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Technical Practice

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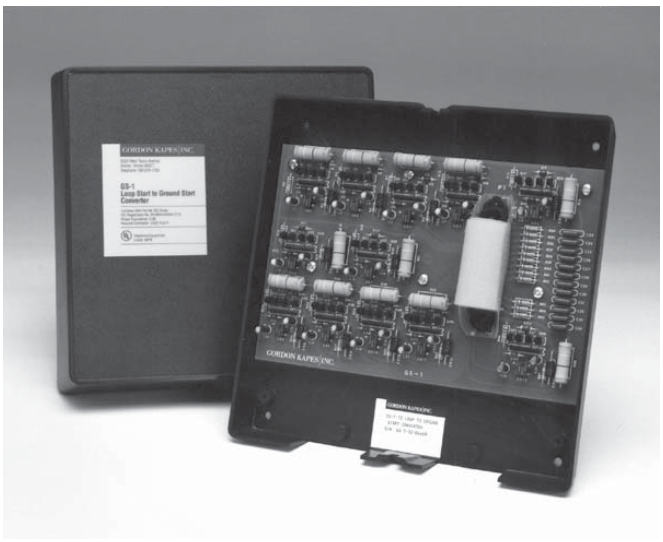
GS-1 LOOP START TO GROUND START CONVERTER

Contents



1. General Description

1.1 NEW PRACTICE ISSUE Issue 7 of the GS-1 Technical Practice is released due to improved graphics.

1.2 PRODUCT OVERVIEW The GS-1 Loop Start to Ground Start Converter is designed to allow standard telephone sets to be used with CO 2-wire ground start trunk lines.
The GS-1 provides the signaling required to draw CO dial tone when a telephone set is brought off-hook.

1.3 TWO VERSIONS The GS-1 Loop Start to Ground Start Converter is manufactured in two versions. The GS-1-8 provides eight circuits of loop start to ground start conversion. The GS-1-12 provides 12 circuits of loop start to ground start conversion.

1.4 POWER REQUIREMENTS No external power is required for either unit. Power is provided by the CO ground start trunks.

1.5 INTERCONNECTIONS All interconnections are made via a 25-pair plug, P1, which is located on the GS-1 circuit board. P1 mates with a cable-mounted 25-pair connector (standard to the telephone industry), supplied by the installer.

1.6 PHYSICAL DESCRIPTION The GS-1 consists of a precision fabricated printed circuit board, and an injection molded housing consisting of a base and detachable cover. The thermoplastic material used for the housing conforms to industry recognized flame retardant standards. The GS-1 measures 8.75 inches (22.2cm) square, 3.25 inches (8.3cm) deep, and weighs less than two pounds (0.9kg). The GS-1 wall mounts with four #8 screws.

1.7 FCC REGISTRATION The FCC Part 68 registration number is BVV8VH-63354-OT-N, ringer equivalence 0.1B.

1.8 SAFETY COMPLIANCE The GS-1 is LISTED by Underwriters Laboratories Inc. under their UL1459 Telephone Equipment Section.

2. Applications

2.1 PRIMARY APPLICATION The primary application for the GS-1 is in conjunction with power failure transfer (PFT) equipment associated with a Private Branch Exchange (PBX) telephone system. In the event of a power failure or PBX malfunction, standard telephone sets are connected to CO ground start trunks. The GS-1 provides the signaling required to draw dial tone from the CO when the telephone sets are brought off-hook. The need to install ground start push buttons on the PFT station telephones is eliminated.

2.2 COMPATIBILITY WITH PFT EQUIPMENT The GS-1 is compatible with most PBX PFT equipment, including Northern Telecom's SL-1 Emergency Power Failure Transfer Unit and Gordon Kapes, Inc.'s BP-1 PFT Unit.

2.3 NIGHT MODE APPLICATION The GS-1 can be used in a PBX night mode application. In certain situations CO ground start trunks, normally connected to a PBX system, are connected directly to telephone sets after normal working hours. The GS-1 is used to allow these telephone sets to draw CO dial tone when taken off-hook.
2.4 USING GROUND START TRUNKS WITH LOOP START PBX TRUNK PORTS The GS-1 can be used to allow PBX systems that are configured for loop start trunks to be connected to CO ground start trunks. The GS-1 provides the signaling required for the PBX to gain dial tone from the CO.
2.5 PBX SYSTEM PRE-CUTOVER Frequently, CO ground start trunk lines are installed at a PBX system site prior to system cutover. As a temporary arrangement, the GS-1 can be installed to allow single line telephones to access the ground start trunks.

