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Technical Practice

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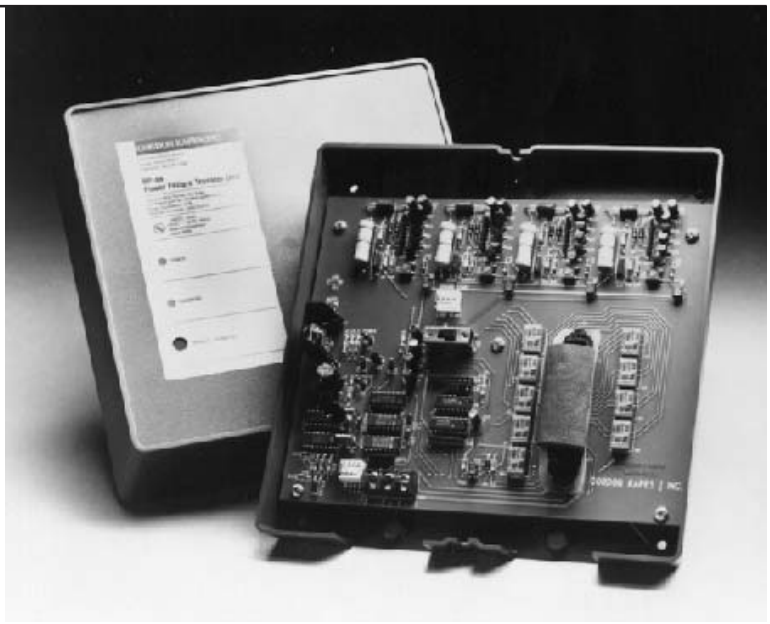
BP-4A POWER FAILURE TRANSFER UNIT

Contents



1. General Description

1.1 PRACTICE In the event that this practice is reissued, the reason for the reissue will be stated in this paragraph.

1.2 PRODUCT OVERVIEW The BP-4A 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-4A 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-4A 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 BP-4A features include four circuits of power failure transfer (PFT), delay transfer on each of the PFT circuits, LED status indicators, manual transfer switch, ground start or loop start trunk selection, two auxiliary relay contacts, return to normal mode delay timer, 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-4A 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-4A takes into account the specific characteristics of these different systems, allowing for direct connection with them.

1.5 POWER REQUIREMENTS The BP-4A can be powered with 24Vac, –24Vdc, or –48Vdc. There are no switches to set or straps to cut. The BP-4A automatically adjusts for the power that is connected.

1.6 DESCRIPTION The BP-4A 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-4A measures 8.75 inches (22.2cm) square, 3.25 inches (8.3cm) deep, and weighs approximately two pounds (0.9kg). It wall mounts with four screws.

1.7 BP-4A KIT For installer convenience, the BP-4A Kit can be ordered from Gordon Kapes, Inc. Contained in a single carton is a BP-4A, a 24Vac Class 2 power transformer, and a seven-foot, 3-conductor cable.
1.8 FCC REGISTRATION The FCC Registration Number is BVV8VH-60403-PX-N. The Ringer Equivalence is 0.1B.
1.9 SAFETY COMPLIANCE The BP-4A is Underwriters Laboratories Inc. listed telephone equipment.

2. Applications
2.1 PRIMARY APPLICATION The primary application for the BP-4A is to provide PFT capability for up to four ground start or loop start trunk lines associated with a PBX telephone system.
2.2 TRANSFER CONTROL LINES The BP-4A contains two transfer control lines: contact input and logic input. These inputs allow a PBX system malfunction alarm signal to place the BP-4A in the transfer mode. With this capability, the BP-4A will work correctly with virtually every PBX. The contact input allows connection of a normally open (not shorted) or normally closed (shorted) contact. The logic input allows connection of a logic level signal. This input is useful as 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 RETURN TO NORMAL MODE DELAY TIMER A unique circuit provides a time delay between when power is restored (or a transfer control line returns to its normal state) and when the four power failure transfer circuits return to the normal, non-PFT mode. The timer is adjustable from 0 to 15 minutes in one-minute increments. The timer ensures that sufficient time is allowed for a PBX to completely reset prior to the BP-4A leaving the transfer mode.
2.4 AUXILIARY RELAY CONTACTS Two sets of isolated relay contacts are available for installer-selected applications. Auxiliary Relay Contact NO is a normally open (not shorted) contact that closes (shorts) when the unit goes into the transfer mode. Auxiliary Relay Contact NC is a normally closed (shorted) contact that opens when the unit goes into the transfer mode.
2.5 NIGHT TRANSFER DEVICE The BP-4A 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 implemented easily by connecting the BP-4A's contact input to a switch on an operator's console.
2.6 USING MULTIPLE BP-4As Multiple BP-4As can be connected to provide more than four circuits of PFT. The transfer control lines are specifically configured to allow bridging (connecting in parallel). A virtually unlimited number of BP-4As can be installed together when the contact input is used. Up to six units can be connected together when the logic input is used.

