

Technical Practice

Issue 8, April 1988

BP-2 POWER FAILURE TRANSFER UNIT

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1. General Description

1.1 PRACTICE This practice (Issue 8, April, 1988) is applicable to BP-2 circuit boards REV C OR LATER. The Rev C boards differ from previous revisions by the addition of a circuit which allows a logic level signal to activate the Forced Bypass Control Line (FBC).

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

1.3 FEATURES Features include eight (8) circuits of PFT, LED status indicators, manual PFT switch, provision for a normally open contact or logic level signal to activate the PFT mode, auxiliary relay contacts, and provision for additional BP-2's to be connected in a master/slave configuration.

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

1.5 DESCRIPTION The BP-2 consists of a precision fabricated printed circuit board, an aluminum chassis, and a detachable plastic cover. The BP-2 measures 8.75 inches square, 3.25 inches deep, and weighs approximately three (3) pounds. The BP-2 wall mounts with four (4) screws, provided with the unit.

1.6 BP-2-24 KIT The BP-2-24 can be ordered from the factory as part of an installation kit, designated as the BP-2-24 Kit. Contained in a single carton is a BP-2-24, a 318-2024 power transformer (24Vac, 20Va), and a seven (7) foot, 3-conductor cable. The cable is used to connect power and earth ground from the transformer to the BP-2-24.

2. Applications

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

2.2 FORCED BYPASS CONTROL LINE Forced Bypass Control Line (FBC) allows a normally open contact or a logic level signal to place the BP-2 in the PFT mode. FBC can be connected to a PBX alarm contact or can be used to place the BP-2 in the PFT mode manually. The FBC/logic FBC function of the BP-2 is compatible with most PBX systems, including ROLM CBX and Redwood® Systems.

2.3 AUXILIARY RELAY CONTACTS Two (2) sets of isolated relay contacts are available for installer-selected applications. Auxiliary Relay Contact NO1 is a normally open (not shorted) contact that closes (shorts) when the BP-2 goes into PFT mode. Auxiliary Relay Contact NO2 is a normally open (not shorted) contact that closes (shorts) when the BP-2 goes into the FBC enabled PFT mode. A power supply failure will not close (short) NO2. The rating of the Auxiliary Relay Contacts are given in Section 5 – Specifications of this practice.

2.4 MANUAL PFT SWITCH Manual PFT switch SW1 is located on the printed circuit board and is accessible with the plastic cover on or off. When necessary, an installer or repair person can manually place the BP-2 in the PFT mode. This is especially useful when the PBX is being serviced. The switch is of the push-push type; push once and the BP-2 is in the PFT mode, push again and it is in the non-PFT mode. LED1 (located on the left side of the unit, near the opening for the switch) lights when the unit is in the non-PFT mode and is unlit when the BP-2 is in the PFT mode either through a power failure or manually via SW1. To operate the switch with the plastic cover on, carefully insert a pencil or other nonmetallic object through the left most opening in the plastic cover until the pencil comes in contact with the switch cap. Applying light force will cause the switch to operate. When operating the switch with the cover on, be careful not to touch any board components other than the switch cap or the BP-2 may be damaged.

2.5 NIGHT TRANSFER DEVICE The BP-2 can be used as a night transfer device. After normal business hours, CO ground start trunk lines can be connected to station telephones, bypassing the normal PBX connections. A switch or relay contact is connected to Forced Bypass Control Line FBC. Closing (shorting) FBC places the BP-2 in the PFT, or "night transfer" mode. A switch located at an operator's console is the usual installation procedure.

2.6 USING MULTIPLE BP-2's Multiple BP-2's can be connected in a master/slave arrangement to provide more than eight (8) circuits of PFT. One BP-2 is designated as master and its Auxiliary Relay Contact NO2 is connected to the FBC of the first slave BP-2; then, Auxiliary Relay Contact NO2 of the first slave is connected to the FBC of the second slave, and this procedure is continued until all BP-2's are connected. During FBC operation the slave BP-2's go into the PFT mode only when the FBC on the master BP-2 is activated. Placing the master BP-2 in the manual PFT mode (utilizing switch SW1) will not affect the slaves. Obviously, a loss of power to the BP-2's will cause all of them to go into the PFT mode.

