

Technical Practice

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BP-2 POWER FAILURE TRANSFER UNIT

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1. General Description

1.1 NEW PRACTICE ISSUE Issue 2 of the BP-2 Technical Practice 40113 is released due to improvements in the, BP-2. BP-2-24s with serial number BP-2-24-18000 or higher and BP-2-48s with serial number BP-2-48-4250 or higher contain these improvements. The improvements include changes to facilitate listing by Underwriters Laboratories, Inc., improved labeling and a new implementation of the manual transfer switch.

1.2 PRODUCT OVERVIEW The BP-2 Power Failure Transfer (PFT) Unit is designed to connect 2-wire Central Office (CO) ground start trunk lines to selected station telephones in the event of a power failure or telecommunications system malfunction. The BP-2 contains automatic loop start to ground start conversion circuitry to provide the signaling required to draw CO dial tone when a station telephone is brought off-hook; this eliminates the need to add ground start push buttons to the station telephones. In the normal, non-transfer mode of operation, the BP-2 connects the CO ground start trunk lines to trunk ports on the associated PBX system; PBX extension ports are connected to the station telephones.

1.3 FEATURES Features include eight circuits of PFT, LED status indicators, manual transfer switch, two auxiliary relay contacts, and provision for additional BP-2s to be connected together. Also included are two transfer control lines which facilitate the connection of a normally open contact or logic level signal, which can be used to control the BP-2's operating mode.

1.4 POWER REQUIREMENTS The BP-2 is manufactured in two versions. The BP-2-24 is designed to operate with an AC or DC power source; 24Vac or -24Vdc, 225mA maximum is required. The BP-2-48 requires -48Vdc, 140mA maximum for operation.

1.5 DESCRIPTION The BP-2 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 BP-2 measures 8.75 inches (22.23cm) square, 3.25 inches (8.26cm) deep, and weighs approximately two pounds (0.9kg). The BP-2 wall mounts with four screws.

1.6 BP-2 KIT For installer convenience the BP-2 Kit can be ordered from Gordon Kapes, Inc. Contained in a single carton is a BP-2-24, a 24Vac power transformer, and a seven-foot, 3-conductor cable.

1.7 FCC REGISTRATION The FCC Part 68 registration number is BW8VH-63354-0T-N, ringer equivalence 0.1 B.

1.8 SAFETY COMPLIANCE The BP-2 is Underwriters Laboratories, Inc. Listed Telephone Equipment.

1.9 DIFFERENCES BETWEEN VERSIONS OF THE BP-2 Since its release in 1983, the BP-2 has undergone a number of improvements. With this version several significant changes and improvements have been made. We will refer to this version as the new type. It is easily identified by the two LEDs, and the manual transfer switch being located on the left side of the circuit board. Several items are worth mentioning:

UL Listing: This is the first BP-2 version to be UL listed. A label on the front of the unit displays the UL symbol.

Connection Points: The connection points of this version remain the same as previous versions. Pin for pin compatibility is maintained.

Transfer Switch: Previous versions of the BP-2 had a switch called the manual PFT switch. This switch placed the BP-2 in the transfer mode by disconnecting the incoming power. In the new version, the switch is referred to as the manual transfer switch. The manual transfer switch places the BP-2 in the transfer mode by simulating a command from the Contact Input or logic Input transfer inputs. Power remains supplied to the unit even when the manual transfer switch in the transfer position.

Auxiliary Relay Contact NO2: Unlike previous versions, auxiliary relay contact NO2 will now follow the action of the manual transfer switch.

Transfer Inputs: Previous versions of the BP-2 contained functions referred to as FBC and logic FBC. For clarity, FBC is now called Contact Input; logic FBC is called Logic Input. The circuits associated with these inputs have been improved to allow simpler connection in multiple BP-2 installations. Installing multiple new BP-2 units no longer requires the rather complicated master/slave arrangement.

Labeling: The cover is now labeled for assistance during installation, testing, and operation. The label identifies the LED indicator lights, manual transfer switch, and lists other pertinent information.

Loop Start to Ground Start Converters: The loop start to ground start converter circuits have been further refined. There are now no known compatibility problems.

2. Applications

2.1 PRIMARY APPLICATION The primary application for the BP-2 is to provide PFT capability for up to eight ground start trunk lines associated with a PBX telephone system.

2.2 TRANSFER CONTROL LINES The BP-2 contains two transfer control lines: Contact Input and Logic Input. These inputs allow a PBX system status signal to place the BP-2 in the transfer mode. The flexibility of the Contact Input and logic Input functions make the BP-2 compatible with many PBX systems. Contact Input allows connection of a normally open (not shorted) contact. Logic Input allows connection of a logic level signal. A switch on the BP-2 allows use of a normally logic high or normally logic low signal.