3. Installation
3.1 WORDS OF CAUTION As with any product, installing the BP-4A 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-4A 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-4A shipping carton is an installation kit. Each kit contains four #8 pan head screws, two nylon cable ties, and a strip of "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-4A 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-4A CONNECTIONS All connections to the BP-4A are made via 25-pair plug P1 and 3-position screw terminal strip TS1. The installer must provide a 25-pair cable mounted connector to mate with P1. Figure 2, 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 The 3-position screw terminal strip provides an alternate connection point for earth ground and power. The three terminals connect in parallel with their respective terminals on plug P1. In some installations, it is convenient to make the earth ground and power connections using terminal strip 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-4A's base.
3.9 CONNECTING POWER The BP-4A requires an external source of power. This can be nominal 24Vac, –24Vdc, or –48Vdc. The BP-4A 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-4A with 24Vac, it is important that both sides of the 24Vac be floating (isolated) from earth ground and that a Class 2 power transformer capable of supplying 5VA be used. Failure to provide this condition can result in incorrect BP-4A 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-4A 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-4A 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-4A.

If you are installing a BP-4A 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.

3.11 TRUNK AND STATION CONNECTIONS Referring to Figure 2 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 four PFT circuits.

3.12 GROUND START OR LOOP START TRUNK SELECTION Each of the four circuits can be independently set to work with either ground start or loop start trunks. Trunk type is selected via a 4-position, DIP-type switch labeled SW1 and located on the BP-4A 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. Select LOOP START for those connected to loop start trunks.

3.13 USING THE TRANSFER CONTROL LINES The BP-4A 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 status signals compatible with the BP-4A's contact input can be in the form of an isolated relay contact or a contact that closes or opens in reference 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 or logic signal the PBX provides, and set the BP-4A mode switch to the appropriate position. Then connect the signal to the appropriate BP-4A transfer control line.

3.14 THE MODE SWITCH The BP-4A contains a 3-position slide switch, labeled MODE, which is used to set which transfer control line is active and how the BP-4A will respond. The three positions are labeled NO, NC, and LOGIC.

Note: If a signal is not going 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 signal will cause the BP-4A to stay "locked" in the transfer mode.

NO Mode: Setting the mode switch to the NO position places the BP-4A 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-4A can return 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 logic input is not used. A signal connected to the logic input is not recognized.

NC Mode: Setting the mode switch to the NC position places the BP-4A 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-4A can return to the normal mode once the contact again closes. In this mode, the logic input is not used. A signal connected to the logic input is not recognized.

Logic Mode: Setting the mode switch to the LOGIC position gives the logic input its 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 must change to a logic low when transfer is requested. The BP-4A can return to the normal mode when a logic high is again present. In this mode, the contact input is not used. A signal connected to the contact input is not recognized.

3.15 CONNECTING TO THE TRANSFER CONTROL LINES Using the PBX documentation, identify the status signal provided by the PBX. Most PBX systems provide some sort of signal for use in controlling external equipment such as PFT units. In the previous section you should have selected the appropriate BP-4A operating mode and set the mode switch as required. Follow the connection information for the desired mode of operation: NO, NC, or LOGIC.

NO Mode: If you have selected the normally open mode of operation, follow this section when connecting the BP-4A 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. 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 (shorts) in reference to PBX ground, connect the contact to the Violet/Green wire of P1. PBX ground must be connected to the Green/Violet wire of P1.

NC Mode: If you have selected the normally closed mode of operation, follow this section when connecting the BP-4A 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. 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 in reference to PBX ground, connect the contact to the Violet/Green wire of P1. PBX ground must be connected to the Green/Violet wire of P1.