3. Installation

3.1 CHECKING FOR DAMAGE The BP-2 should be inspected for damage immediately upon receipt. If damage is found a claim should be filed with the shipper. A replacement BP-2 should be ordered if necessary.

3.2 BP-2 CONNECTIONS All connections to the BP-2 are made via the nine (9) position terminal strip TS1 and the two (2) 25-pair plugs, P1 and P2. The installer must provide two (2) 25-pair cable mounted connectors to mate with the BP-2's plugs.

3.3 MOUNTING The BP-2 wall mounts using four (4) #8 pan head screws, which are provided. The cover is secured by tightening the two (2) clamp screws located on the top and bottom of the cover.

3.4 USING THE TERMINAL STRIP In some installations it is convenient to make connections using Terminal Strip TS1. The nine (9) terminals on TS1 parallel nine (9) contacts on plugs P1 and P2. Connections made on TS1 do not have to be made on P1 and P2, and vice-versa. Terminal strip connections are described in the following paragraphs and illustrated in Figure 1.

3.5 INSTALLING AND TERMINATING THE 25-PAIR

CONNECTORS Install the two 25-pair cable mounted connectors into plugs P1 and P2 located on the BP-2 circuit board. Terminate the cables (e.g., in a "66" type block) and cross-connect with your system. Four (4) cable pairs are cross-connected for each of the eight (8) PFT circuits. Detailed connection information is shown in Figure 1. "Bypass Telephone" stickers are provided to mark the station telephones that are selected for PFT capability.

3.6 CONNECTING EARTH GROUND The BP-2 requires a separate earth ground connection for trunk ground starting. Connect earth ground to either plug P1 Violet/Orange pair, or terminal strip TS1 terminal 1. When using the BP-2-24 with -24Vdc or the BP-2-48 with -48Vdc two (2) ground connections are necessary—one (1) earth ground and one (1) power supply ground. Even if these grounds are electrically the same they still must be connected to the earth ground and power supply ground points on the BP-2. The green colored wire of the 3-conductor cable supplied with the BP-2-24 Kit is intended to connect the power transformer ground terminal to terminal strip TS1 terminal 1, providing the BP-2-24 earth ground.

3.7 CONNECTING POWER The BP-2-24 requires 24Vac or -24Vdc, 225mA for operation. The BP-2-48 requires -48Vdc, 140mA maximum for operation. Determine which version you are installing and what power source you are using before proceeding. Power can be connected using either plug P1 or terminal strip TS1.

Warning: Each side of power is connected to a separate pair of wires. The two (2) wires of each pair are connected together inside the BP-2.

POWERING WITH 24Vac (BP-2-24 ONLY): Connect one (1) lead of the 24Vac to P1 Violet/Brown pair or TS1 terminal 2. Connect the other 24Vac lead to P1 Violet/Slate pair or TS1 terminal 3. For 24Vac operation the two (2) red-colored wire jumper loops (J2 and J3) located near the lower edge of the printed circuit board must be cut. When using the BP-2-24 with 24Vac it is important that both sides of the 24Vac be floating (isolated) from earth ground. Failure to maintain this condition may cause fuses F1 and F2 to blow, and/or damage the BP-2.

POWERING WITH -24Vdc (BP-2-24 ONLY): Connect power supply ground to P1 Violet/Brown pair or TS1 terminal 2. Connect -24Vdc to P1 Violet/Slate pair or TS1 terminal 3. For -24Vdc operation the blue-colored wire jumper loop (J1, located near the lower edge of the printed circuit board) must be cut.

POWERING WITH -48Vdc (BP-2-48 ONLY): Connect power supply ground to P1 Violet/Brown pair or TS1 terminal 2. Connect -48Vdc to P1 Violet/Slate pair or TS1 terminal 3.

3.8 LED INDICATORS LED's on the BP-2 provide visual indication of two (2) conditions. LED1, located on the left side of the printed circuit board, indicates the presence of power to the BP-2. LED2, located on the right side of the printed circuit board, indicates the status of the Forced Bypass Control Line FBC. When FBC/Logic FBC is enabled, LED2 lights and the BP-2 is in the FBC enabled PFT mode. The LED's are visible with the plastic cover on or off.