2.3 AUXILIARY RELAY CONTACTS Two sets of isolated relay contacts are available for installer selected applications. Auxiliary relay contact NO1 is a normally open (not shorted) contact that closes (shorts) when the BP-2 goes into the transfer mode. Auxiliary relay contact NO2 is a normally open contact that closes when the BP-2 goes into the transfer mode due to activation of one of the transfer control lines, or pressing the manual transfer switch. Transfer caused by a loss of power to the BP-2 will not cause NO2 to change state.

2.4 NIGHT TRANSFER DEVICE The BP-2 can be used as a night transfer device. After business hours, CO trunk lines can be connected to station telephones, bypassing the normal PBX connections. This can be easily implemented by connecting the BP-2's Contact Input to a switch on an operator's console.

2.5 MULTIPLE UNITS Multiple BP-2s can be connected together to provide more than eight circuits of PFT. The transfer control lines are specifically designed to allow bridging (connecting in parallel).

3. Installation

3.1 WORDS OF CAUTION As with any product, installing the BP-2 requires a safety first approach.

Warning: Never install telephone wiring during a lightening 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 BP-2 should be inspected for damage immediately upon receipt. If damage is found, a claim should be filed with the shipper. A replacement BP-2 should be ordered if necessary.

3.3 INSTALLATION KIT Included in each BP-2 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.

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 BP-2 wall mounts using four #8 screws appropriate depending on the wall material. Four #8 pan head screws are contained in the installation kit; use these if suitable.

3.6 BP-2 CONNECTIONS All connections to the BP-2 are made via two 25-pair plugs, P1 and P2, and a 9-position screw terminal strip TS1. The installer must provide two 25-pair cable mounted connectors to mate with P1 and P2. Figure 1, located at the end of this practice, gives detailed connection information. Refer to this figure when reading the installation procedures.

3.7 USING THE TERMINAL STRIP In some installations, it is convenient to make connections using the terminal strip. The nine terminals on TS1 parallel nine contacts on plugs P1 and P2. Connections made on TS1 do not have to be made on P1 or P2, and vice-versa.

3.8 INSTALLING AND TERMINATING THE 25-PAIR CONNECTORS Install the two 25-pair cable mounted connectors into plugs P1 and P2. Secure them using the fastener straps that are attached to the plugs. Terminate the cables (e.g., in a "66" type block). Use the cable ties, provided in the installation kit, to secure the 25-pair cables to the mounting points molded into the BP-2s base.

3.9 CONNECTING POWER The BP-2-24 requires 24Vac or -24Vdc, 225mA maximum for operation. The BP-2-48 requires -48Vdc, 140mA maximum for operation. Use the serial number label to confirm the version you are installing, and then connect the appropriate power source. Power can be connected using either plug P1 or terminal strip TS1. Warning: Each side of power is connected to a separate pair of wires. The two wires of each pair are connected together inside the BP-2.

Powering with 24Vac (BP-2-24 ONLY): Connect one lead of the 24Vac to the Violet/Brown pair of P1, or to terminal 2 of TS1. Connect the other 24Vac lead to the Violet/Slate pair of P1, or to terminal 3 of TS1. 24Vac operation requires that the red-colored wire jumper loop be cut. It is labeled J1 and is located near the lower right edge of the printed circuit board. When using the BP-2-24 with 24Vac, it is important that both sides of the 24Vac be floating (isolated) from earth ground. Failure to provide this condition will result in incorrect BP-2-24 operation.

Powering with -24Vdc (BP-2-24 ONLY): Connect power supply ground to the Violet/Brown pair of P1, or to terminal 2 of TS1. Connect -24Vdc to the Violet/Slate pair of P1, or to terminal 3 of TS1. DO NOT CUT the red-colored jumper loop.

Powering with -48Vdc (BP-2-48 ONLY): Connect power supply ground to the Violet/Brown pair of P1, or to terminal 2 of TS1. Connect -48Vdc to the Violet/Slate pair of P1, or to terminal 3 of TS1. There are no jumper loops on the BP-2-48.

3.10 CONNECTING EARTH GROUND Both versions of the BP-2 require a separate earth ground connection for operation of the loop start to ground start conversion circuits. Connect earth

ground to the Violet/Orange pair of P1, or to terminal 1 of TS1. When using the BP-2-24 with -24Vdc, or the BP-2-48 with -48Vdc, two separate ground connections are necessary: one for earth ground and one for power supply ground. Even if the power supply ground is electrically at earth ground, it must still be connected to **BOTH** the power supply ground **AND** the earth ground connection points.

3.11 BP-2 KIT If you are installing a BP-2 Kit: the green-colored wire of the 3-conductor cable is intended to connect the power transformer GND terminal-to-terminal 1 of TS1, the other two wires connect the transformer LOAD terminals to terminals 2 and 3 of TS1.

3.12 TRUNK AND STATION CONNECTIONS Referring to Figure 1, located at the end of this practice, cross-connect the BP-2 with the CO trunks, PBX system trunk and extension ports, and station telephones. Four cable pairs are cross-connected for each of the eight PFT circuits.

