipment.

5. MOUNTING

The 7305–30 is designed to be mounted in one module position of a standard Wescom (or other) Type 400 Shelf. Wescom Type 400 Shelves are available in capacities of from 1 to 13 modules and are designed to be mounted in 19-or 23-inch relay racks. Full-width shelves (11 positions in a 19-inch rack, or 13 positions in a 23-inch rack) require 6 inches of vertical space, while those shelves of less than full capacity require 7 inches of vertical space due to the addition of mounting bars above and below the shelf. Refer to Sections 400–103 and 440–211–202 through 440–723–202 for complete information.

The 7305–30 is also designed to plug into a single pre-wired slot of a TL40XX NTE assembly.



NOTES:

1. ———>X>——— CONNECTOR.
2. <—— PC BOARD CONNECTOR.
3. OPEN, CLOSED SCREW OPTIONS
4. ○>——<○ OPTION STRAP (RECEPTACLE TYPE) FACTORY INSTALLED
○> - - - - <○ ALTERNATE POSITION.
5. GANGED SWITCHES ARE INDICATED BY DASHED CONNECTION LINE OR SUFFIXED REF. DESIG.
6. RING GENERATOR MUST INCLUDE OVERLOAD PROTECTION.
7. —><—, —|—— N.O., N.C. RELAY CONTACTS.

Figure 3. 7305–30 2-Wire Loop Signaling Repeater, Loop Start Only (Issue 2) Block Diagram (Sheet 1 of

2)