3. Installation
3.1 WORDS OF CAUTION As with any product, installing the GS-1 requires a safety first approach.

Warning: Never install telephone wiring during a lightning storm. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations. Never touch non-insulated telephone wires or terminals unless the telephone line has been disconnected at the network interface. Use caution when installing or modifying telephone lines.
3.2 CHECKING FOR DAMAGE The GS-1 should be inspected for damage immediately upon receipt. If damage is found, a claim should be filed with the shipper. A replacement GS-1 should be ordered if necessary.
3.3 INSTALLATION KIT Included in each GS-1 shipping carton is an installation kit. Each kit contains four #8 pan head screws, two nylon cable ties, and a strip containing eight "Power Failure Transfer Telephone" labels. Extra labels are provided with the GS-1-12.
3.4 THE COVER The cover is secured via two clamp screws located on the top and bottom of the cover. Remove the cover at this time.
3.5 MOUNTING The GS-1 wall mounts using four #8 screws appropriate for the wall material. Four #8 pan head screws are contained in the installation kit; use these if suitable.
3.6 INSTALLING AND TERMINATING THE 25-PAIR CONNECTOR Install the 25-pair cable mounted connector into plug P1. Secure it using the fastener strap that is attached to the plug. Terminate the cable (e.g., in a "66" type block). Use one of the cable ties, provided in the installation kit, to secure the 25-pair cable to the mounting point molded into the GS-1's base.
3.7 GROUND CONNECTION The GS-1 requires an earth ground connection for plug P1. We recommend that the ground connection be the same as used by the associated PBX system. Refer to Figure 5, located at the end of the practice, for detailed connection information.
3.8 PFT AND STA CONNECTIONS Two cable pairs are associated with each of the eight (GS-1-8) or 12 (GS-1-12) circuits. Several possible installation scenarios follow this paragraph.
3.9 INSTALLATION WITH PFT EQUIPMENT Refer to Figure 1 when reading this section. The GS-1's PFT connections are connected to the station telephone connections on the associated PFT equipment. The GS-1's STA connections are connected to the station telephones. Thus the GS-1 circuits are electrically connected between the PFT equipment and the station telephones designated for PFT. Ensure that an earth ground connection has been made to the GS-1.

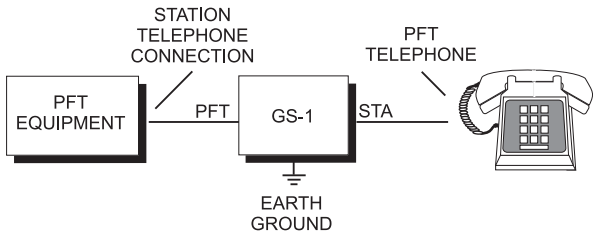


Figure 1 Installation with PFT Equipment.

3.10 INSTALLATION WITH NORTHERN TELECOM SL-1 Refer to Figure 2 when reading this section. The GS-1 easily interfaces with the SL-1's Emergency Power Failure Transfer (PFT) unit. The Emergency PFT unit is the 12-channel PFT unit housed inside the SL-1 cabinet and for which cross connections are made on the MDF. Electrically, the GS-1 is connected between the Emergency PFT unit and the station telephones designated for PFT. The GS-1's PFT connections are connected with the Emergency PFT unit's 500/2500-type telephone set connections. The GS-1's STA connections are connected to the station telephones. Be sure that an earth ground connection has been made to the GS-1.

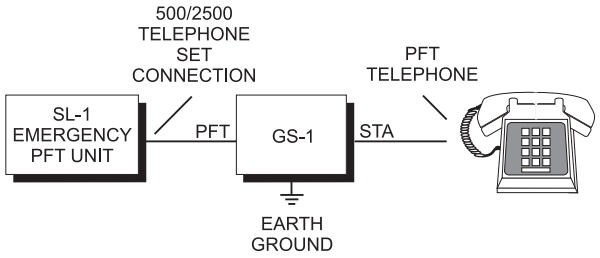


Figure 2 Installation with SL-1 Emergency PFT.

3.11 INSTALLATION WITH GORDON KAPES, INC. BP-1 PFT UNIT The BP-1's STA connections are connected to the GS-1's PFT connections. The GS-1's STA connections are connected to the station telephones. Be certain that an earth ground connection has been made to the GS-1.
3.12 INSTALLATION WITH LOOP START PBX SYSTEMS Refer to Figure 3 when reading this section. The GS-1 can be used to allow connection of CO ground start trunks to PBX systems that are compatible only with CO loop start trunks. The GS-1's PFT connections connect with the CO ground start trunks, and the GS-1's STA connections connect with the PBX's loop start trunk ports.