3.13 THE TRANSFER CONTROL LINES The BP-2 has two transfer control lines: Contact Input and Logic Input. These inputs are designed to be connected to operating status signals on an associated PBX system. The PBX documentation may refer to these points as "Bypass Enable," "Transfer Request," "System Status," etc. PBX connection points that link with the Contact Input can be in the form of an isolated relay contact, or a contact that closes (shorts) to PBX ground. The Logic Input is a different breed. It wants to see logic current, such as from a 5Vdc digital circuit, as the PBX status signal. An installation can utilize both the Contact Input and the Logic Input. An example would be to connect Logic Input to a PBX status signal, and connect Contact Input to a switch mounted on an attendant's console. In this way, two independent functions can place the BP-2 in the transfer mode.

3.14 CONTACT INPUT Follow this section if your PBX provides a normally open contact that closes (shorts) when transfer is requested.

Isolated Contact: If the PBX system provides an isolated normally open (not shorted) contact, connect its leads to the Violet/Green pair of P1, or to terminals 4 and 5 of TS1. An isolated contact provides two leads, neither of which is connected to ground, i.e., neither side of the contact is electrically connected to any other point in the PBX.

Closure to Ground: If the PBX provides a contact closure that is referenced to PBX system ground (a non-isolated contact closure), such as the ROLM CBX series, connect the Green/Violet wire of P1, or TS1 terminal 4, to the contact that closes (shorts) to system ground. Connect the Violet/Green wire of P1, or terminal 5 of TS1, to the system ground.

3.15 LOGIC INPUT Follow this section if your PBX provides a logic signal that changes state when transfer is requested. The Logic Input requires 1mA minimum for detection of a valid logic high. Connect the positive lead of the logic signal to the Violet/Blue wire of P1. Connect the common, ground, or negative lead of the logic signal to the Blue/Violet wire of P1. Set the BP-2's Logic Input switch, which is located on the circuit board, directly to the right of plug P2. This switch allows the use of a normally logic high (e.g., +5Vdc) or normally logic low to initiate transfer. For transfer to occur when logic high is applied, set the switch to the HIGH position. For transfer to occur when logic low is applied, set the switch to the LOW position. Setting

the switch in the LOW position requires that a logic high (e.g., +5Vdc) be applied continuously for normal operation.

Note: For correct operation when the logic input is not utilized, the logic input switch must be set to the HIGH position.

3.16 LOGIC INPUT WITH ROLM 9722 REDWOOD® SYSTEM Logic Input can be directly connected to the Redwood system. Redwood provides a logic signal that is designated as the +5V power-down signal. The power-down function is +5Vdc when Redwood is operating correctly, and changes to 0Vdc upon system failure. Power-down appears on the Black/Green pair of 25-pair plug J52 on the master cabinet. Connect the Black/Green wire of J52 to the Violet/Blue wire of P1; connect the Green/Black wire of J52 to the Blue/Violet wire of P1. Set the Logic Input switch to the LOW position.

3.17 AUXILIARY RELAY CONTACTS The BP-2 provides two sets of isolated, normally open (not shorted) relay contacts for use in installer-selected applications. The designation normally open refers to the state of the relay contact when the BP-2 is in the normal mode. Auxiliary relay contact NO1 closes (shorts) any time that the BP-2 is in the transfer mode. Auxiliary relay contact NO2 closes (shorts) only when Contact Input, Logic Input, or the manual transfer switch places the BP-2 in the transfer mode. A loss of power to the BP-2 will not close NO2.

3.18 MULTIPLE UNITS—NEW VERSION Additional BP-2s can easily be connected together to provide PFT for more than eight trunks. Use this procedure if all BP-2s are of the new type. A new BP-2 can be identified by LED indicator lights and a manual transfer switch on the left side of the circuit board. Skip to the next section if BP-2s of different vintages are being installed together.

Contact Input: The Contact Input connections of a virtually unlimited number of BP-2 units can be bridged together (connected in parallel). Connect the first BP-2 to the PBX as per the instructions in Section 3.14. Connect the Violet/Green pair of the first unit to the Violet/Green pair(s) on the additional BP-2(s). Or, connect TS1 terminal 4 of the first unit to terminal 4 on all the other BP-2s, and terminal 5 on the first unit to terminal 5 on all the other units.

Be certain that the polarity of the connections is maintained.

Logic Input: The Logic Input connections of multiple BP-2s can be bridged together (connected in parallel). Each Logic Input requires a minimum of 1mA of current for correct operation. A standard logic output source can usually provide at least 10mA. This provides plenty of current to conservatively drive the Logic Input on eight BP-2s. Connect the Logic Input of the first BP-2 to the PBX as per the instructions in Section 3.15 for Logic Input. Connect the Violet/Blue pair of the first unit to the Violet/Blue pairs of the additional BP-2s. Be sure that the polarity of the connections is maintained.

