

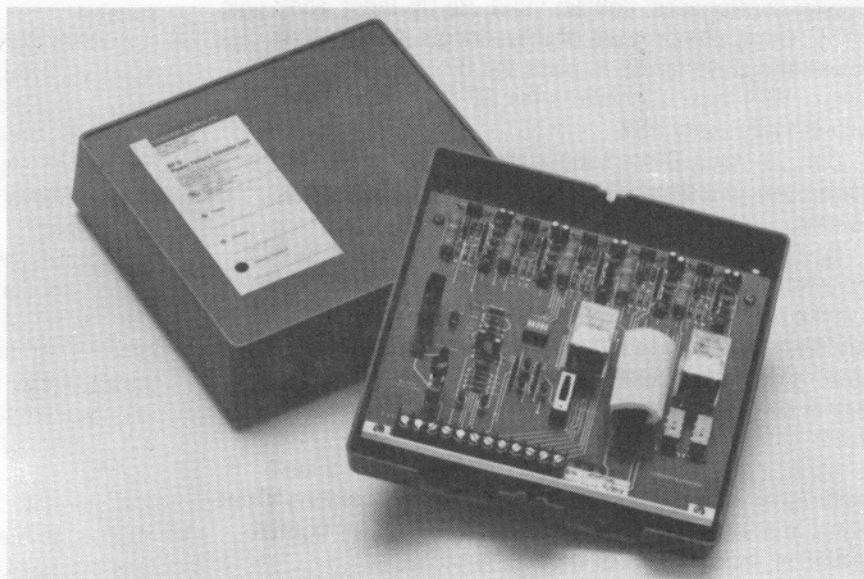
Technical Practice

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BP-5 POWER FAILURE TRANSFER UNIT

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1. General Description

1.1 PRACTICE Issue 2 of this practice is released due to corrections being made to several paragraphs of Section 3 – Installation. Also, the ring equivalence is now correctly stated as 0.0B.

1.2 PRODUCT OVERVIEW The BP-5 Power Failure Transfer Unit is designed to connect two-wire Central Office (CO) ground start or loop start trunk lines to selected station telephones in the event of a power failure or telecommunications system malfunction. When used with ground start trunks, the BP-5 includes 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-5 connects the CO trunk lines to trunk ports on the associated PBX system; PBX extension ports are connected to the station telephones.

1.3 FEATURES Features include five circuits of PFT, LED status indicators, manual transfer switch, ground start or

loop start trunk selection, auxiliary relay contact, and universal powering. Also included are provisions for a normally open, normally closed, or logic level signal to control the operating mode.

1.4 COMPATIBILITY The BP-5 was designed to work correctly with PBX systems from virtually every manufacturer, including AT&T, ROLM, Mitel, NEC, Northern Telecom, and Siemens. The design of the BP-5 takes into account the specific characteristics of these different systems, allowing for direct connection with them.

1.5 POWER REQUIREMENTS The BP-5 can be powered with 24Vac, -24Vdc, or -48Vdc. There are no switches to set, or straps to cut; the BP-5 automatically adjusts for the power that is connected.

1.6 DESCRIPTION The BP-5 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-5 measures 8.75 inches (22.2cm) square, 3.25 inches (8.3cm) deep, and

weighs approximately two pounds (0.9kg). The BP-5 wall mounts with four screws.

1.7 BP-5 KIT For installer convenience the BP-5 Kit can be ordered from Gordon Kapes, Inc. Contained in a single carton is a BP-5, a 24Vac power transformer, and a seven foot, three-conductor cable.

1.8 FCC REGISTRATION The FCC Part 68 registration number is BVV8VH-60403-PX-N, ringer equivalence 0.0B.

1.9 SAFETY COMPLIANCE The BP-5 is Underwriters Laboratories Inc. Listed Telephone Equipment.

2. Applications

2.1 PRIMARY APPLICATION The primary application for the BP-5 is to provide PFT capability for up to five ground start or loop start trunk lines associated with a PBX telephone system.

