Fire Fighter Phone System Installation Instructions

Introduction

This publication describes the installation procedure for the Fire Fighter's Phone on a 4100U or a 4100ES Fire Alarm Control Panel (FACP).

IMPORTANT: Verify FACP System Programmer, Executive, and Slave Software compatibility when installing, or replacing system components. Refer to the Technical Support Information and Downloads website for compatibility information.

In this Publication

This publication discusses the following topics:

Cautions, Warnings, and Regulatory Information

Cautions and Warnings

READ AND SAVE THESE INSTRUCTIONS- Follow the instructions in this installation manual. These instructions must be followed to avoid damage to this product and associated equipment. Product operation and reliability depend upon proper installation.

DO NOT INSTALL ANY SIMPLEX® PRODUCT THAT APPEARS DAMAGED- Upon unpacking your Simplex product, inspect the contents of the carton for shipping damage. If damage is apparent, immediately file a claim with the carrier and notify an authorized Simplex product supplier.

ELECTRICAL HAZARD - Disconnect electrical field power when making any internal adjustments or repairs. All repairs should be performed by a representative or authorized agent of your local Simplex product supplier.

STATIC HAZARD - Static electricity can damage components. Handle as follows:

- Ground yourself before opening or installing components.
- Prior to installation, keep components wrapped in anti-static material at all times.

EYE SAFETY HAZARD - Under certain fiber optic application conditions, the optical output of this device may exceed eye safety limits. Do not use magnification (such as a microscope or other focusing equipment) when viewing the output of this device.

FCC RULES AND REGULATIONS – PART 15 - This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

SYSTEM REACCEPTANCE TEST AFTER SOFTWARE CHANGES To ensure proper system operation, this product must be tested in accordance with NFPA 72® after any programming operation or change in site-specific software. Reacceptance testing is required after any change, addition or deletion of system components, or after any modification, repair or adjustment to system hardware or wiring.

All components, circuits, system operations, or software functions, known to be affected by a change, must be 100% tested. In addition, to ensure that other operations are not inadvertently affected, at least 10% of initiating devices that are not directly affected by the change, up to a maximum of 50 devices, must also be tested and proper system operation verified.

Introduction to the Fire Fighter Phone System

Overview

The Fire Fighter Phone System enables two-way voice communication between the 4100 master phone station and up to six active remote firefighter telephone stations. It is designed to be used in areas where radio communication is not effective or available.

All phones on the Fire Fighter Phone System use a common communication system called a *talk line*. When the master phone (the phone that actually determines whether the talk line is active) is used, its handset is always connected to the talk line via the phone controller card.

Remote phones are connected to the talk line through the phone circuit. Once a phone circuit is connected to a talk line, all remote phones on that circuit are also connected. All active phones on the talk line can talk together, as on a party line. The talk line is generated by the phone system controller card.

Components

The Fire Fighter Phone System is comprised of several modules. A single system is made up of one 4100-1270 Master Telephone with Phone Card, plus any number of the following:

- 4100-1271 Remote Master Telephone
- 4100-1272 Expansion Phone Card
- 4100-1273 Class A Telephone Adapter Module (optional)
- 4100-1280/81/87 LED/Switch Cards
- Remote Phone Assemblies: wall jacks and remote phone cabinets

Each item is described in detail on the following pages.

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Standard Phone Card Illustration

Figure 1 is an illustration of the standard phone card used for the phone controller and expansion cards.

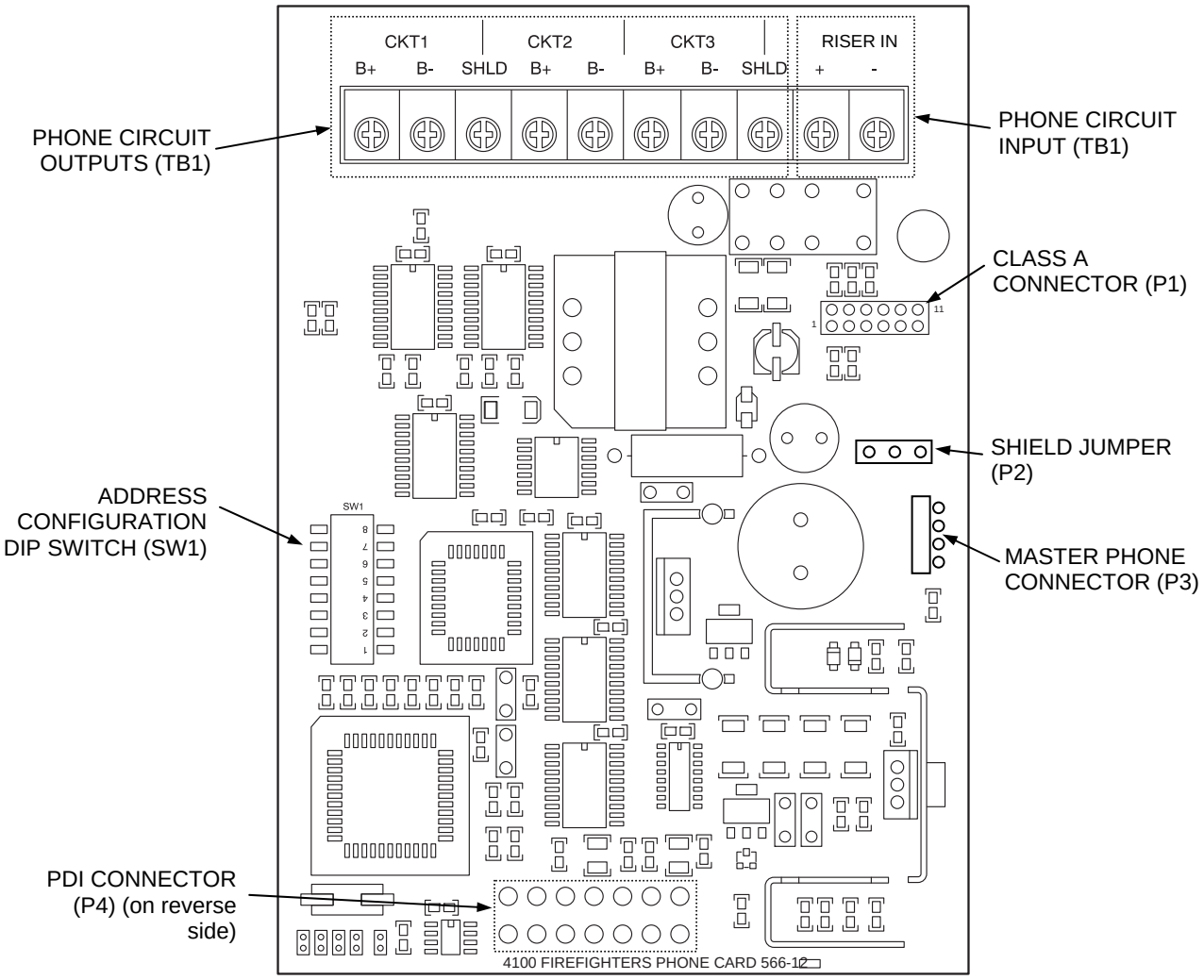

Figure 1. Phone Card

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4100-1270 Master Telephone with Phone Controller Card

The master telephone controls the talk line. When a call comes in from a remote phone, the master phone must be picked up for the talk line to be activated, and for any other remote phones in the network to listen in on the talk line.

The phone controller gives the master telephone or the remote master phone this capability. In addition to supplying the talk line via its connection to the master phone, the controller supplies phone system power. It also includes the following ports:

- an input connection for a separate phone system
- an output connection to the audio system
- three Class B phone circuits or three Class A phone circuits (with the addition of the 4100-1273 Telephone Class A Adapter Module)

4100-1270 Master Telephone with Phone Controller Card LEDs

LEDs on the phone controller are the same as those on the remote controller and expansion cards:

LED1 (PH1). Illuminates to indicate that phone circuit 1 is either active or is in a trouble condition.

LED2 (PH2). Illuminates to indicate that phone circuit 2 is either active or is in a trouble condition.

LED3 (PH3). Illuminates to indicate that phone circuit 3 is either active or is in a trouble condition.

LED4 (COMM TBL). Illuminates to indicate a communication failure or general card failure.

LED5 (XMFR). *4100-1270/-1271 only.* Illuminates to indicate that the network transformer is connected to a circuit.

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4100-1271 Remote Master Telephone with Phone Expansion Card

The remote assembly uses the same physical phone and card as the 4100-1270 Master Telephone with Phone Controller (described above). The remote master phone connects to either a 4100-1272 Telephone Expansion Module directly, or to a phone circuit from an expansion module or controller module.

4100-1272 Telephone Expansion Card

Expansion cards are used if additional phone circuits are needed within a phone system beyond the three phone circuits provided by the phone controller card. Expansion cards include the same features as the master controller.

4100-1273 Class A Telephone Adapter Card

The optional Class A adapter can be used with the 4100-1272 Phone Card. It is mounted onto the given card to provide a Class A connections to each phone circuit.

Figure 2 is an illustration of the 4100-1273 Telephone Class A Adapter Module.