3.19 MULTIPLE UNITS—DIFFERENT BP-2 VERSIONS A different installation procedure is required when installing multiple BP-2s of different vintages. Follow this section if you are installing one or more new units with one or more older BP-2 units. A new BP-2 can be identified by LED indicator lights and a manual transfer switch on the left side of the circuit board. **In this installation scenario, the Contact Input and Logic Input connections cannot be connected in parallel (bridged).** Select a new type BP-2 to be what we will call the master unit. It is important that a new BP-2 be installed as master! Following

section 3.14 and 3.15 as is appropriate, connect the master unit's Contact Input and/or Logic Input to the PBX alarm connection, or other switch or contact closure. Auxiliary relay contact NO1 on the master is then connected to Contact Input or, in the case of an older unit, FBC on the next BP-2, which we will designate slave 1. NO1 on slave 1 is then connected to Contact Input or FBC on slave 2. This procedure is continued for as many BP-2 units as is required. For correct operation, the Logic Input switch on the slave units must be set to the HIGH position. In the completed installation, the slave units will follow the action of the Contact Input, Logic Input and manual transfer switch on the master unit.

3.20 POWER FAILURE TRANSFER TELEPHONE LABELS

Included in the installation kit are eight adhesive-backed labels. These labels are provided to identify the station telephones that are connected to the BP-2s PFT circuits. Apply them to the station telephones at this time.

4. Testing and Operation

4.1 INSTALLATION REVIEW At this stage, the CO trunk lines, PBX trunk and station ports, and station telephones should be cross-connected with the BP-2. Power, earth ground, transfer control line, and auxiliary relay contact connections should be made. Confirm that the Logic Input switch is set to the desired position. Set it to HIGH if Logic Input is not being used.

4.2 EXPLANATION OF OPERATING MODES The BP-2 operates in two modes: normal and transfer.

Normal Mode: Normal mode operation commences when power is applied, the transfer control lines are in their non-transfer state, and the manual transfer switch is not activated. In the normal mode, only the Power LED is lit. The Power LED is the top of two LEDs located on the left side of the BP-2 circuit board.

Transfer Mode: Transfer mode is entered due to anyone of four reasons: loss of power to the BP-2, a transfer request via the Contact Input or Logic Input, or activation of the manual transfer switch. When the BP-2 loses incoming power, the transfer mode is entered and neither LED is lit. When the transfer mode is entered due to a request via the Contact Input or Logic Input, or by pressing the manual transfer switch, the Transfer LED will light; the Power LED will remain lit. The Transfer LED is the bottom of two LEDs located on the left side of the BP-2 circuit board. It aids in differentiating between a transfer caused by the loss of incoming power, and a transfer caused by activating one of the transfer control lines or pressing the manual transfer switch.

4.3 TESTING THE CONTACT INPUT In this section we will test the BP-2 in an installation where the PBX provides a normally open (not shorted) contact that closes when transfer is requested.

Initial Operation: At this stage, the BP-2 should be in the normal mode, with only the Power LED lit. If the Transfer LED is also lit, determine whether or not this is a problem. There are two reasons for the transfer mode being enabled. The first reason is legitimate: the Contact Input is closed (shorted), giving a command to transfer. This could be the case where a new PBX has not yet been brought up to its operating state and is legitimately giving a command to transfer. The second reason is that the manual transfer switch is activated. This switch is

located directly below the two LEDs; press it once to change its on/off state. After performing a review, and making any required changes, the unit should be in the normal mode. Only the Power LED should be lit.

Testing Transfer Operation: Momentarily disconnect the power source from the BP-2. The Power LED should go out, indicating that the unit is in the transfer mode. Again apply power. Only the Power LED should light. Short the Contact Input at the source of the contact, e.g., at the PBX. The Transfer LED should light. The Power LED will remain lit when the Transfer LED is lit. Remove the short and the Transfer LED should go out. Pressing the manual transfer switch should light the Transfer LED. Pressing it again should return the unit to the normal mode.

4.4 TESTING THE LOGIC INPUT In this section we will test the BP-2 in an installation where the PBX provides a logic signal that changes state when transfer is requested.

Initial Operation: At this stage, the BP-2 should be in the normal mode, with only the Power LED lit. If the Transfer LED is also lit, determine whether or not this is a problem. There are two reasons for being in the transfer mode. The first reason is legitimate: the Logic Input has a logic signal in its transfer state presented to it. This would be a logic low if the logic input switch is set to LOW; high if the logic input switch is set to HIGH. This could be the case where a new PBX has not yet been brought up to its operating state and is legitimately giving a command to transfer. The second reason is that the manual transfer switch is activated. This switch is located directly below the two LEDs; press it once to change its on/off state. After performing a review, and making any required changes, the unit should be in the normal mode. Only the Power LED should be lit.