2.2 TRANSFER CONTROL LINES The BP-5 contains three transfer control lines: Contact Input, Re-Op Input, and Logic Input. Using one or more of these inputs allows a PBX power or system failure to place the BP-5 in the transfer mode. With these capabilities the BP-5 will work correctly with virtually every PBX.

Contact Input: Contact Input allows connection of a normally open (not shorted) or normally closed (shorted) contact.

Re-Op Input: Re-Op Input facilitates connection to PBX systems, specifically those from AT&T, that provide a re-operate contact. A PBX re-operate contact gives a momentary closure (short) to indicate that the PBX has reset after a power failure or system malfunction. The Re-Op Input operates in conjunction with a normally closed (shorted) contact that is connected to the Contact Input.

Logic Input: Logic Input allows connection of a logic level signal. Some PBX systems provide an operating status signal in the form of a logic signal: logic high for normal operation, logic low when transfer is requested.

2.3 AUXILIARY RELAY CONTACT A form C (normally open, common, and normally closed connections) relay contact is available for installer selected applications. The relay changes state whenever the BP-5 goes into the transfer mode.

2.4 NIGHT TRANSFER DEVICE The BP-5 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-5's Contact Input to a switch on an operator's console.

2.5 USING MULTIPLE BP-5s Multiple BP-5s can be connected to provide more than five circuits of PFT. The transfer control lines are specifically configured to allow bridging (connecting in parallel).

3. Installation

3.1 WORDS OF CAUTION As with any product, installing the BP-5 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 BP-5 should be inspected for damage immediately upon receipt. A claim should be filed with the shipper if damage is found. A replacement should be ordered if necessary.

3.3 INSTALLATION KIT Included in each BP-5 shipping carton is an installation kit. Each kit contains four #8 pan head screws, two nylon cable ties, and a strip containing "Power Failure Transfer Telephone" labels. The strip may contain extra labels for future replacement use.

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-5 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 BP-5 CONNECTIONS All connections to the BP-5 are made via 25-pair plug P1 and 12-position screw terminal strip TS1. The installer must provide a 25-pair cable mounted connector to mate with P1. 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 and/or required to make certain connections using terminal strip TS1. The first nine terminals parallel contacts on plug P1, the last three are for connecting to the auxiliary relay contact. The auxiliary relay contact function is only accessible via TS1.

3.8 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 BP-5's base.

3.9 CONNECTING POWER The BP-5 requires an external source of power. This can be nominal 24Vac, -24Vdc, or -48Vdc. The BP-5 automatically adjusts to match the power that is connected. The power source can be connected to either the Violet/Slate pair of plug P1 or to terminals 2 and 3 of the terminal strip. It is the installer's option where to connect power.

Powering with 24Vac: Connect one lead of the 24Vac to the Violet/Slate wire of P1, or terminal 2 of TS1. Connect the other 24Vac lead to the Slate/Violet wire of P1, or terminal 3 of TS1. When using the BP-5 with 24Vac, it is important that both sides of the 24Vac be floating (isolated) from earth ground. Failure to provide this condition can result in incorrect BP-5 operation.

Powering with -24Vdc: Connect power supply ground to the Violet/Slate wire of P1, or terminal 2 of TS1. Connect -24Vdc to the Slate/Violet wire of P1, or terminal 3 of TS1.

Powering with -48Vdc: Connect power supply ground to the Violet/Slate wire of P1, or terminal 2 of TS1. Connect -48Vdc to the Slate/Violet wire of P1, or terminal 3 of TS1.

3.10 CONNECTING EARTH GROUND For operation of the loop start to ground start converters, the BP-5 requires a

connection to earth ground. Connect earth ground to the Violet/Brown pair of P1, or to terminal 1 of TS1. When using the BP-5 with -24Vdc or -48Vdc, two separate ground connections are necessary: one for power supply ground and one for earth 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 on the BP-5.

If you are installing a BP-5 Kit: The green wire of the three-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.