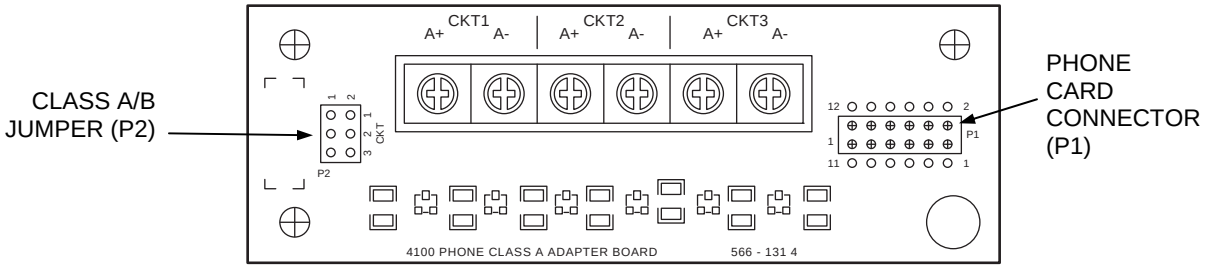

Figure 2. Class A Adapter Card

4100-1280/1281/1287 LED/Switch Cards

The LED/switch cards are used with the master phone assembly. The cards' LEDs and switches make up a user interface from which a phone system can be controlled. Switches can be used to silence piezos, and to toggle connections to audio and phones. More than one set of LED/switch cards can be used per phone system (for example, one at the master controller and another at a remote master controller). Although master phones and remote master phones are usually located in the same cabinet as the LED/switch cards, this is not required. Refer to the *LED/Switch Module Installation Instructions* (574-843) and the *Audio Operator Interface Installation Instructions* (579-168) for detailed installation instructions.

Continued on next page

Remote Phone Assemblies

Remote phones are used by firefighters to establish communication during an emergency. The phone system supports up to 6 phones on-line at any one time.

The process by which a firefighter accesses the talk line depends on what type of phone assemblies are used in a building. There are two general types of remote phone assemblies.

The most basic assembly is the wall jack, into which a firefighter can plug a portable phone. The wall jack is available with or without a Call-Back LED, which blinks when a call is coming in and turns off to indicate successful communication with the master phone.

The second type of assembly is the remote phone cabinet, inside which a hard-wired phone is always present.

Remote phone assemblies are typically placed in or near the stairwell(s) on each floor.

Figures 3, 4, and 5, below, show the components of the remote phone assemblies.

2084-9023 Phone Jack with Call-Back LED

2084-9001 Phone Jack

Figure 3. Remote Phone Jacks

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Remote Phone Assemblies

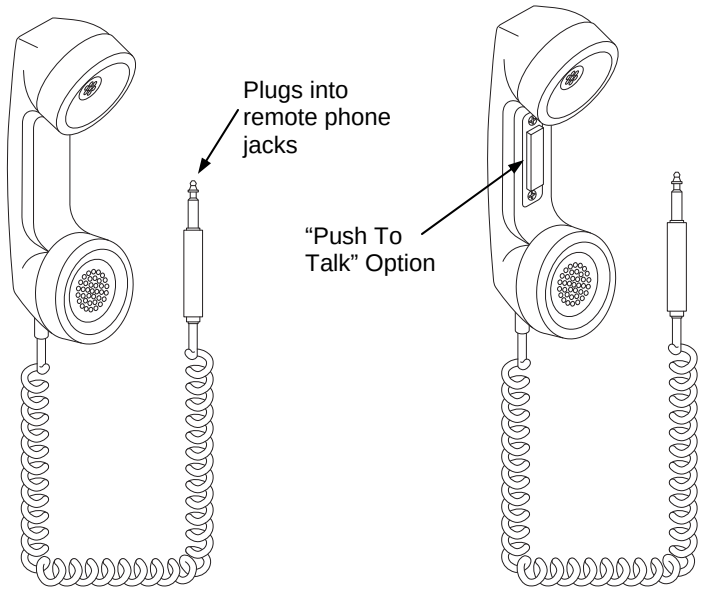

Figure 4. Remote Phone Handsets

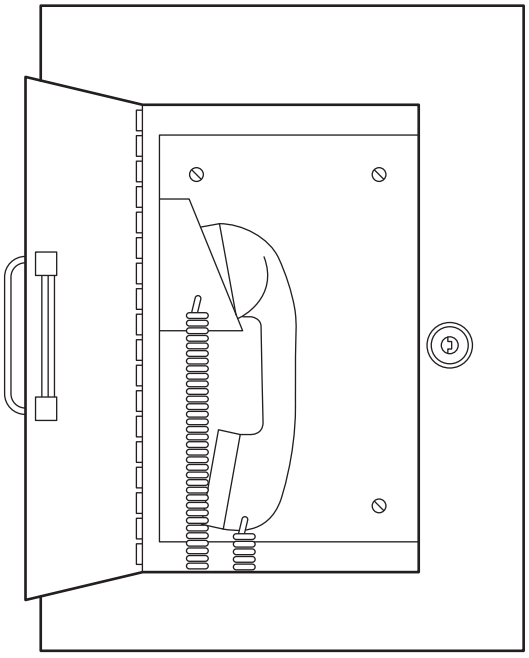

Figure 5. Remote Phone Cabinet

Requirements and Limitations

Refer to Table 1 for electrical environmental requirements.

Table 1. Electrical and Environmental Specifications

Electrical Specifications	
Voltage	24 VDC from FACP (19-32 VDC)
Supervision Current	80 mA maximum
Alarm Current	140 mA when powering master phone and network relay is engaged 180 mA with 2 phones and riser active 220 mA with 3 phones and riser active 250 mA with 4 phones and riser active 276 mA with 5 phones and riser active 304 mA with 6 phones and riser active 329 mA with 7 phones and riser active
Environmental Specifications	
Operating Temperature	32° to 120° F (0° to 49° C)
Humidity	Up to 93% relative humidity at 90° F (32° C)

Installing the Phone Card onto the PDI

Overview

The telephone expansion card is designed to be mounted on the PDI in an FACP expansion cabinet. The module can be mounted on any of the PDI connectors.

Use connector P4, labeled on the backside of the given card, to connect to any of the eight PDI connectors as shown in Figure 6, below.

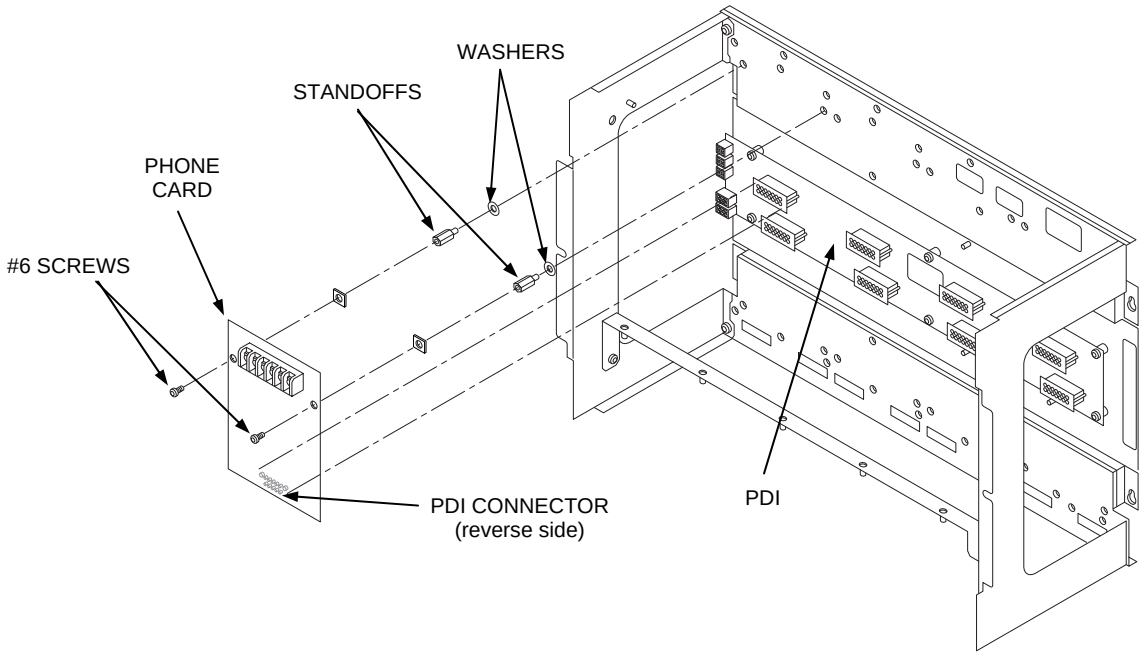

Figure 6. Mounting onto the Power Distribution Interface

Mounting the Class A Card

Use the Figure 7 and the instructions below to mount the Class A card to a phone controller card or expansion card.