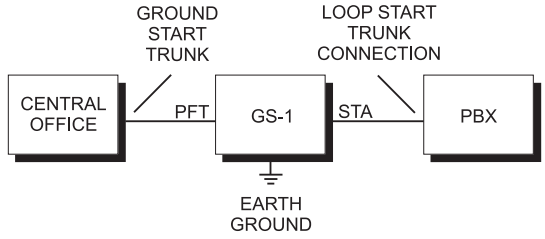


Figure 3 Installation with Loop Start PBX Systems.

3.13 USING STATION TELEPHONES WITH CO GROUND START TRUNKS Refer to Figure 4 when reading this section. The GS-1 can be used as a dedicated loop start to ground start converter, allowing single line telephones to be used on CO ground start trunks. The GS-1's PFT connections are connected with the CO ground start trunks, and the GS-1's STA connections are connected with the station telephones.

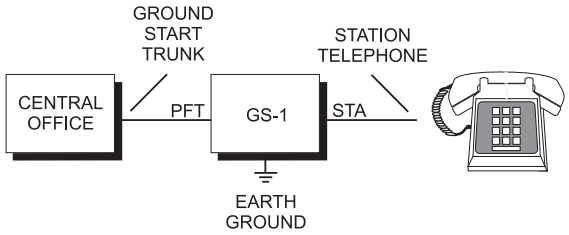


Figure 4 Installation with Station Telephones.

4. Testing and Operation

4.1 TESTING THE TELEPHONE LINES ASSOCIATED WITH THE GS-1 The one or more GS-1 units that have been installed should each be tested by following the procedure outlined in this section. If the GS-1 has been installed with a PFT unit, place the PFT unit in the normal, non-transfer state. Ensure that PBX dial tone can be drawn from each station telephone that is connected via a GS-1 circuit. Check that each station telephone is labeled with a "Power Failure Transfer Telephone" label.

Place the PFT equipment in the transfer state. Ensure that each station telephone can draw a dial tone from the CO. Even if these trunks are of an incoming only type, such as WATS, you usually can still draw dial tone. On each station telephone that connects to a trunk with outgoing call capability: place a call and ensure that it completes correctly. On all station telephones: receive an incoming call.

4.2 PLACING THE GS-1 INTO SERVICE The GS-1 should now be ready for action!

4.3 MAINTENANCE It is recommended that the GS-1 and associated station telephones be tested not less than once a year. Be certain that each PFT station telephone is identified with a PFT telephone label. Moves and changes of PFT station telephones often cause the labeling to go astray. Replacement labels can be ordered from Gordon Kapes, Inc.

5. Circuit Description

5.1 GENERAL DESCRIPTION A separate loop start to ground start (LS-GS) conversion circuit is provided for each GS-1 circuit. The circuit is powered by the CO ground start trunk and does not require external power. The LS-GS conversion circuit can be divided into two sections: ring lead grounding and loop current detection. In the on-hook state, a CO ground start trunk provides nominal –48Vdc on the ring lead, and an open on the tip lead, i.e., it is not connected to anything. The LS-GS conversion circuit detects the station telephone going off-hook and establishes a current path from earth ground to the CO ring lead. The CO senses this current and, when ready, seizes (effectively grounding) the tip lead. This starts loop current flowing. The LS-GS conversion circuit detects the loop current and, after a short delay, stops the current flowing from earth ground to the ring lead. The CO provides dial tone soon after loop current starts flowing. The call is now ready to be dialed.

5.2 INCOMING CALLS The LS-GS conversion circuit does not affect incoming calls to a station telephone.

5.3 OPERATION IN NON-PFT MODE When using the GS-1 with PFT equipment, please note that the GS-1 is connected between the station telephone connections of the PFT equipment and the PFT station telephones. In the normal non-PFT state of operation, the GS-1 is connected between the PBX extensions (i.e., local loop start lines) and the PFT station telephones. In this mode, the GS-1 looks invisible to both the PBX and the station telephones. When a station telephone set is on-hook, the PBX extension port sees approximately 100K ohms from tip to ground. This high impedance, purely resistive load should not interfere with correct PBX operation. Signaling to ground is performed only when the PFT equipment is in the PFT state and CO ground start trunks are connected to the GS-1.