Testing Transfer Operation: Momentarily disconnect the power source from the BP-2. The Power LED should go out, indicating that the unit is in the transfer mode. Again apply power. Only the Power LED should light. Make the logic signal connected to the Logic Input change to the transfer state. With a PBX that provides a normally logic high, simply disconnect the logic signal at the source of the signal, e.g., at the PBX. The Transfer LED should light. The Power LED will remain lit. Reconnect the logic signal and the Transfer LED should go out. Pressing the manual transfer switch should light the Transfer LED. Pressing it again should return the unit to the normal mode.

4.5 TESTING MULTIPLE UNITS—NEW VERSION Use the following paragraphs to test an installation where multiple new version BP-2s have been installed. A new BP-2 can be identified by the LED indicator lights and a manual transfer switch on the left side of the circuit board. Skip to the next section if multiple BP-2s of different vintages have been installed together.

Where Contact Input is Implemented: Place all the BP-2s in the normal mode; only the Power LEDs should be lit. On the first BP-2, press the manual transfer switch. The Transfer LED on this unit should light. Again, press the manual transfer switch on the first unit. The Transfer LED should stop lighting. Repeat this sequence for all the BP-2s. Previously, the Contact Input on each of the BP-2s should have been connected together, and then connected to a normally open contact. Short the contact at the source of the contact, e.g., at the PBX. The Transfer LED on each of the BP-2s should light; the Power LEDs will remain lit. Remove the short and the Transfer LEDs should go out.

Where Logic Input is Implemented: Place all the BP-2s in the normal mode; only the Power LEDs should be lit. On the first BP-2, press the manual transfer switch. The Transfer LED on this unit should light. Again, press the manual transfer switch on the first unit. The Transfer LED should stop lighting. Repeat this sequence for all the BP-2s. Previously, the Logic Input on all the BP-2s should have been connected together, and then connected to a logic signal. Change the state of the logic signal. The Transfer LED on each of the BP-2s should light; the Power LEDs will remain lit. Return the state of the logic signal to the non-transfer state. The Transfer LEDs should go out.

4.6 TESTING MULTIPLE UNITS—DIFFERENT BP-2 VERSIONS Follow this section to test an installation where multiple BP-2s of different vintages have been installed.

Where Contact Input is Implemented: Place all BP-2s in the normal mode; only the Power LEDs should be lit. On the master BP-2, press the manual transfer switch. The Transfer LEDs on all units should light. On older BP-2 versions this LED is called the FBC LED. Again, press the manual transfer switch on the master. The Transfer and/or FBC LEDs should stop lighting. Previously, the Contact Input on the master BP-2 should have been connected to a normally open contact. Short the contact at the source of the contact, e.g., at the PBX. The Transfer and/or FBC LEDs on all BP-2s should light; the Power LEDs will remain lit. Remove the short and the LEDs should go out.

Where Logic Input is Implemented: Place all the BP-2s in the normal mode; only the Power LEDs should be lit. On the master BP-2, press the manual transfer switch. The Transfer LEDs on all units should light. On older BP-2 versions this LED is called the FBC LED. Again, press the manual transfer switch on the master. The Transfer and/or FBC LEDs should stop lighting. Previously, the Logic Input on the master BP-2 should have been connected to a logic signal. Change the state of the logic signal. The Transfer and/or FBC LEDs on all BP-2s should light; the Power LEDs will remain lit. Return the logic signal to the non-transfer state. The Transfer and/or FBC LEDs should go out.

4.7 TESTING THE TELEPHONE LINES ASSOCIATED WITH THE BP-2 The one or more BP-2 units that have been in-stalled should each be tested by following the procedure outlined in this section. Place the BP-2(s) in the normal mode. The Power LED should be lit; the Transfer LED or, on an older unit, FBC LED should not be lit. Ensure that the trunks function correctly by using the PBX to draw CO dial tone from every trunk associated with a BP-2 circuit. Even if these trunks are incoming only type, such as WATS, you usually can still draw dial tone. Ensure that PBX dial tone can be drawn from each station telephone that is connected via a BP-2 circuit. Check that each station telephone is labeled with a "Power Failure Transfer Telephone" label.

Note: In some installations, the single line telephones will be dedicated for PFT use; no PBX extensions will be wired to the telephone via the BP-2. In this case, the single line telephones will not draw dial tone when the associated BP-2 is in the normal mode.

Use the manual transfer switch to place the BP-2 in the transfer mode. On a new BP-2, both LEDs should be lit. On an older version neither LED will be lit. Ensure that each station telephone can draw a dial tone from the CO. Even if these trunks are incoming only type, such as WATS, you usually can still

draw dial tone. On each PFT station telephone that connects to a trunk with outgoing call capability: place a call and ensure that it completes correctly. On all PFT station telephones: receive an incoming call. Return the BP-2 to the normal state. Only the Power LED should be lit.

4.8 PLACING THE BP-2 INTO SERVICE The one or more BP-2s should now be ready for action! Normal operation should find the Power LED(s) lit, and the Transfer LED(s) not lit.

4.9 MAINTENANCE It is recommended that the BP-2 and associated station telephones be tested not less than once a year. Moves and changes of PFT station telephones often cause the labels to go astray. Replacement PFT telephone labels can be ordered from Gordon Kapes, Inc.