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

3.12 GROUND START OR LOOP START TRUNK SELECTION Each of the five circuits can be independently set to work with either ground start or loop start trunks. Trunk type is selected via a five-position DIP-type switch located on the BP-5 printed circuit board. One switch position corresponds to each circuit and associated CO trunk, i.e., switch one to trunk one, switch two to trunk two, etc. Set the switch to GROUND START for circuits connected to ground start trunks, and to LOOP START for those connected to loop start trunks.

3.13 USING THE TRANSFER CONTROL LINES The BP-5 has three transfer control lines: Contact Input, Re-Op 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 BP-5's Contact Input and Re-Op Input can be in the form of an isolated relay contact, or a closure to ground. The Logic Input is a different breed. It wants to see logic current, such as from a 5Vdc digital circuit, when the PBX system is operating correctly.

Using the transfer control lines is really quite easy. Start by determining what type of contact(s) or logic signal the PBX provides, and set the BP-5 mode switch to the appropriate position. Then connect the signal(s) to the BP-5's transfer control lines.

3.14 THE MODE SWITCH The BP-5 contains a four-position slide switch which is used to set which of the transfer control lines are active, and how the BP-5 will respond. The four positions are labeled NO, NC, NC W/RE-OP, and LOGIC.

Note: If no signals are to be connected to the transfer control lines, set the mode switch to the NO position. Setting the mode switch to any other position, without connecting the appropriate input signals, may cause the BP-5 to stay "locked" in the transfer mode.

NO Mode: Setting the mode switch to the NO position places the BP-5 in the normally open contact mode of operation. In this mode, the Contact Input is connected to a normally open (not shorted) contact that closes (shorts) when transfer is requested. The BP-5 immediately returns to the

normal, non-transfer mode once the contact opens. This type of contact is provided by many PBX systems, including the ROLM CBX and 9751, Siemens Saturn, and Northern Telecom SL-1 series. In this mode, the Re-Op Input and Logic Input are not used. Any signals connected to these inputs are not recognized.

NC Mode: Setting the mode switch to the NC position places the BP-5 in the normally closed contact mode of operation. In this mode, the Contact Input is connected to a normally closed (shorted) contact that opens when transfer is requested. The BP-5 immediately returns to the normal mode once the contact closes again. This type of contact is provided by some PBX systems from AT&T. In this mode, the Re-Op Input and Logic Input are not used. Any connections made to these points are not recognized.

NC W/RE-OP Mode: Setting the mode switch to the NC W/RE-OP position places the BP-5 in the normally closed with re-operate mode of operation. In this mode, the Contact Input is connected to a normally closed (shorted) contact that opens when transfer is requested. The Re-Op Input is connected to a normally open (not shorted) contact that momentarily closes (shorts) when the PBX system has successfully reset after "downing" due to a power failure or system malfunction. These contacts are provided by some systems from AT&T. In this mode, the Logic Input is not utilized. Any signal connected to Logic Input is not recognized.

Operation in this mode is a little tricky. When the PBX is up and operating correctly, the Contact Input is closed (shorted); the Re-Op Input is open (not shorted). When the PBX system requests a transfer, the Contact Input opens and the BP-5 enters the transfer mode. Upon PBX system power up, the Contact Input again closes. The BP-5 recognizes this change, but holds in the transfer mode and awaits a closure on the Re-Op Input. After the PBX has reset and is operating correctly, it sends a momentary closure to the Re-Op Input. This signal then "latches" the BP-5 into the normal mode. This two-step process is a little confusing but hey, we didn't design it!

Logic Mode: Setting the mode switch to the LOGIC position gives the Logic Input its one moment of glory. In this mode, the Logic Input is connected to a logic signal that is logic high for normal PBX system operation. This logic signal changes to a logic low when transfer is requested. When a logic high is again present, the BP-5 immediately enters the normal mode. In the Logic Mode, the Contact and Re-Op Inputs are not utilized. Signals connected to these inputs are ignored.

3.15 CONNECTING TO THE TRANSFER CONTROL LINES Using the PBX documentation, identify the status signals provided by the PBX. Most PBX systems provide some sort of signal for use in controlling external equipment such as PFT units. Select the appropriate BP-5 operating mode and set the mode switch, located in the center of the circuit board, to the desired setting. Follow the connection information for the desired mode of operation: NO, NC, NC W/RE-OP, or LOGIC.