5.4 IMPROVED CIRCUITRY GS-1-8's with serial number GS-1-8-0900 or higher, and GS-1-12's with serial number GS-1-12-3600 or higher contain updated circuitry. A change to the circuit implements a short time delay, improving compatibility with one central office switch and some loop extender units. With this release there are now no known incompatibilities between the GS-1 and any other equipment.

6. Specifications

NUMBER OF CIRCUITS
GS-1-8: 8
GS-1-12: 12

POWER REQUIREMENT
No external power is required. Power is provided by the CO ground start trunks.

FCC REGISTRATION
Registration Number: BVV8VH-63354-OT-N
Ringer Equivalence: 0.1B

ENVIRONMENT
0 to 50 degrees C, humidity to 95% (no condensation)

SAFETY COMPLIANCE
Underwriters Laboratories Inc. LISTED Telephone Equipment

RADIATED NOISE COMPLIANCE
Contains no circuitry subject to EMI regulations

RELIABILITY
MTBF 26.5 years, per Method I of Bellcore TS-TSY-000332, Issue 2, July 1988

INTERCONNECTIONS
The GS-1 contains one 25-pair plug. Installer must supply one 25-pair connector.

DIMENSIONS
8.75 inches high (22.2cm)
8.75 inches wide (22.2cm)
3.25 inches deep (8.3cm)

WEIGHT
Less than 2.0 pounds (0.9kg)

MOUNTING
Four #8 pan head screws. Four screws included with each unit, use if appropriate.

7. Incorrect Operation

7.1 REVIEW PRACTICE Should problems arise in the operation of the GS-1, please review Section 3—Installation of this practice. Ensure that all connections have been made properly. If another GS-1 is available, substitute and retest.

7.2 EARTH GROUNDING Ensure that a good earth ground is connected to the GS-1. Connecting to the same ground point that the PBX does is a good bet. Failure to provide this will result in no, or possibly intermittent loop start to ground start conversion or cross talk between GS-1 circuits. Unless you want one big party line, connect the GS-1 to earth ground!

7.3 CO TRUNK TIP AND RING POLARITY Be certain that the CO trunk tip and ring polarity is correct, and are not reversed. When a ground start trunk is in the idle, on-hook state, the ring lead should measure nominally –48Vdc with respect to earth ground; the tip will be floating, i.e., not connected to anything. You'll measure random voltages between the tip lead and ground; the value your meter reads is not meaningful.

7.4 LOOP RESISTANCE LIMIT The GS-1 loop start to ground start conversion circuitry is such that electrically the station telephone loop is connected in series with the CO ground start trunk line. The sum of the station and CO loop resistances must not exceed the maximum CO resistance limit, which is usually approximately 1500 ohms. Incorrect loop start to ground start conversion may occur if the total loop resistance exceeds 1500 ohms.

7.5 APPLICATION LIMITATIONS The GS-1 was designed to operate correctly in most applications requiring loop start to ground start conversion. However, Gordon Kapes, Inc. does not guarantee that the GS-1 is compatible with all CO ground start trunk lines, PBX systems and associated PFT equipment, and station telephones. All functions of the installed GS-1 should be thoroughly tested before the unit is placed into service. Note to our attorney: are you happy now that we put in this paragraph?

7.6 SAVE TIME You are encouraged to call Gordon Kapes, Inc. for technical support. We much prefer a telephone call BEFORE you tear your hair out! We do not mind "walking" you through an installation, or performing a verbal review prior to your actually getting started. Please have these items with you: a copy of this technical practice, PBX documentation, and adequate tools. In addition, it is very helpful to have a digital VOM, such as the wonderful Fluke 70 or 80 series, a lineperson's handset, and some cross connect wire. (For a those rare cases, it's not a bad idea to have some aspirin and a bag of chocolate chip cookies in your tool case for easy inhaling!)

8. Repair and Replacement

8.1 NOT SO FAST Statistically, most equipment returned to Gordon Kapes, Inc. for repair actually has nothing wrong with it. A telephone call to Gordon Kapes, Inc. technical support can often help to get the equipment operating correctly. We don't mind spending time with our customers getting a site up and running.

8.2 SEND IT BACK If you determine that the GS-1 is defective, return for repair or replacement according to the Gordon Kapes, Inc. Warranty/Repair and Return policy.

8.3 ONLY WE FIX IT In the event that GS-1 repairs are ever required, they should only be performed by Gordon Kapes, Inc. or an authorized representative. For further information, contact Gordon Kapes, Inc.