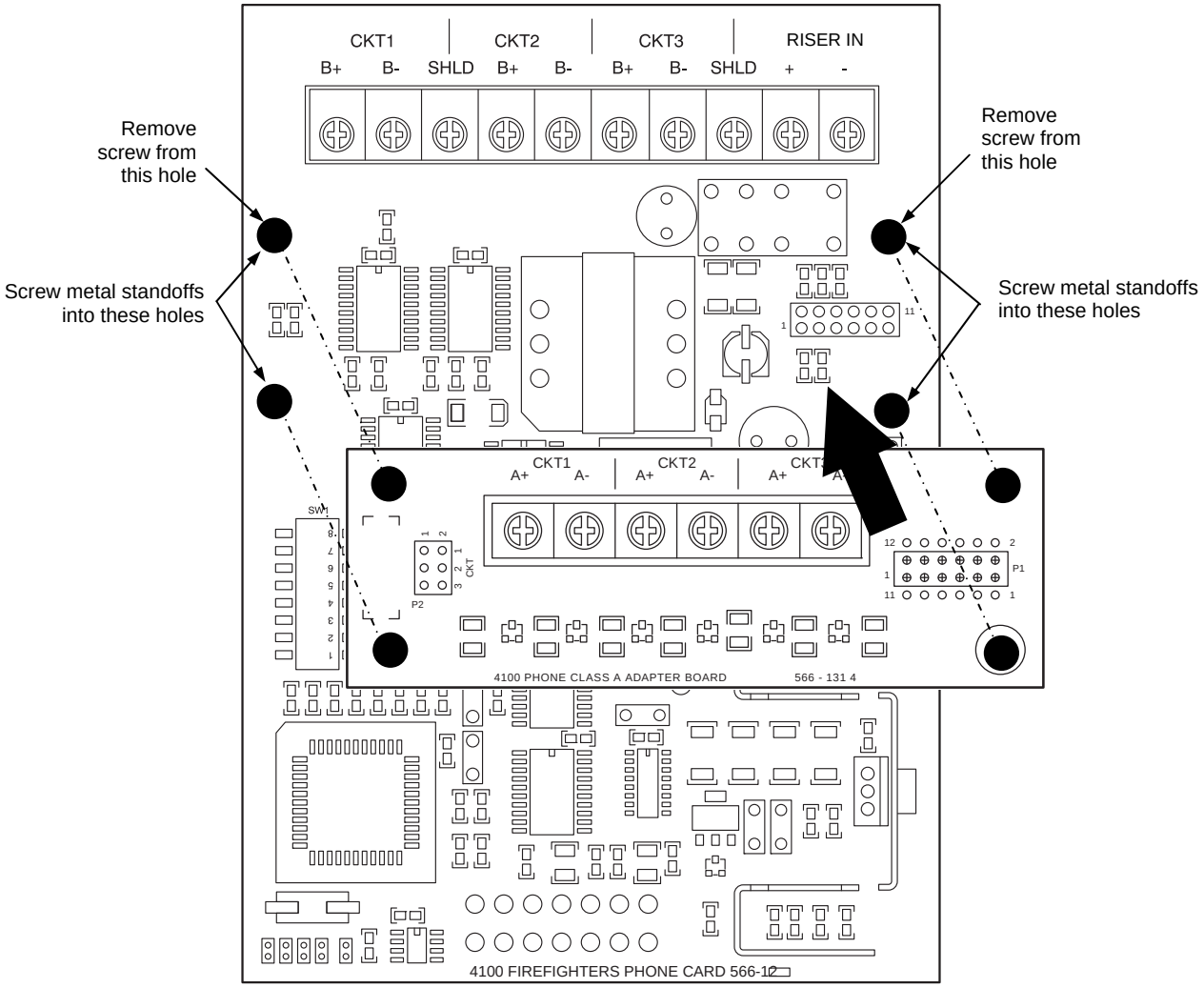

Figure 7. Class A Adapter Card Mounting

1. Remove and set aside the two screws from the holes shown on the phone card (see Figure 7).
2. Secure four threaded metal standoffs to the screw holes on the phone card.
3. Align and then connect P1 on the Class A adapter with P1 on the phone card.
4. Secure the Class A adapter to the metal standoffs using four screws.

Mounting the Remote Phone Assemblies

Overview

This section describes how to install the wall-mount remote phone jack and the remote phone enclosure, respectively.

Remote Jack Mounting

Use the following instructions and Figure 8 to mount the remote phone jack to a wall.

1. Unscrew the trim plate from the mounting bracket using the two screws and retainers.
2. Re-screw the trim plate to the mounting bracket and then mount the assembly *to* a single-gang box as shown.

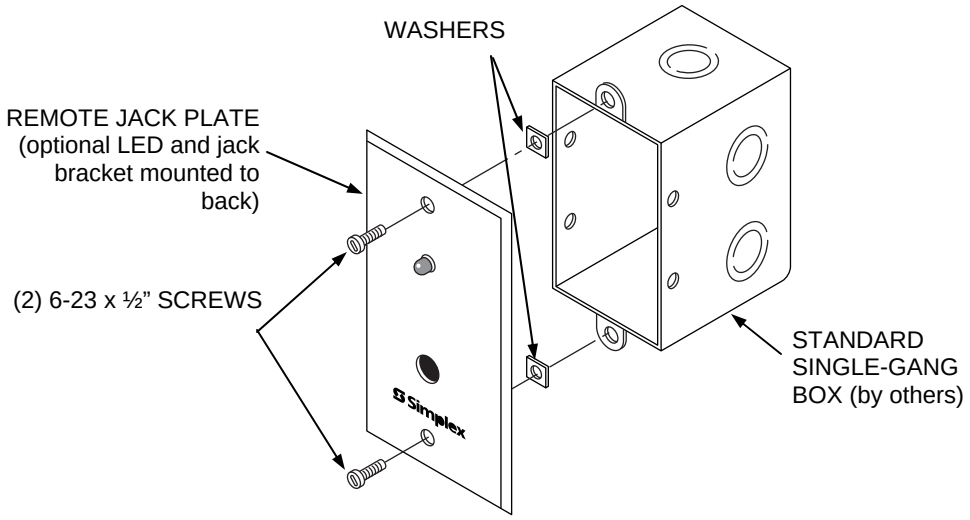

Figure 8. Phone Jack Mounting

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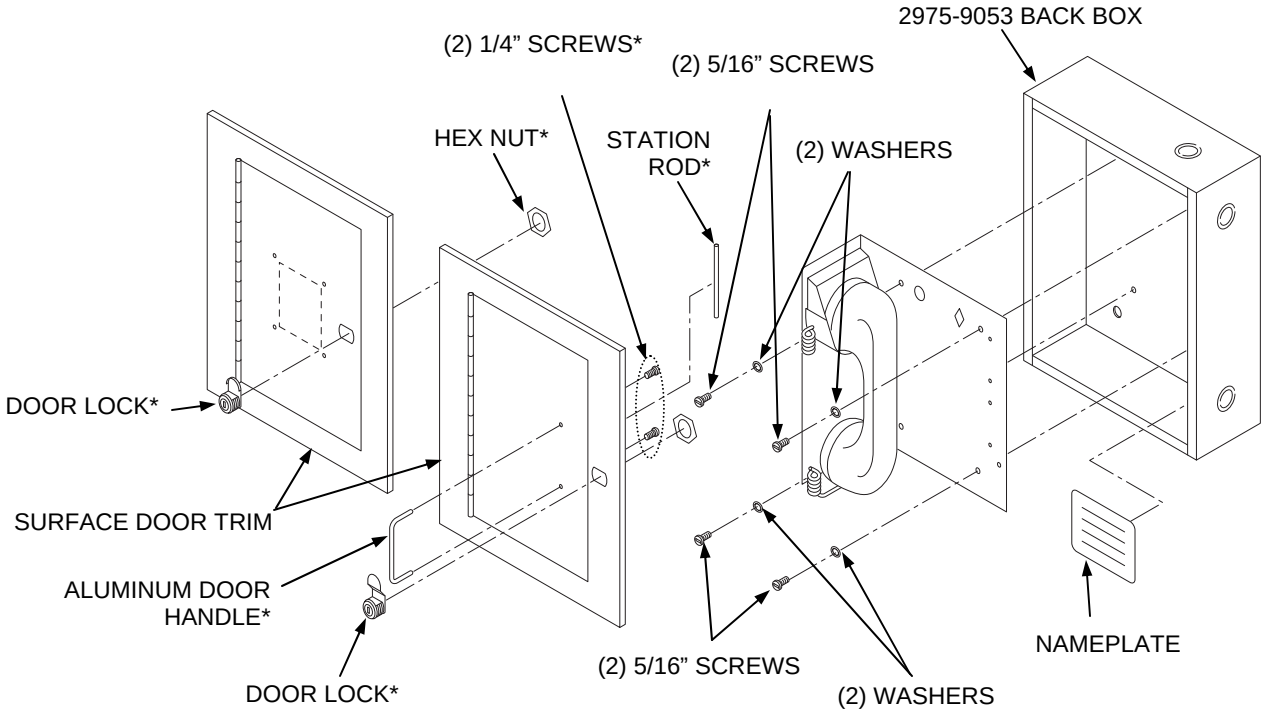
Remote Cabinet Assembly Mounting

The remote phone cabinet can be ordered by itself, without a phone or door, or it may be factory assembled. Even with a pre-assembled cabinet, you may need to disassemble the parts in order to mount the cabinet into the wall.