5. Circuit Description

5.1 GENERAL The circuit description is intended to familiarize you with the BP-2 for engineering and applications use.

5.2 NORMAL MODE During normal operation, power is supplied to the BP-2 by an external source. The manual transfer switch is in the normal position. The Power LED is lit and the Transfer LED is not lit. If utilized, the contact connected to the Contact Input is open (not shorted). If utilized, the logic signal connected to the Logic Input is in its normal state. The three transfer relays are energized, connecting the CO trunk lines to the PBX trunk ports, and the PBX station ports to the station telephones. Auxiliary relay contact NO1, created by one contact on one of the transfer relays, is open (not shorted). The manual transfer relay is not energized, making auxiliary relay contact NO2 open (not shorted).

Each loop start to ground start (LS-GS) conversion circuit is electrically in series with the tip lead of its respective station telephone loop. There is a high resistance path from the station telephone's tip lead to ground, and a high impedance path from the station telephone's ring lead to ground. These paths to ground do not affect the station port's performance; the LS-GS circuitry looks invisible to the station port.

5.3 TRANSFER MODE There are four causes for the BP-2 to go into the transfer mode: loss of incoming power, activation of the manual transfer switch, or a request to transfer from the Contact Input or Logic Input. When the unit goes into the transfer mode, the three transfer relays de-energize, connecting the CO trunk lines to the station telephones. The LS-GS conversion circuits are now active. The transfer relays de-energizing causes auxiliary relay contact NO1 to change state. If the transfer mode was initiated by a loss of power, neither LED is lit. If the transfer mode was initiated by one of the transfer control lines or the manual transfer switch, both LEDs will be lit, and the manual transfer relay will energize, causing auxiliary relay contact NO2 to change state.

5.4 LOOP START TO GROUND START CONVERSION CIRCUIT A separate LS-GS conversion circuit is provided for each PFT 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 (not shorted) on the tip lead, i.e., it is not connected to anything. The LS-GS conversion circuit detects the station telephone set 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.

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

5.6 TRANSFER CONTROL LINES The BP-2 provides two transfer control lines: Contact Input and Logic Input. Both allow external signals to control the manual transfer relay, which in turn controls the operating status of the BP-2.

Contact Input: Contact Input allows use of a normally open contact, or a closure to power supply ground or common, to place the BP-2 in the transfer mode. The circuit has an input impedance of approximately 10k ohms to provide isolation between the BP-2 and the contact closure. The circuit is designed so as to allow multiple BP-2 units to be bridged together (connected in parallel).

Logic Input: The logic Input circuit utilizes an optical isolator, with a 1800 ohm resistor in series with it, to electrically isolate the logic level input signal from the BP-2. A switch selects whether a logic low or logic high input signal activates the manual transfer relay. The circuit is relatively sensitive, allowing one logic signal to drive the logic Input on multiple BP-2 units.

5.7 TERMINAL STRIP TS1 Terminal Strip TS1 parallels nine contacts on plugs P1 and P2. TS1 provides access to earth ground, power, Contact Input, and auxiliary relay contacts NO1 and NO2. Logic Input connections appear only on plug P1.

5.8 24VAC VERSUS -24VDC OPERATION When the BP-2-24 is powered by 24Vac, the installer cuts the red-colored wire jumper loop, placing a resistor in series with the manual transfer relay. This resistor limits the voltage applied to the manual transfer relay. When the BP-2-24 is powered by -24Vdc, the jumper loop is not cut, shunting the resistor. This allows the full incoming -24Vdc to be applied to the manual transfer relay.

5.9 DIFFERENCES BETWEEN -24 AND -48 VERSIONS Slight differences are found between the BP-2-24 and the BP-2-48. One capacitor and the jumper loop are not required for the BP-2-48 and are not inserted into the circuit board. The three PFT relays are 24V type for the BP-2-24 and 48V type for the BP-2-48. The manual transfer relay for both versions is a 24V type.

6. Specifications

POWER REQUIREMENT

BP-2-24: 24Vac or -24Vdc, 225mA maximum

BP-2-48: -48Vdc, 140mA maximum

NUMBER OF PFT CIRCUITS

8

TRUNK COMPATIBILITY

Intended for use with ground start trunks only

AUXILIARY RELAY CONTACT RATINGS

NO1, NO2: 1A maximum at 30Vdc or 100Vac (resistive)

CONTACT INPUT

Transfer is enabled by closing (shorting) the Contact Input connections. The contact connected to the Contact Input must be capable of handling 5mA at -48Vdc. Contact Inputs on multiple BP-2 units can be bridged (connected in parallel).

LOGIC INPUT

Transfer is enabled by changing the state of a logic signal applied to the Logic Input. A switch on the BP-2 selects if transfer is caused by logic high or logic low. Minimum logic current for logic high: 1mA. Input current is limited via a 1800 ohm resistor in series with the Logic Input's optical coupler.