3.9 BP-2 CONFIGURATION FOR FBC OR LOGIC FBC OPERATION FBC allows a normally open (not shorted) contact to place the BP-2 in the PFT mode, while Logic FBC provides for the use of a +5Vdc logic signal (instead of a normally open contact) to control FBC. Logic FBC is available only on BP-2's Rev C or later.

Please Note: WHEN THE LOGIC FBC OPTION IS NOT UTILIZED, SW2 MUST BE SET TO THE "HIGH" POSITION FOR CORRECT OPERATION.

FBC CONNECTION: With a PBX system, FBC is connected to a normally open (not shorted) alarm contact. With ROLM CBX systems, FBC is connected to pins 3 and 9 of the modem/alarm connector J2 on the Service Alarm Panel. Connect P1 Violet/Green wire or TS1 terminal 5 to J2 pin 3, and connect P1 Green/Violet wire or TS1 terminal 4 to J2 pin 9. The BP-2 will go into the PFT mode when the CBX system gives a "Bypass Enable" command. Other brands of PBX systems are also easily interfaced. FBC can also be used as a manually operated PFT control via a remotely located switch or relay contact.

LOGIC FBC CONNECTION: For Logic FBC operation, the logic signal current must be 4mA minimum, 20mA maximum. Exceeding the maximum current rating will destroy circuitry on the BP-2. Insure that the +5Vdc source utilizes a current limiting device (usually a resistor) before making any connections. If the

+5Vdc source is not current limited, install a 1K ohm resistor in series to provide correct current limiting. Logic FBC connections are made to the Violet/Blue pair of plug P1. Connect +5Vdc to the Violet/Blue wire, and connect logic ground to the Blue/Violet wire. Both +5Vdc and logic ground must be connected because Logic FBC is electrically isolated from the rest of the BP-2. Switch SW2 on the BP-2 should be set at this time. SW2 allows the use of a positive or negative going logic, i.e., a normally logic high (+5Vdc) or normally logic low (0Vdc) to trigger FBC. For FBC to trigger when +5Vdc (logic high) is applied, set SW2 to the "HIGH" position. For FBC to trigger when 0Vdc (logic low) is applied, set SW2 to the "LOW" position. Note that a setting in the "LOW" position requires that +5Vdc be applied continuously for non-PFT operation.

LOGIC FBC CONNECTION WITH ROLM REDWOOD SYSTEM: Logic FBC can be connected directly to ROLM Corporation's Redwood system. Redwood provides a current limited +5Vdc logic signal designated Aux 0. Aux 0 is +5Vdc (logic high) when the Redwood system is functioning correctly, and drops to 0Vdc (logic low) upon system failure. Aux 0 appears on the Black/Green wire (pin 38) of 25-pair plug J52 on the master cabinet. Logic ground appears on the Green/Black wire (pin 13) of J52. SW2 on the BP-2 should be set to the "LOW" position, designating that a logic low will place the BP-2 in the FBC enabled PFT mode. Connect BP-2 J1 Violet/Blue wire to Redwood J52 Black/Green wire, and connect BP-2 J1 Blue/Violet wire to Redwood J52 Green/Black wire. No external current limiting resistor is required because Aux 0 is already current limited.

4. Circuit Description

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

4.2 NON-PFT OPERATION During non-PFT operation, power is supplied to the BP-2, the manual PFT switch is in the "on" state, and Forced Bypass Control Line FBC is open (not shorted). PFT relays K1 through K3 are energized, connecting the CO ground start trunk lines to the PBX trunk inputs and the PBX station outputs to the station telephones. Auxiliary Relay Contact NO1 is open (not shorted). Forced Bypass Control Relay K4 is not energized, making Auxiliary Relay contact NO2 open (not shorted). LED1, on the left side of the printed circuit board, is lit, indicating the presence of power. LED2, on the right side of the printed circuit board, is not lit, indicating that FBC is open (not shorted). The loop to ground start conversion circuitry always remains in series with the station telephones. Since the station telephones are connected to loop start PBX extensions, no loop to ground start conversion is performed. The circuitry looks invisible to both the PBX and the station telephones. When the station telephone is on-hook the PBX extension output sees approximately 200K ohms across the tip and ring leads, and 100K ohms from tip to earth ground and from ring to earth ground. This high impedance, purely resistive load should not interfere with correct PBX operation.