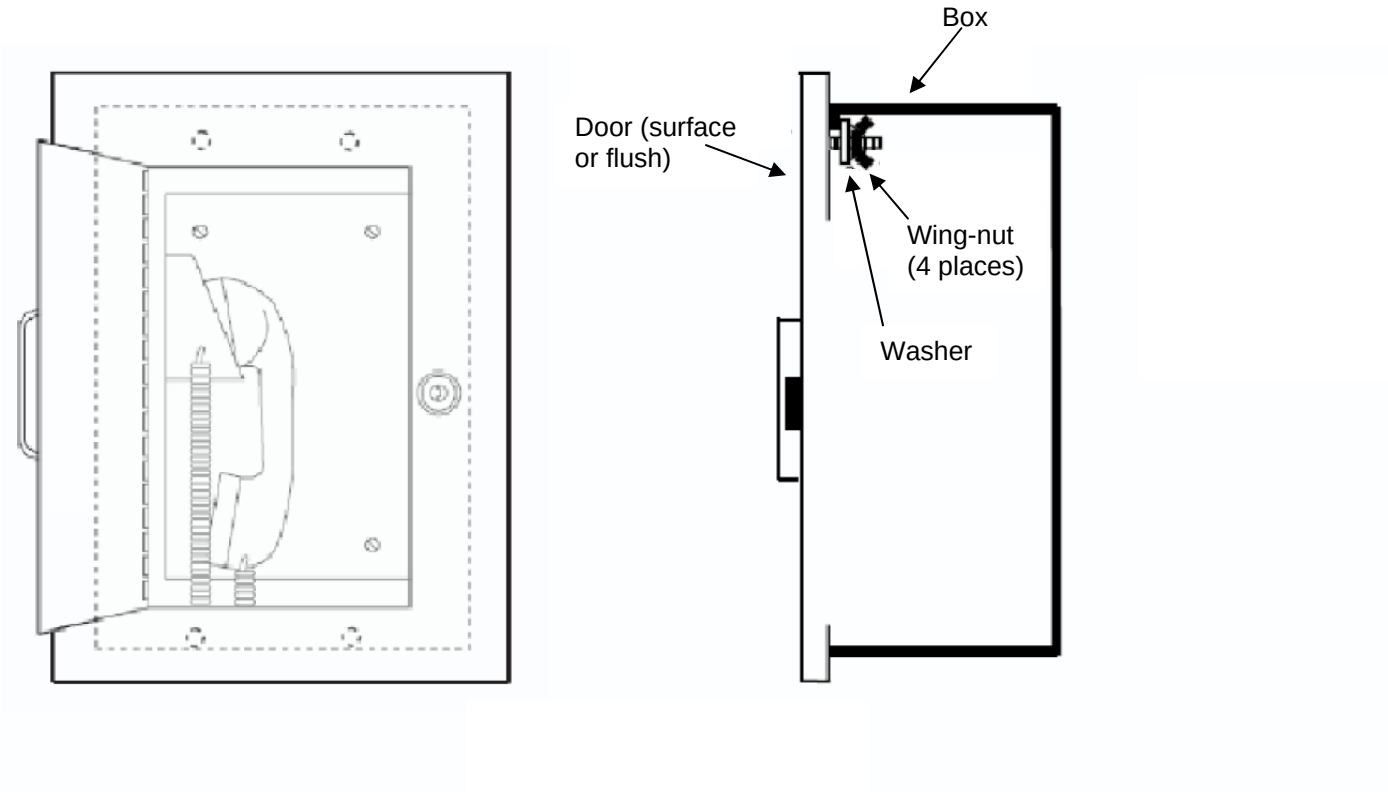
Once the cabinet is secured to the wall (or studs, depending on the situation), the rest of the cabinet assembly must be mounted (or re-mounted) to the cabinet. To assemble the remote phone cabinet contents once the cabinet is mounted, use Figure 9 and Figure 10.



* Available only in certain versions of the remote phone assembly.

Figure 9. Remote Phone Cabinet Mounting

Remote Cabinet Assembly Mounting



1. Place the door assembly over the box.
2. Open the door and locate the studs.
3. Place the lockwasher (supplied) over the stud so that it overlaps the box and secure it with the wing-nut (supplied). Do not fully tighten.
4. When all four are in place, center the door as required and tighten the wing-nuts securely.

Figure 10. Door Mounting

Card Configuration

Overview

This section contains instructions on configuring the phone system via jumpers and DIP switches.

Setting the Shield Jumper (P2 on Phone Card)

Use Jumper P2 on the phone card as follows:

Position 1-2: connect shield to 0 V
Position 2-3: connect shield to Earth

Setting the Shield Jumper (P2 on Class A Adapter)

Use Jumper P2 on the Class A adapter to enable Class A operation for a given circuit.

Position 1-2: Enable Class A operation for Speaker Circuit 1
Position 3-4: Enable Class A operation for Speaker Circuit 2
Position 5-6: Enable Class A operation for Speaker Circuit 3

Setting the Device Address and Baud Rate (SW1)

Switch SW1 on the 4100-1270/1272 card is an eight-position DIP switch. From left to right (see Figure 11, below) these switches are designated as SW1-1 through SW1-8. The function of these switches is as follows:

- **SW1-1**. This switch sets the baud rate for the internal communications line running between the card and the 4100 CPU. Set this switch to ON.
- **SW1-2 through SW1-8**. These switches set the card's address within the FACP. Refer to Table 2 for a complete list of the switch settings for all of the possible card addresses.

  Note: You must set these switches to the value assigned to the card by the Programmer.

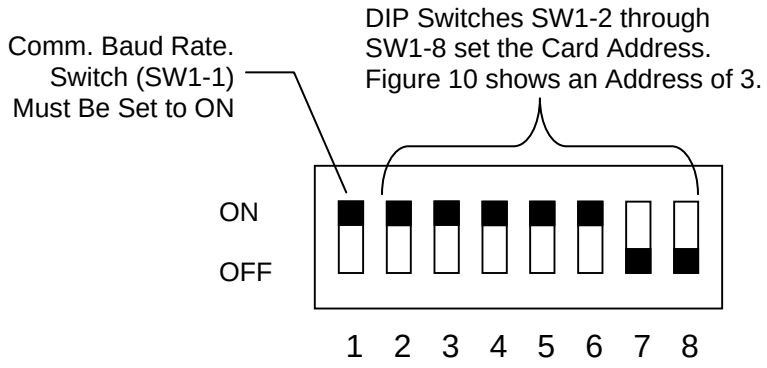


Figure 11. DIP Switch SW1

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Setting the Device Address and Baud Rate (SW1)