ENVIRONMENT

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

SAFETY COMPLIANCE

Underwriters Laboratories, Inc. Listed Telephone Equipment

FCC REGISTRATION

Registration Number: BW8VH-63354-0T-N

Ringer Equivalence: 0.1 B

RADIATED NOISE COMPLIANCE

Contains no circuitry subject to EMI regulations

RELIABILITY

MTBF 26.2 years, per Method I of Bellcore TS-TSY-000332, Issue 2, July 1988

INTERCONNECTIONS

The BP-2 contains two 25-pair plugs and one 9-position screw terminal strip. Installer must supply two 25-pair connectors.

DIMENSIONS

8.75 inches high (22.23cm)

8.75 inches wide (22.23cm)

3.25 inches deep (8.26cm)

WEIGHT

Approximately 2 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 BP-2, please review Section 3 - Installation and Section 4 - Testing and Operation of this practice.

7.2 LOGIC INPUT SWITCH If the Logic Input switch is in-correctly set, the BP-2 may remain "locked" in the transfer mode. It must be set to the HIGH position when the Logic Input function is not used or when a logic high (normally +5Vdc) is used to request transfer. If set to the LOW position, a logic high signal must be present for normal operation.

7.3 EARTH GROUNDING Ensure that the earth ground source connected to the BP-2 is truly at earth ground potential. Using the same ground point that the PBX does will generally guarantee a good ground. Failure to provide this will result in no, or possibly intermittent loop start to ground start conversion or crosstalk

between BP-2 circuits. Unless you want one big party line, connect the BP-2 to earth ground!

7.4 CO TRUNK TIP AND RING POLARITY Be certain that the CO trunk lines are correctly connected. When a ground start trunk is in the 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.

7.5 EXTENSION TIP AND RING POLARITY It is important that the connections from the PBX extension ports to the BP-2s EXT connections maintain correct tip and ring polarity. When a PBX extension is in the on-hook state, the ring lead should measure nominally -48Vdc with respect to the tip lead. Some PBX systems may use a lower loop volt-age, e.g., -30Vdc . This lower loop voltage poses no problem to the BP-2.

7.6 INCORRECT POWER CONNECTION Ensure that the power source is correctly connected to either plug P1 or Terminal Strip TS1. As soon as power is applied, the Power LED will light. Note that in the BP-2, both wires of the Violet/Brown pair are shorted together, and both wires of the Violet/Slate pair are shorted together. One side of the power to the BP-2 is carried by the Violet/Brown pair, and the other side is carried by the Violet/Slate Pair. Care must be taken so as not to connect both sides of the power source to either of these pairs alone—damage to the power source or the BP-2 may result.

7.7 LOOP RESISTANCE LIMIT In the transfer mode, the station telephone loop is connected in series with the CO 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. When the BP-2 is in the transfer mode, failure to reliably draw CO dial tone may indicate excessive loop length. Contact Gordon Kapes, Inc. technical support for assistance.

7.8 APPLICATION LIMITATIONS The BP-2 was designed to operate correctly in most PH applications. However, Gordon Kapes, Inc. does not guarantee the BP-2 to be compatible with all ground start or loop start trunk lines, PBXs, and station telephones. All functions of the installed BP-2 should be thoroughly tested before the unit is placed into service.

7.9 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 those rare cases, it's not a bad idea to have some aspirin and the telephone number of a pizza place that delivers!)

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 BP-2 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 BP-2 repairs are ever required, they should only be performed by Gordon Kapes, Inc. or an authorized representative. For further in-formation, contact Gordon Kapes, Inc.

9. FCC Requirements

9.1 TYPE OF SERVICE Your BP-2 is designed to be used on standard device telephone lines. The BP-2 connects to the telephone line by means of standard jacks called USOC RJ21 X. 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 effect 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 re-quest. 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 1 BP-2 Power Failure Transfer Unit Connection Diagram