Logic Mode: If you have selected the logic mode of operation, follow this paragraph when connecting the BP-4A to the PBX. Connect the positive lead of the logic signal to the Violet/Orange wire of P1. Connect the common, ground, or negative lead of the logic signal to the Orange/Violet wire of P1.

3.16 RETURN TO NORMAL MODE DELAY TIMER The BP-4A incorporates a delay timer circuit to allow a PBX to completely reset prior to the PFT trunks being returned to the normal, non-transfer mode. The timer is activated upon the transfer control input (contact or logic) going from the transfer state to the normal state, or when power is applied to the unit after an interruption. Only after the timer has gone through a complete cycle can the PFT circuits return to the normal mode.

The delay timer is adjustable from 0 to 15 minutes in one-minute increments. Four positions of a DIP switch are used to set the timer interval. Refer to Figure 1 for details on setting the time interval.

Figure 1 Time Interval Settings

Switch	Function
1	ON adds 1 minute
2	ON adds 2 minutes
3	ON adds 4 minutes
4	ON adds 8 minutes

All switches OFF disables the delay timer function.

3.17 AUXILIARY RELAY CONTACTS The BP-4A provides two sets of isolated relay contacts for use in installer-selected applications. Auxiliary relay contact NO closes (shorts) and auxiliary relay contact NC opens (removes short) any time the unit is in the transfer mode.

3.18 MULTIPLE UNITS Additional BP-4A units easily can be connected to provide PFT for more than four trunks. The following paragraphs detail the various installation scenarios.

NO or NC Modes: The contact input connections of a virtually unlimited number of BP-4A units can be bridged together (connected in parallel). Connect the first BP-4A to the PBX according to 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-4As. Be certain that the polarity of the connections is maintained.

Logic Mode: The logic input connections of up to six BP-4As 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 is plenty of current to conservatively drive six BP-4As. Connect the logic input of the first BP-4A to the PBX according to the instructions in Section 3.15 for logic mode. Connect P1 Violet/Orange pair of the first unit to P1 Violet/Orange pairs of the additional BP-4As. Be sure that the polarity of the connections is maintained.

3.19 SECURING THE CONNECTING WIRES Use the second nylon cable tie 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-4A's base.

3.20 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-4A'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-4A. Power, earth ground, transfer control line, and relay contact connections should be made. The mode, delay timer, and loop start/ground start switches should be set.

4.2 STATUS LEDs The BP-4A contains two LED indicator lights. They are designed to provide assistance during installation, troubleshooting, and maintenance. The power LED is lit any time power is supplied to the unit. The transfer LED has three states: off, lit steadily, and flashing. The transfer LED lights steadily any time the unit is in the transfer mode while power is present. The transfer LED flashes when the contact or logic transfer control input has gone from the transfer to the normal state or power has returned to the unit, and the timer is actively delaying the unit from returning the normal mode. Once the timing cycle has completed, the LED stops lighting.

4.3 EXPLANATION OF OPERATING MODES The BP-4A operates in two modes: normal and transfer.

Normal Mode: Normal mode operation commences when power is applied, the selected transfer control line is in its non-transfer state, the manual transfer switch is not activated and, if used, the delay timer has completed its time interval. In the normal mode, the power LED is lit.

Transfer Mode: Transfer mode is entered for any of three reasons: loss of power to the BP-4A, a transfer request via the contact input or logic input, or activation of the manual transfer switch. When the BP-4A loses incoming power, the transfer mode is entered and neither of the LEDs are 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 and the power LED will remain lit. The transfer LED helps to differentiate 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.

4.4 TESTING THE BP-4A IN THE NORMALLY OPEN MODE In this section, we will test the BP-4A in an installation where the mode switch has been set to the NO position. This would be 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-4A should be in the normal mode, with only the power LED lit. If the transfer LED is lit steadily or is flashing, determine whether or not this is a problem. There are three 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 it is legitimately giving a command to transfer. The second reason is that the timer is active and the time interval has not completed. The transfer LED will be flashing when the timer is active. Reset the timer by pressing the manual transfer switch twice. The third 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-4A. The power LED should go out, indicating that the unit is in the transfer mode. Again apply power. The power LED should light. If the delay timer has been selected, the transfer LED will flash until the delay time has completed. 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 one of two things will happen. If the delay timer is set for 0 seconds, the transfer LED should immediately go out. If the timer is set to anything but 0 seconds, removing the short will start the timer and the transfer LED will flash until the timer has completed its cycle. If desired, the timer can be reset mid-cycle by pressing the manual transfer switch twice. This eliminates the need to wait for the entire cycle to finish.