4.3 PFT MODE Power failure is defined as a loss of power to the BP-2. When a power failure occurs. PFT Relays K1 through K3 de-energize, connecting the CO ground start trunk lines to the station telephones. The loop to ground start conversion circuitry is now in series with the CO ground start trunk lines. In the station telephone on-hook state -48Vdc is present on the ring

lead of the CO ground start trunk line; the tip lead is floating, i.e., not connected to anything. The loop to ground start conversion circuitry detects station telephone off-hook, and establishes a current path from earth ground to the CO ground start trunk line ring lead. The CO senses this current and, when ready, grounds the tip lead and starts loop current flowing. The loop to ground start conversion circuitry detects this current and stops the earth ground to ring lead current path. The call is now ready to be dialed in the normal manner.

4.4 MANUAL PFT MODE Manual PFT is initiated by operating Manual PFT switch SW1. PFT relays K1 through K3 de-energize, connecting the CO ground start trunk lines to the station telephones. Auxiliary Relay Contact NO1 closes (shorts). LED1 is not lit, showing the loss of power to the BP-2 circuitry.

4.5 FORCED BYPASS CONTROL LINE FBC/LOGIC FBC FBC enabled PFT mode operation is initiated by closing (shorting) FBC, or by the presence or absence of a +5Vdc logic signal on the Logic FBC connections. Closing FBC causes FBC relay K4 to energize. The Logic FBC circuit contains an optoisolator on its input to electrically isolate the logic level input signal from the BP-2. The output of the optoisolator controls transistor Q17, which in turn controls FBC relay K4. Switch SW2 selects whether a logic low or logic high input signal activates Logic FBC. When FBC Relay K4 energizes, LED2 lights and Auxiliary Relay Contact NO2 closes. PFT relays K1 through K3 de-energize, connecting the CO ground start trunk lines to the station telephones. Auxiliary Relay Contact NO1 closes (shorts). LED1 remains lit because power is still present.

4.6 TERMINAL STRIP TS1 Terminal Strip TS1 parallels nine (9) contacts on plugs P1 and P2. TS1 provides access to earth ground, power, FBC, and Auxiliary Relay Contacts NO1 and NO2. Logic FBC connections appear only on plug P1.

4.7 24VAC VERSUS -24VDC OPERATION When the BP-2-24 is powered by 24Vac, the two (2) red-colored wire jumper loops J2 and J3 are cut, allowing resistors R51 and R52 to act as voltage dropping resistors; the blue-colored wire jumper loop J1 remains intact, allowing capacitor C9 to remain in the circuit and act as a filter. When the BP-2-24 is powered by -24Vdc, the two (2) intact red-colored wire jumper loops J2 and J3 shunt R51 and R52. The blue-colored wire jumper loop J1 is cut, removing C9 from the circuit.

4.8 FUSES Fuses F1 and F2 protect the BP-2-24 and the power source from damage. Fuse F1 protects the BP-2-48 and the power source from damage. They are equivalent to BUSS GMT and Littelfuse 401 series alarm indicator fuses. F1 and F2 are rated at 2 amps and are field replaceable.

4.9 DIFFERENCES BETWEEN -24 AND -48 VERSIONS Slight differences are found between the BP-2-24 and the BP-2-48. Capacitor C9, resistor R51, diodes CR27, CR28, CR29, fuse F1, and jumpers J1, J2 and J3 are not required for the BP-2-48 and are not inserted into the circuit board.

5. Specifications

POWER REQUIREMENT

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

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

RELAY CONTACT RATINGS

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

FUSING

BP-2-24: Two (2), 2 amp fuses

BP-2-48: One (1), 2 amp fuse

Fuses are equivalent to BUSS GMT and Littelfuse 401 series and are field replaceable.

FORCED BYPASS CONTROL LINE FBC

FBC is enabled in one of two ways:

- 1) Close (short) FBC by contact closure capable of handling 40Vdc, 40mA for the BP-2-24 and -48Vdc, 40mA for the BP-2-48.
- 2) Apply or remove +5Vdc logic signal to Logic FBC connection. Minimum current 4mA, maximum 20mA.