Table 2. 4100-1270/1272 Card Addresses

Address	SW 1-2	SW 1-3	SW 1-4	SW 1-5	SW 1-6	SW 1-7	SW 1-8	Address	SW 1-2	SW 1-3	SW 1-4	SW 1-5	SW 1-6	SW 1-7	SW 1-8
1	ON	ON	ON	ON	ON	ON	OFF	61	ON	OFF	OFF	OFF	OFF	ON	OFF
2	ON	ON	ON	ON	ON	OFF	ON	62	ON	OFF	OFF	OFF	OFF	OFF	ON
3	ON	ON	ON	ON	ON	OFF	OFF	63	ON	OFF	OFF	OFF	OFF	OFF	OFF
4	ON	ON	ON	ON	OFF	ON	ON	64	OFF	ON	ON	ON	ON	ON	ON
5	ON	ON	ON	ON	OFF	ON	OFF	65	OFF	ON	ON	ON	ON	ON	OFF
6	ON	ON	ON	ON	OFF	OFF	ON	66	OFF	ON	ON	ON	ON	OFF	ON
7	ON	ON	ON	ON	OFF	OFF	OFF	67	OFF	ON	ON	ON	ON	OFF	OFF
8	ON	ON	ON	OFF	ON	ON	ON	68	OFF	ON	ON	ON	OFF	ON	ON
9	ON	ON	ON	OFF	ON	ON	OFF	69	OFF	ON	ON	ON	OFF	ON	OFF
10	ON	ON	ON	OFF	ON	OFF	ON	70	OFF	ON	ON	ON	OFF	OFF	ON
11	ON	ON	ON	OFF	ON	OFF	OFF	71	OFF	ON	ON	ON	OFF	OFF	OFF
12	ON	ON	ON	OFF	OFF	ON	ON	72	OFF	ON	ON	OFF	ON	ON	ON
13	ON	ON	ON	OFF	OFF	ON	OFF	73	OFF	ON	ON	OFF	ON	ON	OFF
14	ON	ON	ON	OFF	OFF	OFF	ON	74	OFF	ON	ON	OFF	ON	OFF	ON
15	ON	ON	ON	OFF	OFF	OFF	OFF	75	OFF	ON	ON	OFF	ON	OFF	OFF
16	ON	ON	OFF	ON	ON	ON	ON	76	OFF	ON	ON	OFF	OFF	ON	ON
17	ON	ON	OFF	ON	ON	ON	OFF	77	OFF	ON	ON	OFF	OFF	ON	OFF
18	ON	ON	OFF	ON	ON	OFF	ON	78	OFF	ON	ON	OFF	OFF	OFF	ON
19	ON	ON	OFF	ON	ON	OFF	OFF	79	OFF	ON	ON	OFF	OFF	OFF	OFF
20	ON	ON	OFF	ON	OFF	ON	ON	80	OFF	ON	OFF	ON	ON	ON	ON
21	ON	ON	OFF	ON	OFF	ON	OFF	81	OFF	ON	OFF	ON	ON	ON	OFF
22	ON	ON	OFF	ON	OFF	OFF	ON	82	OFF	ON	OFF	ON	ON	OFF	ON
23	ON	ON	OFF	ON	OFF	OFF	OFF	83	OFF	ON	OFF	ON	ON	OFF	OFF
24	ON	ON	OFF	OFF	ON	ON	ON	84	OFF	ON	OFF	ON	OFF	ON	ON
25	ON	ON	OFF	OFF	ON	ON	OFF	85	OFF	ON	OFF	ON	OFF	ON	OFF
26	ON	ON	OFF	OFF	ON	OFF	ON	86	OFF	ON	OFF	ON	OFF	OFF	ON
27	ON	ON	OFF	OFF	ON	OFF	OFF	87	OFF	ON	OFF	ON	OFF	OFF	OFF
28	ON	ON	OFF	OFF	OFF	ON	ON	88	OFF	ON	OFF	OFF	ON	ON	ON
29	ON	ON	OFF	OFF	OFF	ON	OFF	89	OFF	ON	OFF	OFF	ON	ON	OFF
30	ON	ON	OFF	OFF	OFF	OFF	ON	90	OFF	ON	OFF	OFF	ON	OFF	ON
31	ON	ON	OFF	OFF	OFF	OFF	OFF	91	OFF	ON	OFF	OFF	ON	OFF	OFF
32	ON	OFF	ON	ON	ON	ON	ON	92	OFF	ON	OFF	OFF	OFF	ON	ON
33	ON	OFF	ON	ON	ON	ON	OFF	93	OFF	ON	OFF	OFF	OFF	ON	OFF
34	ON	OFF	ON	ON	ON	OFF	ON	94	OFF	ON	OFF	OFF	OFF	OFF	ON
35	ON	OFF	ON	ON	ON	OFF	OFF	95	OFF	ON	OFF	OFF	OFF	OFF	OFF
36	ON	OFF	ON	ON	OFF	ON	ON	96	OFF	OFF	ON	ON	ON	ON	ON
37	ON	OFF	ON	ON	OFF	ON	OFF	97	OFF	OFF	ON	ON	ON	ON	OFF
38	ON	OFF	ON	ON	OFF	OFF	ON	98	OFF	OFF	ON	ON	ON	OFF	ON
39	ON	OFF	ON	ON	OFF	OFF	OFF	99	OFF	OFF	ON	ON	ON	OFF	OFF
40	ON	OFF	ON	OFF	ON	ON	ON	100	OFF	OFF	ON	ON	OFF	ON	ON
41	ON	OFF	ON	OFF	ON	ON	OFF	101	OFF	OFF	ON	ON	OFF	ON	OFF
42	ON	OFF	ON	OFF	ON	OFF	ON	102	OFF	OFF	ON	ON	OFF	OFF	ON
43	ON	OFF	ON	OFF	ON	OFF	OFF	103	OFF	OFF	ON	ON	OFF	OFF	OFF
44	ON	OFF	ON	OFF	OFF	ON	ON	104	OFF	OFF	ON	OFF	ON	ON	ON
45	ON	OFF	ON	OFF	OFF	ON	OFF	105	OFF	OFF	ON	OFF	ON	ON	OFF
46	ON	OFF	ON	OFF	OFF	OFF	ON	106	OFF	OFF	ON	OFF	ON	OFF	ON
47	ON	OFF	ON	OFF	OFF	OFF	OFF	107	OFF	OFF	ON	OFF	ON	OFF	OFF
48	ON	OFF	OFF	ON	ON	ON	ON	108	OFF	OFF	ON	OFF	OFF	ON	ON
49	ON	OFF	OFF	ON	ON	ON	OFF	109	OFF	OFF	ON	OFF	OFF	ON	OFF
50	ON	OFF	OFF	ON	ON	OFF	ON	110	OFF	OFF	ON	OFF	OFF	OFF	ON
51	ON	OFF	OFF	ON	ON	OFF	OFF	111	OFF	OFF	ON	OFF	OFF	OFF	OFF
52	ON	OFF	OFF	ON	OFF	ON	ON	112	OFF	OFF	OFF	ON	ON	ON	ON
53	ON	OFF	OFF	ON	OFF	ON	OFF	113	OFF	OFF	OFF	ON	ON	ON	OFF
54	ON	OFF	OFF	ON	OFF	OFF	ON	114	OFF	OFF	OFF	ON	ON	OFF	ON
55	ON	OFF	OFF	ON	OFF	OFF	OFF	115	OFF	OFF	OFF	ON	ON	OFF	OFF
56	ON	OFF	OFF	OFF	ON	ON	ON	116	OFF	OFF	OFF	ON	OFF	ON	ON
57	ON	OFF	OFF	OFF	ON	ON	OFF	117	OFF	OFF	OFF	ON	OFF	ON	OFF
58	ON	OFF	OFF	OFF	ON	OFF	ON	118	OFF	OFF	OFF	ON	OFF	OFF	ON
59	ON	OFF	OFF	OFF	ON	OFF	OFF	119	OFF	OFF	OFF	ON	OFF	OFF	OFF
60	ON	OFF	OFF	OFF	OFF	ON	ON								

Single-System Wiring

Overview

This section describes wiring for a single phone system—that is, a group of phone cards and phone assemblies that use just one phone controller card. These instructions can be adapted for wiring multiple phone systems; refer to “Multi-System Wiring” for more information.

The phone controller and expansion phone cards can each connect to an unlimited number of wall jacks and remote phones. The cards use Class B wiring by default, and can accommodate Class A wiring with the addition of a Class A adapter.

Figure 12, below, is an overview of how the phone system is wired.

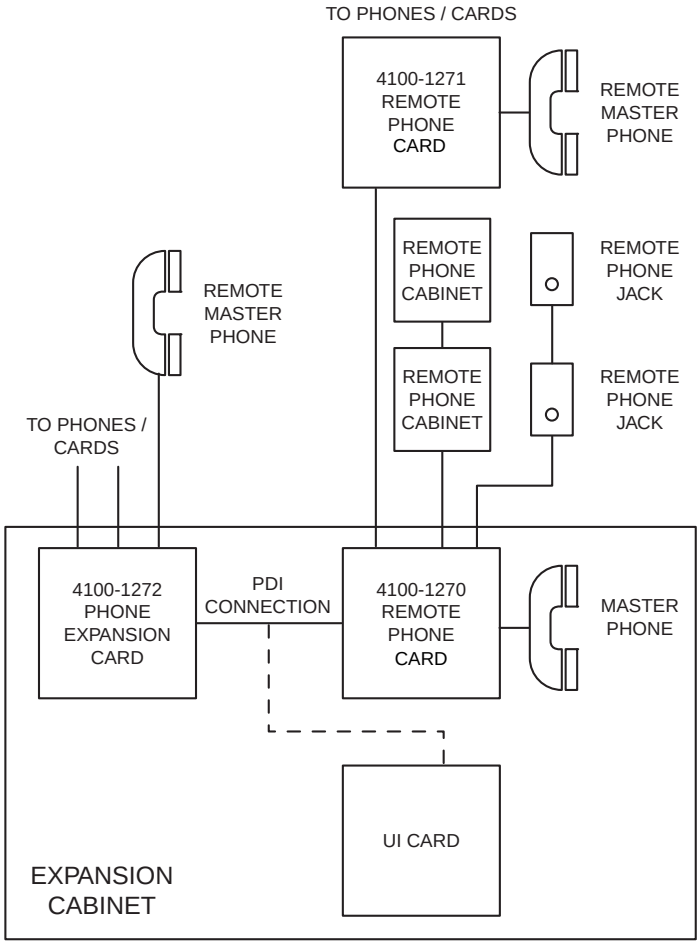

Figure 12. Phone System Block Diagram

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Wiring Guidelines

Make sure these prerequisites are accounted for before installing the cards:

- All remote phones must be installed within 2,500 feet (762 m) of the phone card.
- Conductors must test free of all grounds.
- All wires must be between 12 AWG (3.309 mm^2) and 18 AWG (0.8231 mm^2), or as the local code dictates.
- A total of 6 remote phones can be activated in the phone system at once, but an unlimited number of remote phone assemblies can be connected in a system.
- "T" tapping is not permitted for any field wiring.
- Any circuits that are not used must be jumpered. Class B wiring requires a 4081-9008 10 K EOL Resistor Harness Assembly for each unused circuit. Class A wiring requires 12 AWG to 24 AWG wire from B+ to A+ and B- to A- for each unused circuit.
- Loop wires once through the supplied ferrite bead(s) as shown in Figure 13.

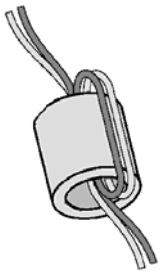

Figure 13.
Loop wires As Shown.

Class B Wiring

The following instructions apply to the wiring for the 4100-1270 Phone Controller Card and the 4100-1271/1272 Expansion Cards. To use Class B wiring to connect any of these phone cards to each other, or to remote phones, read the following instructions and refer to Figure 14, on the next page.