NO Mode: If you have selected the normally open mode of operation, follow this section when connecting the BP-5 to the PBX.

Isolated Contact: If your PBX 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.

Closure to Ground: If your PBX provides a normally open (not shorted) contact that closes to ground, connect the contact to the Violet/Green wire of P1 or terminal 5 of TS1. Connect the Green/Violet wire of P1 or terminal 4 of TS1 to PBX ground.

NC Mode: If you have selected the normally closed mode of operation, follow this section when connecting the BP-5 to the PBX.

Isolated Contact: If your PBX provides an isolated, normally closed (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.

Closure to Ground: If your PBX provides a normally closed (shorted) contact that is closed to ground, connect the contact to the Violet/Green wire of P1 or terminal 5 of TS1. Connect the Green/Violet wire of P1 or terminal 4 of TS1 to PBX ground.

NC W/RE-OP Mode: If you have selected the normally closed with re-operate mode of operation, follow this section when connecting the BP-5 to the PBX.

Isolated Contact: If your PBX provides an isolated, normally closed (shorted) contact, connect its leads to the Violet/Green pair of P1 or to terminals 4 and 5 of TS1. If your PBX provides an isolated, normally open (not shorted) re-operate contact, connect its leads to the Violet/Orange pair of P1 or to terminals 6 and 7 of TS1. An isolated contact provides two leads, neither of which are connected to ground.

Closure to Ground: If your PBX provides a normally closed (shorted) contact that is closed to ground, connect the contact to the Violet/Green wire of P1 or terminal 5 of TS1. Connect the Green/Violet wire of P1 or terminal 4 of TS1 to PBX ground. If your PBX provides a normally open (not shorted) re-operate contact that closes to ground, connect the contact to the Violet/Orange wire of P1 or terminal 7 of TS1. Connect the Orange/Violet wire of P1 or terminal 6 of TS1 to PBX ground.

Logic Mode: If you have selected the Logic Mode of operation, follow this paragraph when connecting the BP-5 to the PBX. Connect the positive lead of the logic signal to the Violet/Blue wire of P1 or terminal 8 of TS1. Connect the common, ground, or negative lead of the logic signal to the Blue/Violet wire of P1 or terminal 9 of TS1. The Logic Input requires 1mA minimum for detection of a valid logic high.

3.16 AUXILIARY RELAY CONTACT The BP-5 provides an isolated relay contact for use in installer-selected applications. It is accessible only via terminals 10, 11, and 12 of the terminal strip. This relay contact provides a common, a normally closed, and a normally open connection. The designations normally closed and normally open refer to the

state of the auxiliary relay contact when the BP-5 is in the normal mode. The contact changes state any time the unit is in the transfer mode.

3.17 MULTIPLE UNITS Additional BP-5 units can be easily connected to provide PFT for more than five trunks. The following paragraphs detail the various installation scenarios.

NO or NC Modes: The Contact Input connections of a virtually unlimited number of BP-5 units can be bridged together (connected in parallel). Connect the first BP-5 to the PBX as per the instructions in Section 3.15 for Normally Open or Normally Closed modes of operation. Connect P1 Violet/Green pair of the first unit to P1 Violet/Green pair on the additional BP-5s. Or, connect TS1 terminal 4 of the first unit to terminal 4 on all the other BP-5s, 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.

NC W/RE-OP Mode: The Contact Input and Re-Op Input connections of a virtually unlimited number of BP-5 units can be bridged together (connected in parallel). Connect the first BP-5 to the PBX as per the instructions in Section 3.15 for NC W/RE-OP operation. Connect P1 Violet/Green pair of the first unit to P1 Violet/Green pair on the additional BP-5s. Connect P1 Violet/Orange pair of the first unit to P1 Violet/Orange pair of the additional BP-5s. Or, connect TS1 terminal 4 of the first unit to terminal 4 on the other BP-5s, terminal 5 to all the other terminal 5s, terminal 6 to all the other terminal 6s, and terminal 7 to all the other terminal 7s. Be sure that the polarity of the connections is maintained.