4.5 TESTING THE BP-4A IN THE NORMALLY CLOSED MODE In this section, we will test the BP-4A in an installation where the mode switch has been set to the NC position. This would be the case when the PBX provides a normally closed (shorted) contact that opens when transfer is requested.

Initial Operation: At this stage, the BP-4A should be in the normal mode, with only the power LED lit. If the transfer LED is lit steadily or is flashing, determine whether or not this is a problem. There are three 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 and it is legitimately giving a command to transfer. The second reason is that the timer is active and the time interval has not completed. The transfer LED will be flashing when the timer is active. Reset the timer by pressing the manual transfer switch twice. The third 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-4A. The power LED should go out, indicating that the unit is in the transfer mode. Again apply power. The power LED should light. If the delay timer has been selected, the transfer LED will flash until the delay time has completed. Remove the short on 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. Reconnect the short and one of two things will happen. If the delay timer is set for 0 seconds, the transfer LED should immediately go out. If the timer is set to anything but 0 seconds, reconnecting the short will start the timer and the transfer LED will flash until the timer has completed its cycle. If desired, the timer can be reset mid-cycle by pressing the manual transfer switch twice. This eliminates the need to wait for the entire cycle to finish.

4.6 TESTING THE BP-4A IN THE LOGIC MODE In this section, we will test the BP-4A 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-4A should be in the normal mode, with only the power LED lit. If the transfer LED is also lit steadily or is flashing, determine whether or not this is a problem. There are three reasons for the transfer mode being enabled. 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 and it is legitimately giving a command to transfer. The second reason is that the timer is active and the time interval has not completed. The transfer LED will be flashing when the timer is active. Reset the timer by pressing the manual transfer switch twice. The third 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-4A. The power LED should go out, indicating that the unit is in the transfer mode. Again apply power. The power LED should light. If the delay timer has been selected, the transfer LED will flash until the delay time has completed. 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 when the transfer LED is lit. Reconnect the logic signal and one of two things will happen. If the delay timer is set for 0 seconds, the transfer LED should immediately go out. If the timer is set to anything but 0 seconds, restoring the logic high signal will start the timer and the transfer LED will flash until the timer has completed its cycle. If desired, the timer can be reset mid-cycle by pressing the manual transfer switch twice. This eliminates the need to wait for the entire cycle to finish.

4.7 TESTING MULTIPLE BP-4As Use the following paragraphs to test a multiple BP-4A installation. Place all the BP-4As in the normal mode. Only the power LEDs should be lit. Press the manual transfer switch on the first BP-4A. 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-4As. Now refer to the section appropriate for your installation.

NO Mode: Previously, the contact input on each of the BP-4As 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-4As should light and the power LEDs will remain lit. Remove the short and one of two things will happen. If the timers are set for 0 seconds, the transfer LEDs should immediately go out. If the delay timers are set to anything but 0 seconds, removing the short will start the timers operating and the transfer LEDs will flash. As each timer completes its cycle, its associated transfer LED will stop lighting. If desired, the timer can be reset in mid-cycle by pressing the manual transfer switch twice.

NC Mode: Previously, the contact input on all the BP-4As 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 of the BP-4As should light and the power LEDs will remain lit. Reconnect the closure and one of two things will happen. If the timer is set for 0 seconds, the transfer LEDs should immediately go out. If the timer is set to anything but 0, reconnecting the short will start the timers operating and the transfer LEDs will start flashing. As each timer completes its cycle, its associated transfer LED will stop lighting. If desired, the timer can be reset mid-cycle by pressing the manual transfer switch twice.

LOGIC Mode: Previously, the logic input on all the BP-4As 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 of the BP-4As should light and the power LEDs will remain lit. Reconnect the logic signal and one of two things will happen. If the timer is set for 0 seconds, the transfer LEDs should immediately go out. If the timer is set to anything but 0, reconnecting logic high will start the timers operating and the transfer LEDs will start flashing. As each timer completes its cycle, its associated transfer LED will stop lighting. If desired, the timer can be reset mid-cycle by pressing the manual transfer switch twice. This eliminates the need to wait for the entire cycle to finish.