1. On TB1, connect B+ and B- on CKT1 to a junction box or to an expansion phone card.
   - *Junction box connection:* Skip ahead to step 2.
   - *Phone card-to-phone card (riser) connection:* route the wires from CKT1 on the first phone card to RISER IN + and RISER IN – on an expansion phone card in another cabinet. **Do *not* connect CKT1 to RISER IN terminals if the phone expansion card is in the same cabinet—the PDI makes the connection instead.** When you are finished, repeat this step for CKT2 and/or CKT3, *or* you may continue to step 2 to connect a circuit from a junction box to remote phone assemblies.
2. Connect the two wires from the junction box to the desired number of remote phone assemblies.
   - *Remote phone cabinet connection:* route the wires to screw terminals 15 (negative) and 13 (positive) on the remote phone cabinet. Terminals 12 and 14 can either be jumpered with a 4081-9008 (10 K) EOL Resistor Harness Assembly for the end of the line, or they can be routed to the next remote phone cabinet. If they are routed to another cabinet, connect wire from terminal 12 on the first cabinet to terminal 13 on the next, and from terminal 14 on the first cabinet to terminal 15 on the second.
   - *Remote phone jack connection:* crimp the wires to the red (positive) and black (negative) wire leads on the remote jack. The remaining two wires on the remote jack can be connected to another jack, or they can make up the end of the circuit. If it is the last jack in the circuit, use a 4081-9008 (10 K) EOL Resistor Harness Assembly for the end of the line.

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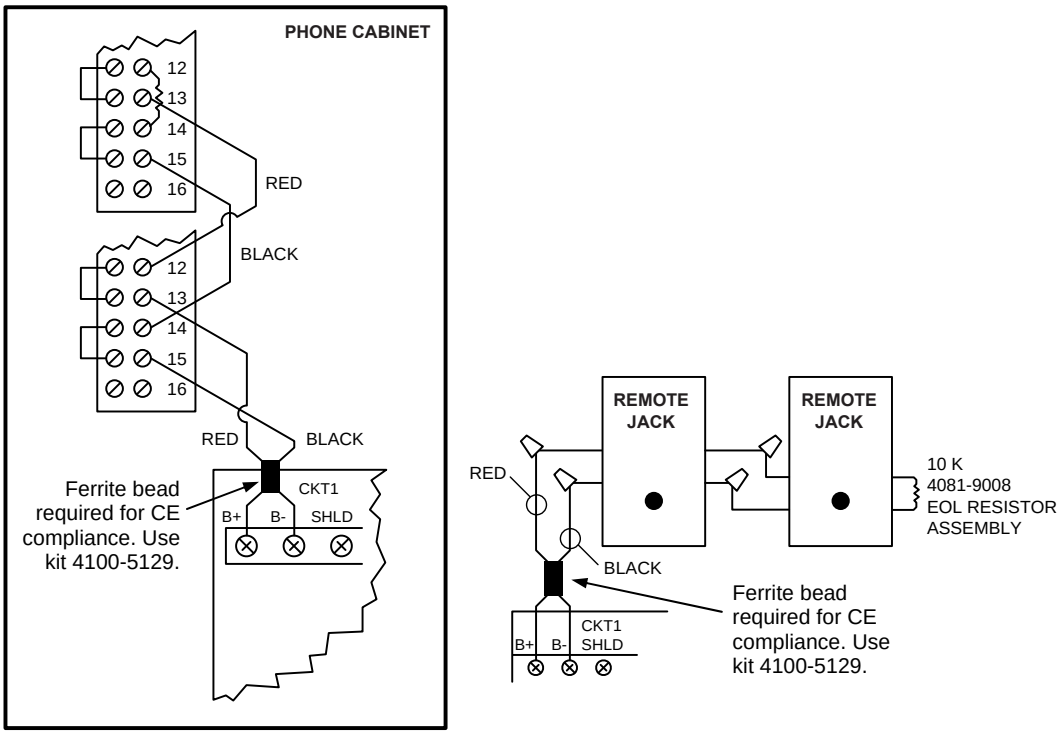
Class B Wiring

3. Repeat step 2 for each remote phone assembly.



- Leave the 4081-9008 (10 K) EOL Resistor Harness Assembly on the "+" to "-" terminals of unused contacts.
- All wiring is 18 AWG (0.8231 mm^2), twisted-shielded pair.
- Conductors must be free of all grounds.
- All wiring is supervised unless otherwise noted.

Figure 14. Class B Wiring: Phone Card to Phone Assemblies

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Class A Wiring

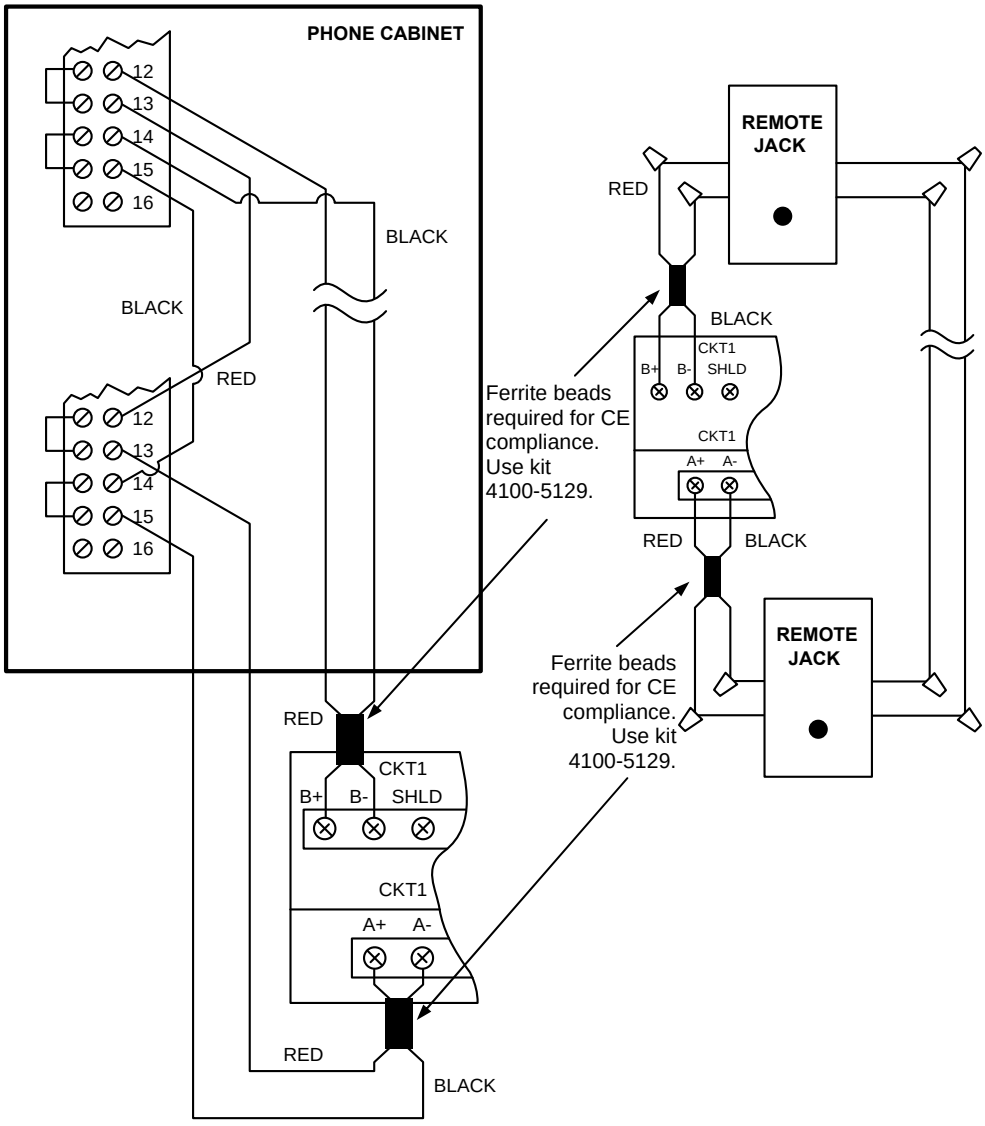
The following instructions apply to the 4100-1270 Phone Controller Card, and the 4100-1271/1272 Expansion Cards. To use Class A wiring to connect any of these phone cards to each other, or to remote phones, read the following instructions and refer to Figure 15, on the next page.