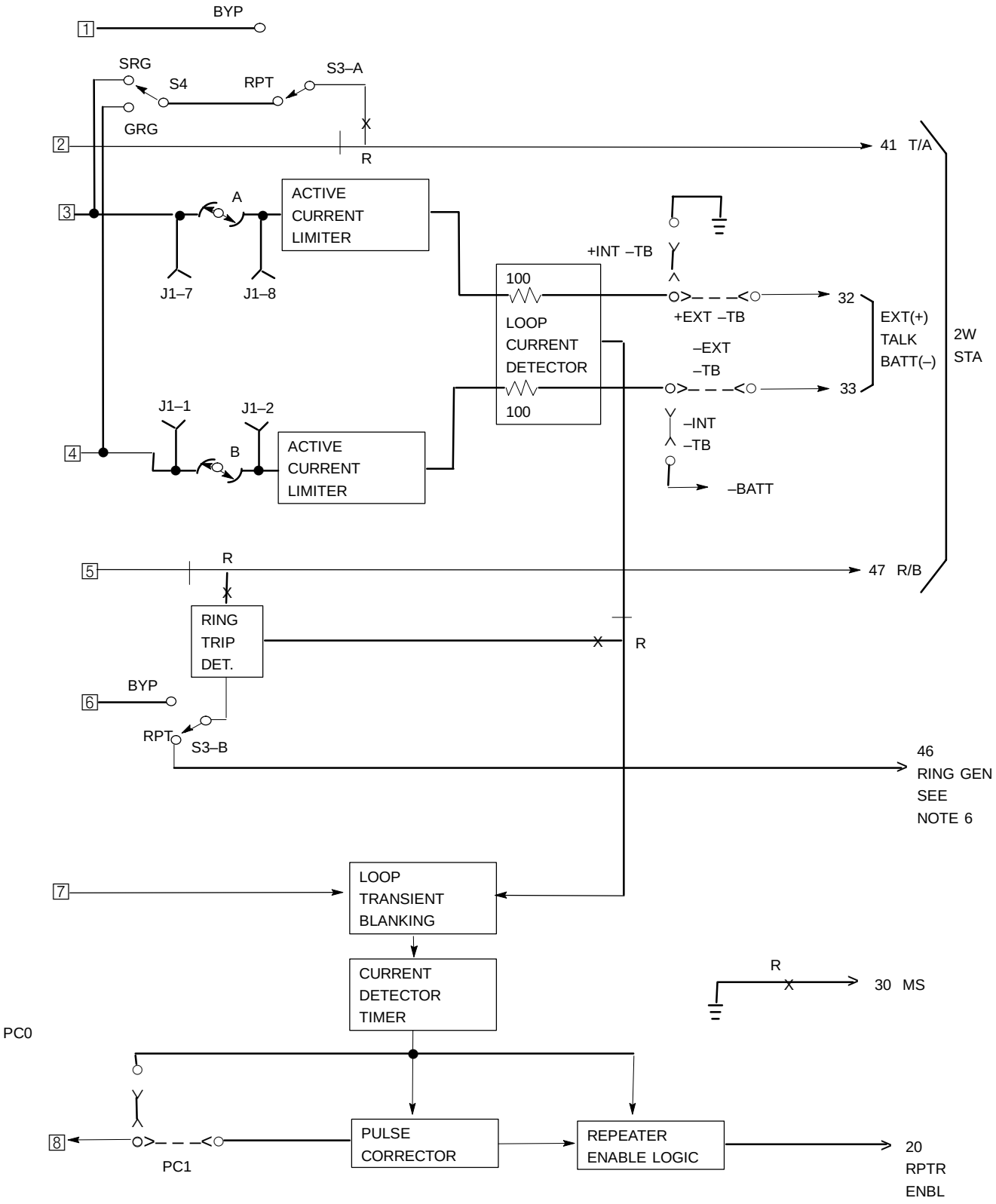


Figure 4. 7305–30 2-Wire Loop Signaling Repeater, Loop Start Only Block Diagram (Sheet 2 of 2)

6. INSTALLER CONNECTIONS

The 7305–30 makes electrical connection to the associated equipment through a 56-pin, wire-wrapped, card-edge connector provided as part of the mounting assembly. Make all connections to the module in accordance with the information contained in Table 1.

CAUTION

Do not make any connections when power is applied to the equipment or when modules are installed in the mounting assembly.

CAUTION

This unit contains a mercury-wetted-contact relay. During shipment, surplus mercury may collect on the relay contacts, causing a short. To correct this condition, hold the unit upright, tap it gently on a hard surface, and install.

Table 1. 7305–30 Installer Connections

Lead Designation		Pin
SWG T/A*	Line connections	55
SWG R/B*		49
T/A	Drop connections	41
R/B		47
RD1	Ringing connections for HORIZON System	5
RD2		15
+	External talk battery connections	32
–		33
RING GEN	External ring generator	46
MS	Machine start	30
RPTR ENBL	Repeater enable	20
–48V	Office battery	35
GRD	Ground	17
*SWG connections are polarity sensitive, verify connection of incoming tip to T/A and incoming ring to R/B.		

Insert the module into its mounting position after making all installer connections and after properly conditioning the module for the required service. Do not force a module into position. If excessive resistance is encountered while inserting a module, remove and reinsert the module and check the card guide and connector for improper alignment and/or the presence of foreign material.

7. OPTIONS

The 7305–30 is equipped with switch, push-on, and screw options which allow the module to be arranged for various features and modes of service. The locations of these options are shown in Figure 4 and their usage is explained in the paragraphs which follow.

Note: When opening a screw option, rotate the screw counterclockwise two full turns to insure the connection is broken. When closing a screw option, rotate the screw clockwise until it seats.

7.1 Impedance/Repeat Coil Bypass Options (S1 And S2)

Switch S1 sets the line impedance of the 7305–30 at either 600/900 ohms or selects A&B lead signaling. S2 performs the same function for the station side of the unit. Place S 1 and S 2 in the positions appropriate to the installation.

7.2 Repeated/Bypassed Ringing Option (S3)

The RPT position of switch S3 places locally-generated ringing (which follows the ringing/silent pattern of the SWG ringing) on the 2W station side of the module. When S3 is in the BYP position, ringing is supplied from the SWG, eliminating the need for an external ringing source. (The SWG ringing is applied to pins 5 and 15 when S3 is in the BYP position and switch S5 is in the H position.)