Logic Mode: The Logic Input connections of up to six BP-5s 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 provide at least 10mA. This provides plenty of current to conservatively drive six BP-5s. Connect the Logic Input of the first BP-5 to the PBX as per the instructions in Section 3.15 for Logic Mode. Connect P1 Violet/Blue pair of the first unit to P1 Violet/Blue pairs of the additional BP-5s. Or, connect TS1 terminal 8 of the first unit to terminal 8 on the other BP-5s, and terminal 9 to all the other terminal 9s. Be sure that the polarity of the connections is maintained.

3.18 SECURING THE CONNECTING WIRES Use the second of the nylon cable ties, provided in the installation kit, to secure any wires connected to the terminal strip to the mounting point molded into the left side of the BP-5's base.

3.19 POWER FAILURE TRANSFER TELEPHONE LABELS Included in the installation kit are adhesive-backed labels. These labels are provided to identify the station telephones that are connected to the BP-5's PFT circuits. Apply them to the station telephones at this time. You may have received more labels than you require. Keep these for future replacement use.

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-5. Power, earth ground, transfer control line, and relay contact connections

should be made. The mode switch and loop start/ground start switches should be set.

4.2 EXPLANATION OF OPERATING MODES The BP-5 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.

Transfer Mode: Transfer mode is entered due to any one of three reasons: loss of power to the BP-5, a transfer request via the Contact Input or Logic Input, or activation of the manual transfer switch. When the BP-5 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 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 BP-5 IN THE NORMALLY OPEN MODE In this section, we will test the BP-5 in an installation where the mode switch has been set to the NO position. This is the case where the PBX provides a normally open (not shorted) contact that closes when transfer is requested.

Initial Operation: At this stage, the BP-5 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; it is legitimately giving a command to transfer. The second reason is that the manual transfer switch is activated. 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-5. 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 BP-5 IN THE NORMALLY CLOSED MODE In this section, we will test the BP-5 in an installation where the mode switch has been set to the NC position. This is the case where the PBX provides a normally closed (shorted) contact that opens when transfer should take place.

Initial Operation: At this stage, the BP-5 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 open (not 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; it is legitimately giving a command to transfer. The second reason is that the manual transfer switch is activated. 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-5. The Power LED should go out, indicating that the unit is in the transfer mode. Again apply power. Only the Power LED should light. Open the closure connected to the Contact Input at the source of the closure, e.g., at the PBX. The Transfer LED should light. The Power LED will remain lit when the Transfer LED is lit. Reconnect the closure 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 THE BP-5 IN THE NORMALLY CLOSED WITH RE-OPERATE MODE In this section, we will test the BP-5 in an installation where the mode switch has been set to the NC W/RE-OP position. This is the case where the PBX is providing a normally closed (shorted) contact that opens when transfer is requested, and a second contact that momentarily closes upon system reset.

Initial Operation: At this stage, the BP-5 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 three reasons for the BP-5 being in the transfer mode. The first reason is legitimate: the Contact Input is open (not 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; it is legitimately giving a command to transfer. The second reason involves the Re-Op Input. Even if the Contact Input is presented with a closure, until the Re-Op Input momentarily closes (shorts), the BP-5 will stay in the transfer mode. To change from the transfer mode to the normal mode, momentarily short the contact connected to the Re-Op Input. A third reason is that the manual transfer switch on the BP-5 is activated. 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-5. The Power LED should go out, indicating that the unit is in the transfer mode. Again apply power. Both LEDs should light. The BP-5 is now awaiting a momentary closure on the Re-Op Input. Momentarily short the contact connected to the Re-Op Input. Now only the Power LED should be lit. Open the closure connected to the Contact Input at the source of the closure, e.g., at the PBX. The Transfer LED should light; the Power LED will remain lit. Reconnect the closure. Both LEDs will remain lit. Again, the BP-5 is awaiting a closure on the Re-Op Input. Momentarily short the contact connected to the Re-Op Input. Now only the Power LED should be lit. Test the manual transfer switch by pressing it once. Both LEDs should light. Press it again and the unit will return to the normal mode.