9. FCC Requirements

9.1 TYPE OF SERVICE Your GS-1 is designed to be used on standard device telephone lines. The GS-1 connects to the telephone line by means of a standard jack called the USOC RJ21X. Connection to telephone company-provided coin service (central office implemented systems) is prohibited. Connection to party line service is subject to state tariffs.

9.2 TELEPHONE COMPANY PROCEDURES The goal of the telephone company is to provide you with the best service it can, within the constraints of receiving a good return on shareholder equity. In order to do this, it may occasionally be necessary for them to make changes in their equipment, operations, or procedures. If these changes might affect your service or the operation of your equipment, the telephone company will give you notice, in writing, possibly in advance, to allow you to make any changes necessary to maintain uninterrupted service.

If you have any questions about your telephone line, such as how many pieces of equipment you can connect to it, the telephone company will provide this information upon request.

In certain circumstances, it may be necessary for the telephone company to request information from you concerning the equipment which you have connected to your telephone line. Upon request of the telephone company, provide the FCC registration number and the ringer equivalence number (REN) of the equipment which is connected to your line; both of these items are listed on the equipment label. The sum of all of the RENs on your telephone line should be less than five in order to assure proper service from the telephone company. In some cases, a sum of five may not be usable on a given line.

9.3 IF PROBLEMS ARISE If any of your telephone equipment is not operating properly, you should immediately remove it from your telephone line, as it may cause harm to the telephone network. If the telephone company notes a problem, they may temporarily discontinue service. When practical, they will notify you in advance of this disconnection. If advance notice is not feasible, you will be notified as soon as possible. When you are notified, you will be given an opportunity to correct the problem and be informed of your right to file a complaint with the FCC. You have the right to remain silent, if you waive your right to remain silent...

Specifications and information contained in this technical practice subject to change without notice.

Figure 5 GS-1 Loop Start to Ground Start Converter Connection Diagram

Plug Pin	Wire Color	Connection	Circuit	Circuit Number
26	WHT-BLU	T	PFT	
1	BLU-WHT	R		1
27	WHT-ORN	T	STA	
2	ORN-WHT	R		
28	WHT-GRN	T	PFT	
3	GRN-WHT	R		2
29	WHT-BRN	T	STA	
4	BRN-WHT	R		
30	WHT-SLT	T	PFT	
5	SLT-WHT	R		3
31	RED-BLU	T	STA	
6	BLU-RED	R		
32	RED-ORN	T	PFT	
7	ORN-RED	R		4
33	RED-GRN	T	STA	
8	GRN-RED	R		
34	RED-BRN	T	PFT	
9	BRN-RED	R		5
35	RED-SLT	T	STA	
10	SLT-RED	R		
36	BLK-BLU	T	PFT	
11	BLU-BLK	R		6
37	BLK-ORN	T	STA	
12	ORN-BLK	R		
38	BLK-GRN	T	PFT	
13	GRN-BLK	R		7
39	BLK-BRN	T	STA	
14	BRN-BLK	R		
40	BLK-SLT	T	PFT	
15	SLT-BLK	R		8
41	YEL-BLU	T	STA	
16	BLU-YEL	R		
42	YEL-ORN	T	PFT	
17	ORN-YEL	R		9*
43	YEL-GRN	T	STA	
18	GRN-YEL	R		
44	YEL-BRN	T	PFT	
19	BRN-YEL	R		10*
45	YEL-SLT	T	STA	
20	SLT-YEL	R		
46	VIO-BLU	T	PFT	
21	BLU-VIO	R		11*
47	VIO-ORN	T	STA	
22	ORN-VIO	R		
48	VIO-GRN	T	PFT	
23	GRN-VIO	R		12*
49	VIO-BRN	T	STA	
24	BRN-VIO	R		
50	VIO-SLT	GROUND (EARTH)		
25	SLT-VIO	GROUND (EARTH)		

Notes

*Circuits 9-12 are only on GS-1-12.

General installation with PFT equipment: Refer to Figure 1. The GS-1's PFT connections are cross connected to the station telephone connections on the associated PFT equipment. The GS-1's STA connections are connected to the station telephones.

Installation with Northern Telecom SL-1: Refer to Figure 2. Electrically, the GS-1 is connected between the Emergency PFT unit and the station telephone. The GS-1's PFT connections connect with the Emergency PFT unit's 500/2500-type telephone set connections. The GS-1's STA connections connect to the station telephones.