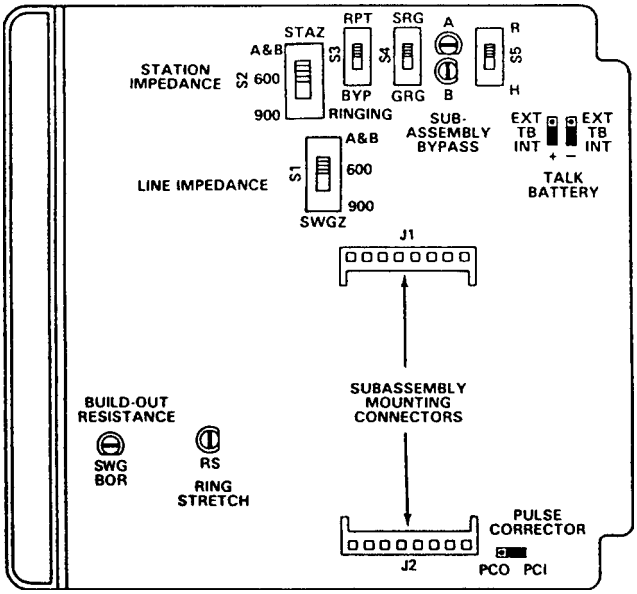


Figure 4. 7305–30 Option Locations

7.3 Grounded/Superimposed Ringing Option (S4)

The 7305–30 can be used with either grounded or negative superimposed ringing generators. If the module is used with a grounded ringing generator, place switch S4 in the GRG position: this supplies negative battery bias from the module on the tip lead only during the ringing interval to activate the ring trip circuit. If used with a negative superimposed ringing generator, place S4 in the SRG position.

7.4 Isolated Ring Detector Option (S5)

When using the 7305–30 in conjunction with a HORIZON Key System, place switch S5 in the H position. This disconnects the ring detector circuit from pins 55 and 49 and connects it to pins 5 and 15. For all standard applications, place switch S5 in the R position. This provides standard ringing detection on the tip and ring leads (pins 55 and 49, respectively).

7.5 Pulse Corrector Option (PCI/PCO)

The integral pulse corrector in the 7305–30 can be enabled and disabled by the PCI/PCO push-on option. To enable the pulse corrector, place the push-on jumper in the PCI position. To disable the pulse corrector, place the jumper in the PCO position.

7.6 Talk Battery Option (+ EXT TB/ + INT TB And –EXT TB/ –INT TB)

The 7305–30 can extend the signaling and supervisory range of a 1500-ohm CO or PBX to a maximum of 5400 ohms (96Vdc operation). The module can be arranged to use the internal ground and battery (–48Vdc) when the talk battery options are in the +INT TB and –INT TB positions. External talk battery potentials of –48, –72, or –96Vdc for –EXT TB and ground, +24V, or +48Vdc for +EXT TB may be used in any combination to a maximum of 96Vdc (total). In general, use a 48Vdc talk battery supply when the subscriber loop is 1500 ohms or less, a 72Vdc supply when the loop is between 1500 and 3000 ohms, and a 96Vdc supply when the subscriber loop is between 3000 and 5400 ohms.

Note: Although the 7305–30 can operate with station loop currents as low as 16mA, loop currents of less than 23mA may affect DTMF signaling and transmission performance. For this reason, it may be necessary to use talk battery voltages higher than those recommended for a given loop length (not to exceed 96Vdc,

total). In calculating the current in the station loop, use 410 ohms as the source impedance of the 7305—30.

7.7 Ring Stretch Option (RS)

The RS screw option controls the release delay of the ringing detector circuit. When the RS option is closed, it provides a symmetrical 70-millisecond operate/release delay. When RS is open, the release time is increased to stretch short ringing intervals. If the 7305–30 is to follow standard 2/4 second ringing, or certain distinctive ringing patterns, close RS. Open the RS option to stretch short ringing intervals or to mask the silent intervals.

7.8 Build-Out Resistance Option (SWG BOR)

The SWG BOR screw option provides current-limiting on short SWG loops and minimizes the internal SWG side resistance on long SWG loops. Close the SWG BOR option for SWG loops over 500 ohms, and open it for loops of 500 ohms or less. Place SWG BOR screw option in the closed position for switch hook flashing.