P1 Pin			P2 Pin		
Number	Cable Color	Connection	Number	Cable Color	Connection
26	WHT-BLU	T EXT-1	26	WHT-BLU	T EXT-5
1	BLU-WHT	R STA-1	1	BLU-WHT	R STA-5
27	WHT-ORN	T STA-1	27	WHT-ORN	T STA-5
2	ORN-WHT	R TRK-1	2	ORN-WHT	R TRK-5
28	WHT-GRN	T TRK-1	28	WHT-GRN	T TRK-5
3	GRN-WHT	R COT-1	3	GRN-WHT	R COT-5
29	WHT-BRN	T COT-1	29	WHT-BRN	T COT-5
4	BRN-WHT	R EXT-2	4	BRN-WHT	R EXT-6
30	WHT-SLT	T EXT-2	30	WHT-SLT	T EXT-6
5	SLT-WHT	R STA-2	5	SLT-WHT	R STA-6
31	RED-BLU	T STA-2	31	RED-BLU	T STA-6
6	BLU-RED	R TRK-2	6	BLU-RED	R TRK-6
32	RED-ORN	T TRK-2	32	RED-ORN	T TRK-6
7	ORN-RED	R COT-2	7	ORN-RED	R COT-6
33	RED-GRN	T COT-2	33	RED-GRN	T COT-6
8	GRN-RED	R EXT-3	8	GRN-RED	R EXT-7
34	RED-BRN	T EXT-3	34	RED-BRN	T EXT-7
9	BRN-RED	R STA-3	9	BRN-RED	R STA-7
35	RED-SLT	T STA-3	35	RED-SLT	T STA-7
10	SLT-RED	R TRK-3	10	SLT-RED	R TRK-7
36	BLK-BLU	T TRK-3	36	BLK-BLU	T TRK-7
11	BLU-BLK	R COT-3	11	BLU-BLK	R COT-7
37	BLK-ORN	T COT-3	37	BLK-ORN	T COT-7
12	ORN-BLK	R EXT-4	12	ORN-BLK	R EXT-8
38	BLK-GRN	T EXT-4	38	BLK-GRN	T EXT-8
13	GRN-BLK	R STA-4	13	GRN-BLK	R STA-8
39	BLK-BRN	T STA-4	39	BLK-BRN	T STA-8
14	BRN-BLK	R TRK-4	14	BRN-BLK	R TRK-8
40	BLK-SLT	T TRK-4	40	BLK-SLT	T TRK-8
15	SLT-BLK	R COT-4	15	SLT-BLK	R COT-8
41	YEL-BLU	T COT-4	41	YEL-BLU	T COT-8
16	BLU-YEL	R	16	BLU-YEL	R
42	YEL-ORN		42	YEL-ORN	
17	ORN-YEL		17	ORN-YEL	
43	YEL-GRN		43	YEL-GRN	
18	GRN-YEL		18	GRN-YEL	
44	YEL-BRN		44	YEL-BRN	
19	BRN-YEL		19	BRN-YEL	
45	YEL-SLT		45	YEL-SLT	
20	SLT-YEL		20	SLT-YEL	
46	VIO-BLU	+ Logic Input	46	VIO-BLU	
21	BLU-VIO	- Logic Input	21	BLU-VIO	
47	VIO-ORN	GND (Earth)	47	VIO-ORN	
22	ORN-VIO	GND (Earth)	22	ORN-VIO	
48	VIO-GRN	Contact Input	48	VIO-GRN	
23	GRN-VIO	Contact Input	23	GRN-VIO	
49	VIO-BRN	See Note 1	49	VIO-BRN	NO2
24	BRN-VIO	See Note 1	24	BRN-VIO	NO2
50	VIO-SLT	See Note 1	50	VIO-SLT	NO1
25	SLT-VIO	See Note 1	25	SLT-VIO	NO1

Terminal Strip TS1

1	2	3	4	5	6	7	8	9
GND (Earth)	See Note 2	Contact	Input		NO2		NO1	

Note 1

P1 Pin Number	Cable Color	BP-2-24 @ 24Vac Operation	BP-2-24 @ -24Vdc Operation	BP-2-48 @ -48Vdc Operation
49	VIO-BRN	AC Common	GND (pwr sup)	GND (pwr sup)
24	BRN-VIO	AC Common	GND (pwr sup)	GND (pwr sup)
50	VIO-SLT	±24Vac	-24Vdc	-48Vdc
25	SLT-VIO	±24Vac	-24Vdc	-48Vdc

Note 2

TS1 Terminal Number	BP-2-24 @ 24Vac Operation	BP-2-24 @ -24Vdc Operation	BP-2-48 @ -48Vdc Operation
2	AC Common	GND (pwr sup)	GND (pwr sup)
3	±24Vac	-24Vdc	-48Vdc

Note 3

EXT: Tip and Ring from PBX extension port
 STA: Tip and Ring to station telephone
 TRK: Tip and Ring to PBX trunk port
 COT: Tip and Ring from Central Office (CO)

Note 4

Contact Input: Close (short) to place BP-2 in transfer mode.
 Logic Input: Apply or remove (1mA minimum) logic signal to control transfer. For transfer on logic high set the Logic Input switch to the HIGH position. For transfer on logic low set the Logic Input switch to the LOW position. For ROLM Redwood systems, use master cabinet plug J52: BLK-GRN wire to BP-2 P1 VIO-BLU wire; GRN-BLK wire to BP-2 P1 BLU-VIO wire. Set the Logic Input switch to the LOW position.
 If the Logic Input is not used, set the Logic Input switch to the HIGH position.

Note 5

NO2: Normally open (not shorted) auxiliary relay contact. Closes (shorts) when the BP-2 goes into the transfer mode due to activation of Contact Input, Logic Input, or manual transfer switch. Power failure will not close (short) NO2.
 NO1: Normally open (not shorted) auxiliary relay contact. Closes (shorts) when any transfer mode occurs.

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