1. Mount the 4100-1273 Class A Telephone Adapter onto the phone card. Refer to Figure 7.
   - Plug P1 on the Class A card to P1 on the phone card.
   - Use four screws two secure the adapter to the card.
2. Install the header into the appropriate two pins on shunt jumper port P2 on the class A adapter card.
   - Jumper P2-1 and P2-2 to enable Class A wiring for Circuit 1.
   - Jumper P2-3 and P2-4 to enable Class A wiring for Circuit 2.
   - Jumper P2-5 and P2-6 to enable Class A wiring for Circuit 3.
3. On the Class A card's TB1 screw terminal, connect A+ and A- on CKT1 to a junction box or to another phone card.
   - *Junction box connection:* Skip ahead to step 4.
   - *Phone card-to-phone card (riser) connection:* route the wires from CKT1 on the first phone card to RISER IN + and RISER IN – on a phone expansion card in another cabinet. **Do *not* connect CKT1 to RISER IN terminals if the phone expansion card is in the same cabinet—the PDI makes the connection instead.** When you are finished, you may route the circuit further to a junction box (continue to step 4), or terminate the circuit back at the phone card (skip ahead to step 5).
4. Connect the two wires from the junction box to the desired number of remote phone assemblies.
   - *Remote phone cabinet connection:* route the wires from CKT1 on the Class A adapter to screw terminals 15 (negative) and 13 (positive) on the remote phone cabinet. Terminals 12 and 14 can either be routed back to the phone controller card (see step 5), or they can be routed to the next remote phone cabinet. If they are routed to another cabinet, connect wire from terminal 12 on the first cabinet to terminal 13 on the next, and from terminal 14 on the first cabinet to terminal 15 on the second.
   - *Remote phone jack connection:* crimp the wires to the red (positive) and black (negative) wire leads on the remote jack. The remaining two wires on the remote jack can be connected to more jacks. When the jack connections are complete, continue to step 5.

Continued on next page

Class A Wiring

5. Route the two wires back to the phone card, and terminate them on the phone card's TB1 screw terminals (CKT1 B+ and B-) to complete the Class A connection.
6. Repeat steps 3 through 5 for each remote phone assembly.



- Leave the 4081-9008 (10 K) EOL Resistor Harness Assembly on the "+" to "-" terminals of unused contacts.
- All wiring is 18 AWG (0.8231 mm^2), twisted-shielded pair.
- Conductors must be free of all grounds.
- All wiring is supervised unless otherwise noted.
- A remote master phone must connect to a dedicated zone, and will vary on which signal circuit depending on the system configuration.

Figure 15. Class A Wiring

Multi-System Wiring

Overview

Two or more phone systems can be connected to each other, so that multiple master controllers have control over phone circuits on multiple phone systems. There are three ways to connect two or more systems together, using *system-to-system wiring*, *network wiring*, and *2120 wiring*.

System-to-System Wiring

System-to-system wiring occurs when two or more phone controller cards—and therefore two or more phone systems—are connected to each other via their screw terminals.

System-to-system wiring can be accomplished simply by connecting one of the three CKT outputs on a controller card to the RISER IN input on the controller card for the next system. From there, all of the wiring rules described in “Single-System Wiring” apply.

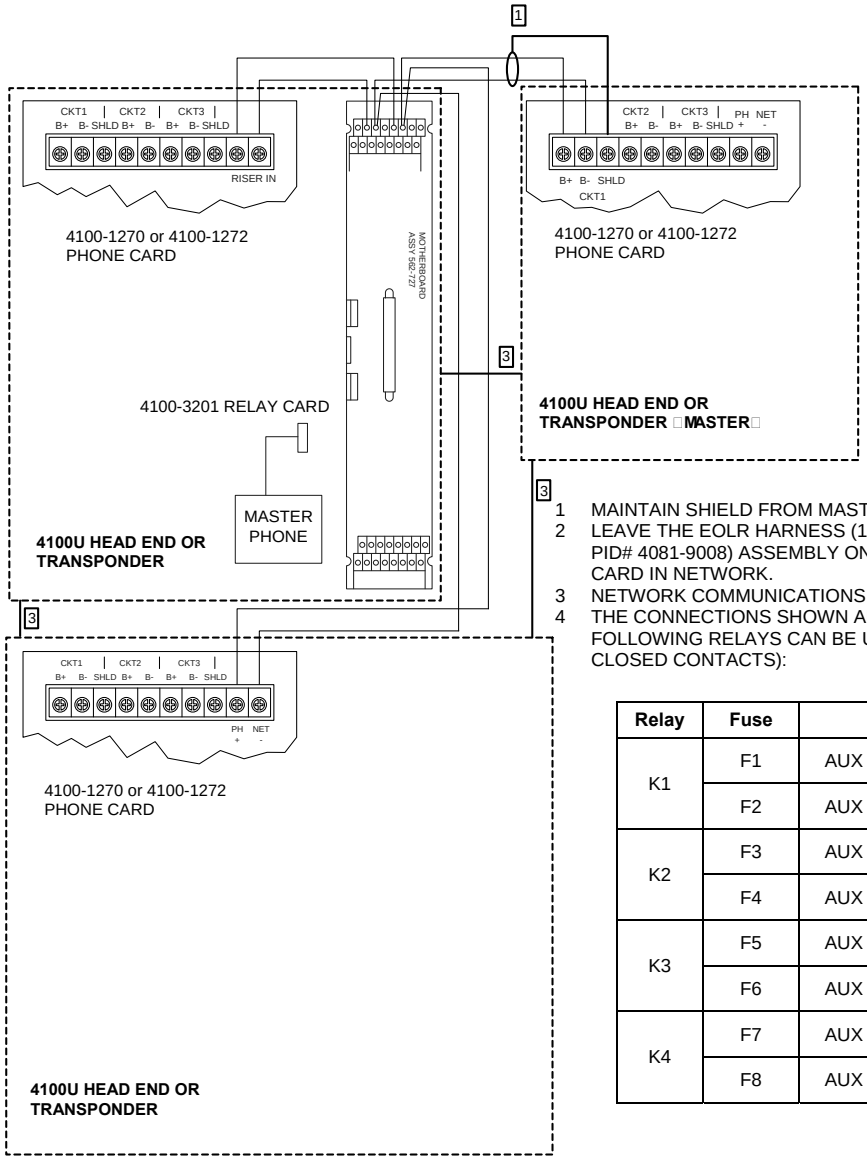
Network Wiring

When an FACP network card is installed in the 4100, it can be used to allow one system’s phone controller to control all phone circuits across all connected phone systems.

Figure 16, on the next page, is an illustration of network wiring for phone cards.

Continued on next page

Network Wiring



1 MAINTAIN SHIELD FROM MASTER TO REMOTE RELAY CARDS.
2 LEAVE THE EOLR HARNESS (10K ohm, ½ W: P/N 733-894, PID# 4081-9008) ASSEMBLY ON LAST RELAY AND PHONE CARD IN NETWORK.
3 NETWORK COMMUNICATIONS. REFER TO 579-182.
4 THE CONNECTIONS SHOWN ARE ONLY AN EXAMPLE. THE FOLLOWING RELAYS CAN BE USED (DO NOT USE NORMALLY CLOSED CONTACTS):

Relay	Fuse	Contacts	
K1	F1	AUX 3A	TB1-7 COM
			TB1-6 NO
	F2	AUX 3B	TB1-4 COM
			TB1-3 NO
K2	F3	AUX 4A	TB1-15 COM
			TB1-14 NO
	F4	AUX 4B	TB1-12 COM
			TB1-11 NO
K3	F5	AUX 5A	TB2-2 COM
			TB2-3 NO
	F6	AUX 5B	TB2-5 COM
			TB2-6 NO
K4	F7	AUX 6A	TB2-10 COM
			TB2-11 NO
	F8	AUX 6B	TB2-13 COM
			TB2-14 NO

Figure 16. Network Wiring (4100U FACP shown)

Continued on next page

Network Wiring

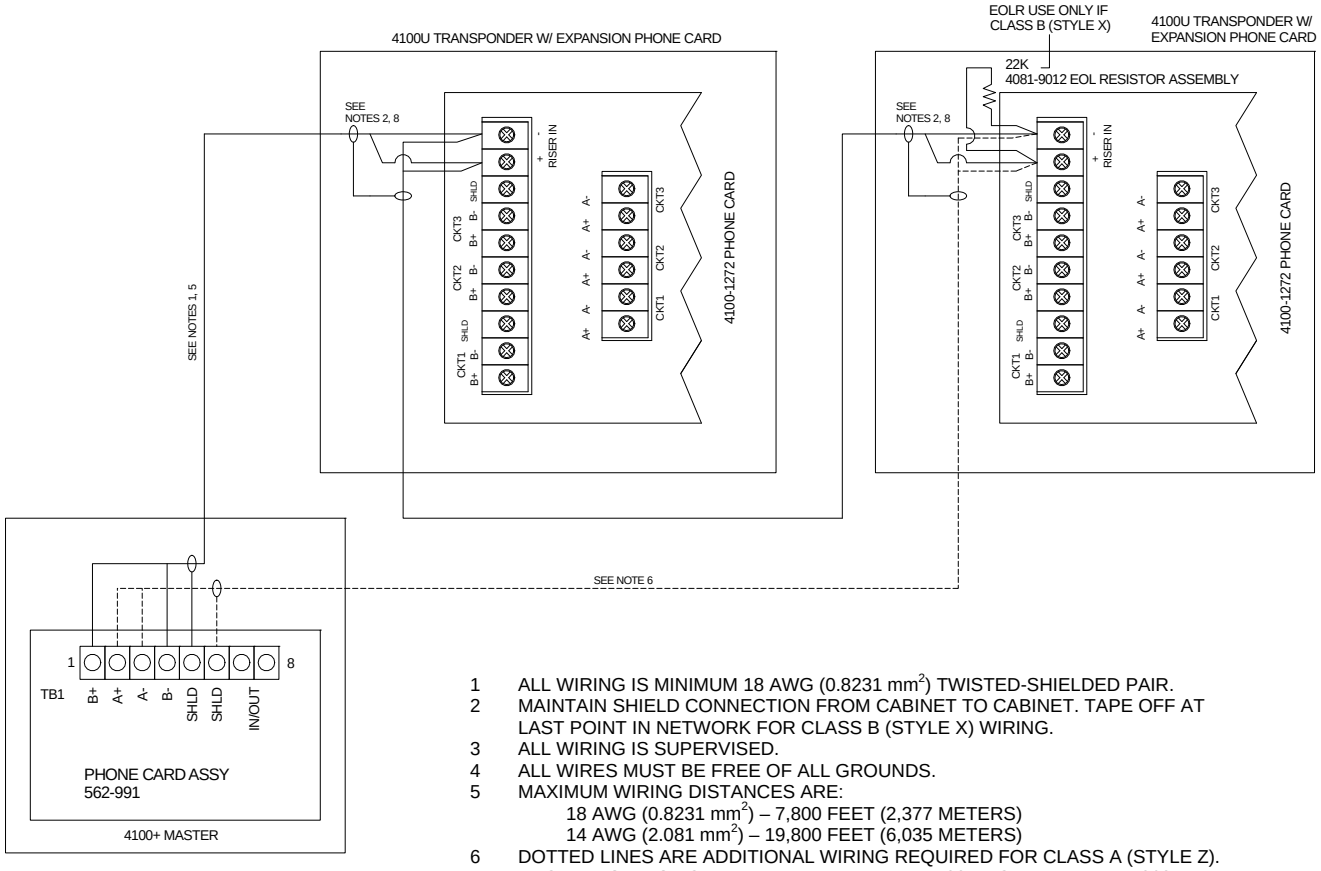
See document 579-182 for complete instructions on how to install a 4100 network card into the system.