7.9 7377–50 Battery Boost Subassembly Options (A and B)

When the7377–50 Battery Boost Subassembly is not used, close both the A and B screw options. When this subassembly is installed, open both of these options.

8. TESTING

It is recommended that an end-to-end test be made to verify the performance of the 7305–30 after conditioning the options and installing the module.

Use the following steps to test the unit.

Step	Action	Verification
1.	Place the station equipment associated with the 7305–30 off-hook.	The BUSY LED on the 7305–30 illuminates and the SWG returns dial tone.
2.	Place a test call to the SWG.	The BUSY LED flashes during dial pulsing and ringback tone is audible.
3.	The SWG goes off-hook in response to the ringing.	Ringing and ringback tone stop. The talk path is complete.
4.	Request that a test call be placed from the SWG to the local station equipment, and place the station equipment on-hook.	The BUSY LED is extinguished, then the local station equipment is rung.
5.	Place the station equipment off-hook.	Ringing and ringback tone stop, the BUSY LED illuminates, and the talk path is complete.

Note: Key system side current flow must occur to enable VF transmission.

9. TECHNICAL ASSISTANCE

9.1 Technical Assistance — U.S.

If technical assistance is required, contact Charles Industries' Technical Services Center at:

847–806–8500
847–806–8556 (FAX)
800–607–8500
techserv@charlesindustries.com (e-mail)

9.2 Technical Assistance — Canada

Canadian customers contact:

905–821–7673 (Main Office)
905–821–3280 (FAX)

10. WARRANTY & CUSTOMER SERVICE

10.1 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

Telephone: 847–806–6300 (Main Office)
847–806–6231 (FAX)

10.2 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.

10.3 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.

10.4 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.

11. SPECIFICATIONS

The electrical and physical characteristics of the 7305–30 (Issue 2) are as follows:

(a) POWER REQUIREMENTS AND LIMITS:

Voltage	Maximum Current*	
	Idle	Busy
–44V	15mA	34mA
–48V	15mA	37mA
–56V	18mA	42mA
*Does not include loop current.		

(b) RETURN LOSS: 20dB ERL.

(c) MAXIMUM INSERTION LOSS: l.0dB at 1000Hz.

(d) FREQUENCY RESPONSE: –0.6dB, + 0.5d B at 600 to 4000Hz; –1. 30d B, +0.5dB at 400 to 600Hz; –2.6dB, +0.5dB at 250 to 400Hz (all levels referenced to 1000Hz).

(e) LONGITUDINAL BALANCE: 60dB (minimum) at 250 to 4000Hz.

(f) MAXIMUM ENVELOPE DELAY DISTORTION: 200usec, 600 to 3000Hz; 300usec, 400 to 3200Hz; 700usec, 250 to 4000Hz.

(g) CROSSTALK IMMUNITY: 80dB (minimum).

(h) STATION SIDE LOOP LENGTH:

Loop Current	Voltage		
	–48V	–72V	–96V
16mA	2450 ohms	3900 ohms	5400 ohms
23mA	1550 ohms	2550 ohms	3600 ohms

(i) DIALING SPEED: 8 to 12.5pps.

(j) PULSE CORRECTION:

PPS Input	Percent Break In	Percent Break Out
8	25–80	58 $\pm$5
10	30–80	58 $\pm$5
12.5	40–75	58 $\pm$5

(k) SWITCHGEAR SIDE RING SENSITIVITY: 50Vrms, 16 to 40Hz.

(l) LOCAL RINGING SUPPLY CHARACTERISTICS: 85 to 130Vrms, 16 to 67Hz, negative superimposed or grounded generator.

(m) MAXIMUM STATION SIDE LOOP CURRENT (2W): 48V, 50mA; 72V, 52mA; 96V, 55mA.

11.1 Physical

See Table 2 for the physical characteristics of the unit.

Table 2. 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	19 ounces	540 grams
Temperature	32° to 120°F	0 to 49°C