4.8 TESTING THE TELEPHONE LINES ASSOCIATED WITH THE BP-4A The one or more BP-4A units that have been installed should each be tested by following the procedure outlined in this section. Place the BP-4A 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-4A circuit. Even if these trunks are of an 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-4A 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-4A. In this case, the single line telephones will not draw dial tone when the associated BP-4A is in the normal mode.

Use the manual transfer switch to place the BP-4A 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 of 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-4A INTO SERVICE The one or more BP-4As should now be ready for action! Normal operation should find the power LED lit, and the transfer LED not lit.

4.10 MAINTENANCE It is recommended that the BP-4A 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-4A for engineering and applications use.

5.2 POWERING The BP-4A automatically adjusts for 24Vac, –24Vdc, or –48Vdc operation. Power enters the unit and passes through a full wave rectifier circuit. For 24Vac operation, this converts the AC to DC. For DC operation, this acts as a polarity guard. An electrolytic capacitor provides filtering. The rectified and filtered power is fed to a 3-terminal regulator which produces –24Vdc. The –24Vdc provides power for the transfer relays and the power LED. The –24Vdc is also fed to a 3-terminal regulator which provides –12Vdc for use by the logic circuitry and the auxiliary relay.

5.3 LOGIC CIRCUITRY The BP-4A uses CMOS integrated circuits for low power, reliable operation. An oscillator provides a low frequency clock signal for use by the timer circuitry. DIP switches program a divider circuit for the desired time interval. Robust integrated circuit relay drivers control the transfer and auxiliary relays.

5.4 TRANSFER CONTROL LINES The contact input is isolated from the nasty outside world via high impedance, TTL-type inputs. The logic input uses an optical coupler to maintain isolation from the device supplying the logic signal.

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 DELAY TRANSFER Associated with each transfer circuit is a delay transfer circuit. This circuit ensures that when the unit goes from the transfer mode to the normal mode, a call in progress is not disconnected. An optical coupler monitors trunk off-hook status and provides a control signal to the relay driver circuit. If the BP-4A returns to the normal mode while an off-hook condition is detected, the transfer relays (two per circuit) are not energized. Only when the trunk goes back to the on-hook state for approximately one second will the relays energize. This one second allows station telephones to generate a "flash" signal without causing the circuit to return to the normal mode. A flash is a momentary break in loop current used for signalling to such functions as call waiting and Centrex transfer.

5.8 AUXILIARY RELAY CONTACTS The auxiliary relay provides two contacts. One is used to provide the normally open contact, the other provides the normally closed contact. The contacts follow the operating mode of the BP-4A, changing state any time the BP-4A is in the transfer mode.

5.9 TERMINAL STRIP TS1 The three terminals on terminal strip TS1 parallel contacts on plug P1. This is provided as an installer convenience. TS1 provides access to earth ground and power connections.

6. Specifications

POWER REQUIREMENT
18 to 30Vac, 80mA maximum
Class 2 power transformer only, minimum 5VA rating
–22 to –56Vdc, 70mA maximum

TRANSFER VOLTAGE
Minimum voltage to go from normal mode to transfer mode:
7Vac, –10Vdc, approximate
Minimum voltage to go from transfer mode to normal mode:
9Vac, –18dc, approximate

NUMBER OF PFT CIRCUITS
4

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

RETURN TO NORMAL MODE DELAY TIMER
Time Interval: 0 to 15 minutes, selectable in 60-second increments
Accuracy: ±10% of selected time interval

PFT CIRCUIT DELAY TRANSFER
Off-Hook Recognition: 10 ±5mA trunk loop current recognized as valid off-hook
Off-Hook to On-Hook Duration: 1 second (nominal) break in loop current recognized as valid on-hook

AUXILIARY RELAY CONTACTS
Qty: 2
Type: one normally open (not shorted), one normally closed (shorted), both break before make
Rating: 0.5A maximum at 60Vdc or 60Vac (resistive)

TRANSFER CONTROL INPUTS
Contact Input: the contact connected to the contact input must be capable of handling 1mA at –20Vdc; contact inputs on multiple BP-4A 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-4A units can be bridged (connected in parallel).
Operating Mode: switch selectable for normally open contact input, normally closed contact input, or normally high logic input.