4.6 TESTING THE BP-5 IN THE LOGIC MODE In this section, we will test the BP-5 in an installation where the mode

switch has been set to the LOGIC position. This is the case where the PBX provides a normally high logic signal that changes to logic low when transfer is requested.

Initial Operation: At this stage, the BP-5 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 low presented to it. This could be the case where a new PBX has not yet been brought up to its operating state; it is legitimately giving a command to transfer. The second reason is that the manual transfer switch is activated. 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.

Note: the Logic Input is polarity sensitive. Failure to connect the positive lead of the logic signal to the BP-5's "+ Logic" connection will cause the BP-5 to stay "locked" in the transfer mode.

Testing Transfer Operation: Momentarily disconnect the power source from the BP-5. The Power LED should go out, indicating that the unit is in the transfer mode. Again apply power. Only the Power LED should light. 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.

4.7 TESTING MULTIPLE BP-5s Use the following paragraphs to test an installation where multiple BP-5s have been installed.

NO Mode: Place all the BP-5s in the normal mode; only the Power LEDs should be lit. On the first BP-5, 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 BP-5s. Previously, the Contact Inputs on each BP-5 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 BP-5 unit should light; the Power LEDs will remain lit. Remove the short and the Transfer LEDs should go out.

NC Mode: Place all BP-5s in the normal mode; only the Power LEDs should be lit. On the first BP-5, 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-5s. Previously, the Contact Input on all the BP-5s should have been connected together, and then connected to a normally closed contact. Disconnect the closure at its source, e.g., at the PBX. The Transfer LED on each BP-5 should light; the Power LEDs will remain lit. Reconnect the closure and the Transfer LEDs should stop lighting.

NC W/RE-OP Mode: Place all the units in the normal mode; only the Power LEDs should be lit. On the first BP-5, 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 BP-5s. Previously, the Contact Inputs on all BP-5s should have been connected together, and then connected to a normally closed contact. Disconnect the closure at its source, e.g., at the PBX. The Transfer LED on each BP-5 should light; the Power LEDs will remain lit. Reconnect the closure. Both LEDs will remain lit on all units. The BP-5s are awaiting a closure on their Re-Op Input. Previously, the Re-Op Input on all BP-5s should have been connected together, and then connected to a normally open contact. Momentarily short the contact at the source of the contact, e.g., at the PBX. All BP-5s should return to the normal mode; only the Power LEDs should be lit.

LOGIC Mode: Place all the units in the normal mode; only the Power LEDs should be lit. On the first BP-5, 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 each unit. Previously, the Logic Inputs on each BP-5 should have been connected together, and then connected to a logic signal. Disconnect the logic signal at the source of the signal, e.g., at the PBX. The Transfer LED on each BP-5 should light; the Power LED will remain lit. Reconnect the logic signal; the Transfer LEDs should go out.

4.8 TESTING THE TELEPHONE LINES ASSOCIATED WITH THE BP-5 The one or more BP-5 units that have been installed should each be tested by following the procedure outlined in this section. Place BP-5 in the normal mode. The Power LED should be lit; the Transfer 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-5 circuit. Even if these trunks are an incoming-only type, such as WATS, you usually still can draw dial tone. Ensure that PBX dial tone can be drawn from each station telephone that is connected via a BP-5 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 BP-5. In this case, the single line telephones will not draw dial tone when the associated BP-5 is in the normal mode.

Use the manual transfer switch to place the BP-5 in the transfer mode. Both LEDs should be lit. Ensure that each station telephone can draw a dial tone from the CO. Even if these trunks are an 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.

4.9 PLACING THE BP-5 INTO SERVICE The one or more BP-5s should now be ready for action! Normal operation should find the Power LED(s) lit, and the Transfer LED(s) not lit.

4.10 MAINTENANCE It is recommended that the BP-5 and associated station telephones be tested not less than once a year. Be certain that each PFT 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 The circuit description is intended to familiarize you with the BP-5 for engineering and applications use.