DIMENSIONS

8.75 inches high (22.0cm)

8.75 inches wide (22.0cm)

3.35 inches deep (8.3cm)

WEIGHT

Approximately 3 pounds (1.4kg)

MOUNTING

Wall mounted with four (4) #8 pan head screws.

6. Incorrect Operation

6.1 INCORRECT SETTING OF SWITCH SW2 If Logic FBC switch SW2 is incorrectly set the BP-2 may remain "latched" in the FBC enabled PFT mode. SW2 must be set to the "HIGH" position when the Logic FBC function is not used or when a logic high (+5Vdc) is used to trigger FBC. If SW2 is set to the "LOW" position a logic high (+5Vdc) signal must be present for non-PFT mode operation; absence of the logic high signal will trigger FBC.

6.2 EARTH GROUNDING Insure that a good earth ground connection is provided. Failure to provide this will result in incorrect operation of the loop to ground start conversion circuitry.

6.3 TRUNK TIP AND RING POLARITY Insure that the CO ground start trunk lines are correctly connected. When a ground start trunk is in the on-hook state the ring lead should measure -48Vdc with respect to earth ground.

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

6.5 FUSING Field replaceable fuses are used in the BP-2. They are 2 amp alarm indicator type equivalent to BUSS GMT and Littelfuse 401 series—also known as "grasshopper" or alarm fuses. The BP-2-24 contains two (2) fuses and the BP-2-48 contains one (1) fuse.

6.6 LOOP RESISTANCE LIMIT In the PFT mode, the station telephone loop is connected in series with the CO ground start trunk line. The sum of the local and CO loop resistances must not exceed the maximum resistance limit, which is approximately 1500 ohms. Incorrect loop to ground start conversion may occur if the total loop resistance approaches 1500 ohms.

6.7 INCORRECT OPERATION DUE TO REVERSE BATTERY FROM THE CO In rare instances CO answer supervision (i.e., reverse battery upon answer) is returned to the PBX via the ground start trunk. The loop to ground start conversion circuitry in the BP-2 does not function correctly in this situation. A typical scenario is as follows: The BP-2 is operating in the PFT mode and the CO is returning answer supervision. When the PFT station telephone goes off-hook the BP-2's loop to ground start circuit will correctly draw CO dial tone. However, when the called party answers the CO reverses trunk battery, and the loop to ground start circuit allows current leakage to ground, causing a hum on the trunk. There are no field fixes available to solve this problem. A factory modification can be performed by special order to correct this rare situation. Contact the factory for details.

6.8 APPLICATION LIMITATIONS The BP-2 was designed to operate correctly in most PFT applications. However, Gordon Kapes, Inc. does not guarantee that the BP-2 is compatible with all ground start trunk lines, PBX's and station telephones. All functions of the installed BP-2 should be thoroughly tested before the BP-2 is placed into service.

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

Figure 1 BP-2 Power Failure Transfer Unit Connection Diagram

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

Terminal Strip TS1

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

Note 1

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

Note 2

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

Note 3

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

Note 4

FBC: Forced Bypass Control Line. Close (short) this pair to place BP-2 in PFT mode. For ROLM CBX systems use 15-pin modem/alarm connector J2: Pin 3 to P1, VIO-GRN wire or TS1, terminal 5. Pin 9 to P1, GRN-VIO wire or TS1, terminal 4.

Logic FBC: Apply or remove current limited (4mA minimum, 20mA maximum) +5Vdc logic signal to control FBC. For FBC to trigger on logic high (+5Vdc) set switch SW2 to "HIGH." For FBC to trigger on logic low (0Vdc) set switch SW2 to "LOW." For ROLM Redwood systems, use master cabinet plug J52: BLK-GRN wire to BP-2 P1 VIO-BLU wire; GRN-BLK wire to BP-2 P1 BLU-VIO wire. Set switch SW2 to "LOW." WHEN NOT USING LOGIC FBC, SWITCH SW2 MUST BE SET TO THE "HIGH" POSITION FOR CORRECT OPERATION.

Note 5

NO2: Normally open (not shorted) auxiliary relay contact. Closes (shorts) when FBC closes (shorts) and causes PFT mode. Power failure will not close (short) NO2.
 NO1: Normally open (not shorted) auxiliary relay contact. Closes (shorts) when any PFT mode occurs.

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