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: 0.1B

RADIATED NOISE COMPLIANCE
Contains no circuitry subject to EMI regulations

RELIABILITY
MTBF 20.1 years, per Method 1 of Bellcore TS-TSY-000332, Issue 3, September 1990

INTERCONNECTIONS
The BP-4A contains one 25-pair plug and one 3-position screw terminal strip. Installer must supply one 25-pair connector (female).

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-4A, 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-4A in the logic mode without a logic source will cause the unit to remain "locked" in the transfer mode. If the mode switch is set to the NC mode a closed (shorted) contact must be connected. Leaving the BP-4A in the NC mode without a shorted contact input will leave the unit locked in the transfer mode.

7.3 LOGIC INPUT The logic input is polarity sensitive! Correct operation requires that the logic signal's + and – connections are correctly connected.

7.4 RETURN TO NORMAL MODE DELAY TIMER This feature is wonderful but is rarely seen on PFT equipment. If you are having trouble getting the BP-4A to respond to your wishes, start by disabling the delay timer. Simply place the four DIP switches to the OFF position and the delay timer is no longer active. This will allow the unit to be tested without the timer's intervention. Then, to familiarize yourself with the timer, set the time interval for one minute. This will allow you to observe the timer in action without going crazy waiting for a long time interval to complete! Once you are comfortable with what is going on, reset the time to the desired interval. Remember that pressing the manual transfer switch twice will reset a timer cycle that is in process.

7.5 EARTH GROUNDING Ensure that the "earth ground" point connected to the BP-4A 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-4A circuits. Unless you want one big party line, connect the BP-4A to earth ground!

7.6 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.

7.7 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-4A 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.

7.8 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.

7.9 APPLICATION LIMITATIONS The BP-4A was designed to operate correctly in most PFT applications. However, Gordon Kapes, Inc. does not guarantee the BP-4A to be compatible with all ground start or loop start trunk lines, PBXs, and station telephones. All functions of the installed BP-4A 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 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 line-person'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-4A 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-4A, they should only be performed by Gordon Kapes, Inc. or an authorized representative. For further information, contact Gordon Kapes, Inc.

9. United States FCC Notes

9.1 TYPE OF SERVICE Your BP-4A is designed to be used on standard device telephone lines. The BP-4A 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 affect your service or the operation of your equipment, the telephone company will give you notice, in writing, possibly in advance, to allow you to make any changes necessary to maintain uninterrupted service. If you have any questions about your telephone line, such as how many pieces of equipment you can connect to it, the telephone company will provide this information upon request.

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

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

10. Canadian DOC Notes

10.1 LABEL If present, the Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

10.2 PERMISSION Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

10.3 REPAIRS Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

10.4 PRACTICE SAFE TELEPHONY Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas. Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

10.5 LOAD NUMBER The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the load numbers of all the devices does not exceed 100.

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

Figure 2 BP-4A 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		
17	ORN-YEL		
43	YEL-GRN		
18	GRN-YEL		
44	YEL-BRN		
19	BRN-YEL		
45	YEL-SLT	NO Aux Relay	
20	SLT-YEL	NO Aux Relay	
46	VIO-BLU	NC Aux Relay	
21	BLU-VIO	NC Aux Relay	
47	VIO-ORN	+ Logic Input	
22	ORN-VIO	– Logic 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

Terminal Strip TS1 Terminal Number	BP-4A w/24Vac Operation	BP-4A w/–24Vdc Operation	BP-4A w/–48Vdc Operation
1	GND (Earth)	GND (Earth)	GND (Earth)
2	AC Common	GND (pwr sup)	GND (pwr sup)
3	±24Vac	–24Vdc	–48Vdc

Note 1

P1 Pin Number	Cable Color	BP-4A w/24Vac Operation	BP-4A w/–24Vdc Operation	BP-4A w/–48Vdc Operation
50	VIO-SLT	AC Common	GND (pwr sup)	GND (pwr sup)
25	SLT-VIO	±24Vac	–24Vdc	–48Vdc

Note 2

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 3

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 LOGIC position: Connect Logic Input to PBX current limited logic source (1mA minimum, 60mA maximum). BP-4A transfers on logic low.

If Contact Input or Logic Input are not used set mode switch to NO position.

Note 4

NO: Normally open (not shorted) isolated auxiliary relay contact. Closes (shorts) when unit goes into the transfer mode.

NC: Normally closed (shorted) isolated auxiliary relay contact. Opens (not shorted) when unit goes into the transfer mode.