5.2 POWERING The BP-5 is one clever dude. It has the ability to automatically adjust for 24Vac, -24Vdc, or -48Vdc operation. For 24Vac or -24Vdc operation, the two PFT relays are connected in parallel. For -48Vdc operation, a voltage sensing circuit detects the higher voltage and switches the two relay coils into a series arrangement. For all three power inputs, a power supply circuit provides a filtered and regulated source of nominal -24Vdc for use by the Contact Input, Re-Op Input, and Logic Input circuitry.

5.3 NORMAL MODE During normal operation, power is supplied to the BP-5 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 the mode switch is set to NO: the contact connected to the Contact Input is open (not shorted).

If the mode switch is set to NC: the contact connected to the Contact Input is closed (shorted).

If the mode switch is set to NC W/RE-OP: the contact connected to the Contact Input is closed (shorted) and the contact connected to the Re-Op Input is open (not shorted).

If the mode switch is set to LOGIC: the logic signal is supplying current, which is flowing through the Logic Input.

The two PFT relays are energized, connecting the CO trunk lines to the PBX trunk ports, and the PBX station ports to the station telephones. The auxiliary relay contact is in its normal state.

Each loop start to ground start (LS-GS) conversion circuit is electrically in series with the tip lead of its respective station telephone loop. For each PFT circuit that is set for ground start, 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. PFT circuits set for loop start have no connection paths from the station telephone's tip or ring lead to ground. In either the ground start or loop start setting, the LS-GS circuitry looks invisible to the station port.

5.4 TRANSFER MODE There are three causes for the BP-5 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 two PFT relays de-energize, connecting the CO trunk lines to the station telephones. Individual LS-GS conversion circuits are now active for those circuits set for ground start operation. The PFT relays de-energizing causes the auxiliary relay contact 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.

5.5 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 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. PFT circuits set for loop start have their LS-GS conversion circuitry disabled.

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

5.7 AUXILIARY RELAY CONTACT The auxiliary relay contact is a full form C type, with a common, a normally open, and a normally closed contact. It is created by a contact on one of the PFT relays. The contact follows the operating mode of the BP-5 and changes state any time the BP-5 is in the transfer mode. It is installer-accessible only via the last three terminals of terminal strip TS1.

5.8 TERMINAL STRIP TS1 The first nine terminals on terminal strip TS1 parallel nine contacts on plug P1. This is provided as an installer convenience. The last three terminals on TS1 provide access to the auxiliary relay contact.

6. Specifications

POWER REQUIREMENT

18 to 30Vac, 240mA maximum @ 30Vac

-22 to -30Vdc, 205mA maximum @ -30Vdc

-42 to -56Vdc, 100mA maximum @ -56Vdc

NUMBER OF PFT CIRCUITS

5

TRUNK COMPATIBILITY

Loop start or ground start, switch selectable on a per-circuit basis

AUXILIARY RELAY CONTACT

Type: Form C Type (Break Before Make), provides common, normally open, and normally closed connections

Rating: 1A maximum at 30Vdc or 100Vac (resistive)

CONTACT INPUT

The contact connected to the Contact Input must be capable of handling 1.5mA at -26Vdc. Contact Inputs on multiple BP-5 units can be bridged (connected in parallel).

RE-OP INPUT

The contact connected to the Re-Op Input must be capable of handling 1.5mA at -26Vdc. Re-Op Inputs on multiple BP-5 units can be bridged (connected in parallel).

LOGIC INPUT

Transfer is enabled by applying a logic low to the Logic Input. 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. If sufficient logic current is available, Logic Inputs on multiple BP-5 units can be bridged (connected in parallel).

ENVIRONMENT

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

SAFETY COMPLIANCE

Underwriters Laboratories Inc. Listed Telephone Equipment

FCC REGISTRATION

Registration Number: BVV8VH-60403-PX-N

Ringer Equivalence: 0.0B

RADIATED NOISE COMPLIANCE

Contains no circuitry subject to EMI regulations.

RELIABILITY

MTBF 32.2 years, per Method I of Bellcore TS-TSY-000332, Issue 2, July 1988

INTERCONNECTIONS

The BP-5 contains one 25-pair plug and one 12-position screw terminal strip. 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

Approximately 2 pounds (0.9kg)

MOUNTING

Wall mounts with four #8 pan head screws.

7. Incorrect Operation

7.1 REVIEW PRACTICE Should problems arise in the operation of the BP-5, please review Section 3 – Installation and Section 4 – Testing and Operation of this practice.

7.2 INCORRECT MODE SELECTION If a logic source is not used, the mode switch must not be set to the LOGIC position. Leaving the BP-5 in the Logic Mode without a logic source will cause the unit to remain "locked" in the transfer mode.

7.3 EARTH GROUNDING Ensure that the "earth ground" point connected to the BP-5 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 cross talk between BP-5 circuits. Unless you want one big party line, connect the BP-5 to earth ground!

7.4 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 is not meaningful. When a loop start trunk is in the on-hook state, the ring lead should measure nominally -48Vdc with respect to both the tip lead and earth ground.

7.5 EXTENSION TIP AND RING POLARITY It is important that the connections from the PBX extension ports to the BP-5's 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 voltage, e.g., -30Vdc. This poses no problem for the BP-5.)

7.6 INCORRECT TRUNK TYPE SELECTION Ensure that the loop start/ground start switch setting for each circuit matches the trunk type provided by the CO. A BP-5 circuit which is connected to a ground start trunk, but has the switch set to loop start, will be unable to draw CO dial tone.

7.7 INCORRECT POWER CONNECTION Be sure that the power source is correctly connected to plug P1 or terminal strip TS1. As soon as power is applied, the Power LED will light.

7.8 LOOP RESISTANCE LIMIT In the transfer mode, the station telephone loop is connected in series with the CO trunk. 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-5 is in the transfer mode, failure to reliably draw CO dial tone may indicate excessive station loop length. Contact Gordon Kapes, Inc. technical support for assistance.

7.9 APPLICATION LIMITATIONS The BP-5 was designed to operate correctly in most PFT applications. However, Gordon Kapes, Inc. does not guarantee the BP-5 to be compatible with all ground start or loop start trunk lines, PBXs, and station telephones. All functions of the installed BP-5 should be thoroughly tested before the unit is placed into service.

7.10 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 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-5 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 repairs are ever needed on your BP-5, 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 BP-5 is designed to be used on standard device telephone lines. The BP-5 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. Connection to coin service party lines is not specified but could prove interesting.

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 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 1 BP-5 Power Failure Transfer Unit Connection Diagram

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

Terminal Strip TS1

1	2	3	4	5	6	7	8	9
GND (Earth)	See Note 2		Contact Input		Re-op Input		+ Logic Input	- Logic Input

Terminal Strip TS1 (continued)

10	11	12
NO	COM	NC

Note 1

P1 Pin Number	Cable Color	24Vac Operation	-24Vdc Operation	-48Vdc Operation
50	VIO-SLT	AC Common	GND (power supply)	GND (power supply)
25	SLT-VIO	±24Vac	-24Vdc	-48Vdc

Note 2

Terminal Strip TS1 Terminal Number	24Vac Operation	-24Vdc Operation	-48Vdc Operation
2	AC Common	GND (power supply)	GND (power supply)
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

Mode Switch in NO position: Connect Contact Input to PBX normally open (not shorted) contact.

Mode Switch in NC position: Connect Contact Input to PBX normally closed (shorted) contact.

Mode Switch in NC W/RE-OP position: Connect Contact Input to PBX normally closed (shorted) contact. Connect Re-op Input to PBX normally open (not shorted) contact.

Mode Switch in LOGIC position: Connect Logic Input to PBX current limited logic source (1mA minimum, 20mA maximum). BP-5 transfers on logic low.

If Contact Input, Re-Op Input, or Logic Input are not used, set mode switch to NO position.

Note 5

NO, COM, NC: Normally open (not shorted), common, and normally closed (shorted) auxiliary relay contact. Changes state in transfer mode.

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5520 West Touhy Avenue
Skokie, Illinois 60077
Telephone 708|676-1750
FAX 708|982-0747