2120 Wiring

Phone systems can be connected via a 2120 RS-232 interface. With a 4100/2120 connection, pseudo points can be used to control 4100 phone circuits. This allows one system's master phone card to control all phone circuits across all connected phone systems. See document 575-594 for complete instructions on how to install a 2120 RS-232 card into the system.

4100+ to 4100U /4100ES Interface Wiring

See Figure 17 to connect the 4100+ Master panel to a 4100U/4100ES transponder with Expansion Phone Card.

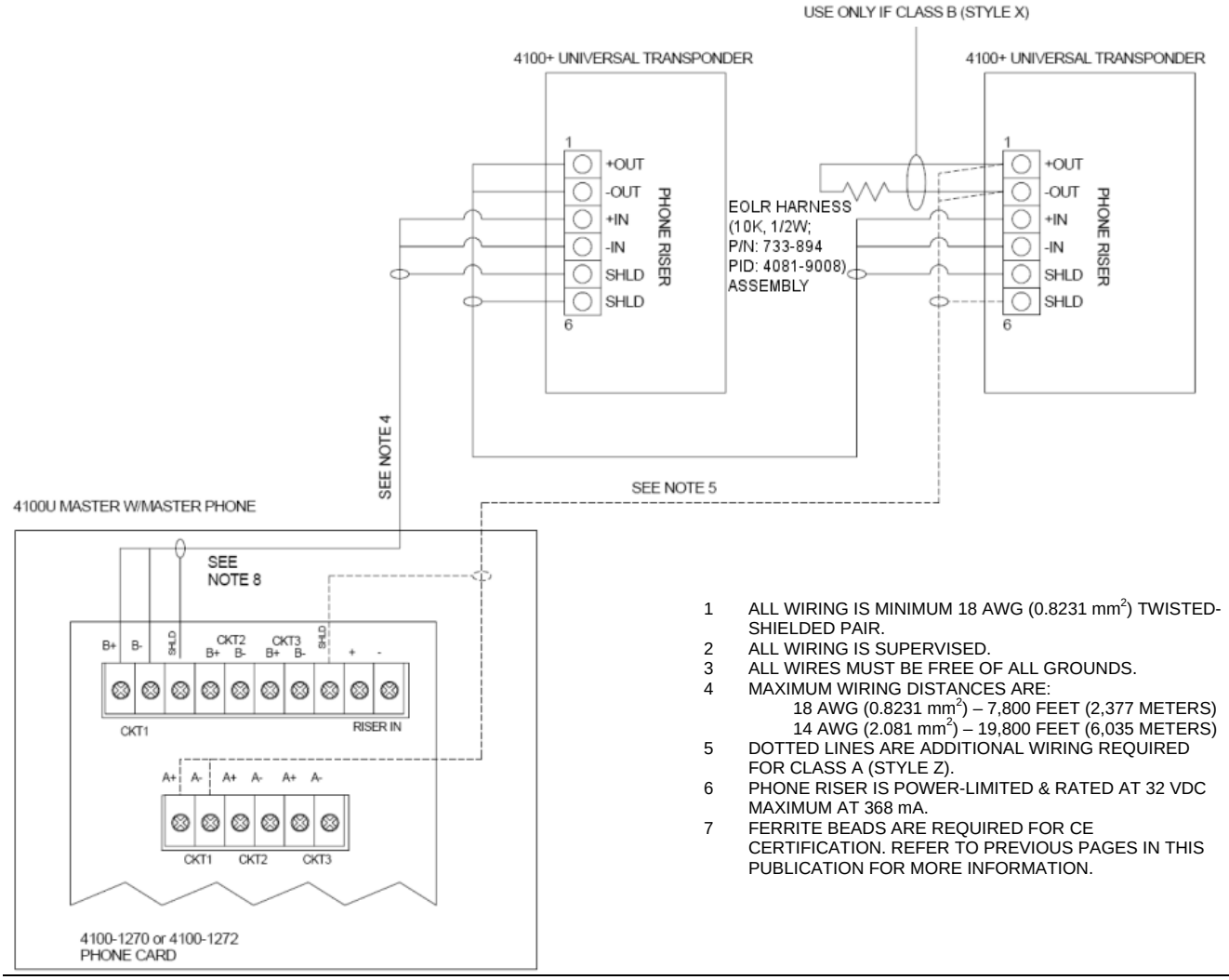


1 ALL WIRING IS MINIMUM 18 AWG (0.8231 mm^2) TWISTED-SHIELDED PAIR.
2 MAINTAIN SHIELD CONNECTION FROM CABINET TO CABINET. TAPE OFF AT LAST POINT IN NETWORK FOR CLASS B (STYLE X) WIRING.
3 ALL WIRING IS SUPERVISED.
4 ALL WIRES MUST BE FREE OF ALL GROUNDS.
5 MAXIMUM WIRING DISTANCES ARE:
18 AWG (0.8231 mm^2) – 7,800 FEET (2,377 METERS)
14 AWG (2.081 mm^2) – 19,800 FEET (6,035 METERS)
6 DOTTED LINES ARE ADDITIONAL WIRING REQUIRED FOR CLASS A (STYLE Z).
7 PHONE RISER IS POWER-LIMITED & RATED AT 32 VDC MAXIMUM AT 368 mA.
8 FERRITE BEADS ARE REQUIRED FOR CE CERTIFICATION. REFER TO PREVIOUS PAGES IN THIS PUBLICATION FOR MORE INFORMATION.

Figure 17. 4100+ Master to 4100U/4100ES Transponder Wiring (4100U FACP shown)

4100U/4100ES to Legacy Interconnect Wiring

See Figure 18 to connect the 4100U/4100ES Master panel to a 4100+ transponder.



1 ALL WIRING IS MINIMUM 18 AWG (0.8231 mm^2) TWISTED-SHIELDED PAIR.
2 ALL WIRING IS SUPERVISED.
3 ALL WIRES MUST BE FREE OF ALL GROUNDS.
4 MAXIMUM WIRING DISTANCES ARE:
18 AWG (0.8231 mm^2) – 7,800 FEET (2,377 METERS)
14 AWG (2.081 mm^2) – 19,800 FEET (6,035 METERS)
5 DOTTED LINES ARE ADDITIONAL WIRING REQUIRED FOR CLASS A (STYLE Z).
6 PHONE RISER IS POWER-LIMITED & RATED AT 32 VDC MAXIMUM AT 368 mA.
7 FERRITE BEADS ARE REQUIRED FOR CE CERTIFICATION. REFER TO PREVIOUS PAGES IN THIS PUBLICATION FOR MORE INFORMATION.

Figure 18. 4100U/4100ES Master to 4100+ Transponder Wiring (4100U FACP shown)

Troubleshooting

Overview	This section describes possible causes of phone system trouble messages that can appear on the 4100 display. Trouble messages appear on the left as titles, and possible causes are listed to the right in the text.
Phone Capacity Exceeded Trouble	More than the maximum number of allowed phones may be active on phone circuits. Reduce the number of potentially active remote phones to six to eliminate the problem.
Master Phone Off-Hook Trouble	A master or remote master phone has been off-hook for longer than the timeout period as indicated in the programmer (default is 90 seconds).
Card Missing Trouble	A controller card or expansion card has lost communication with the 4100 Master.
Short/Open Circuit Trouble	Open Circuit Troubles apply to opens on all wiring in the system, including circuits for phone cards, risers, master phones, and remote master phones. Short Circuit Troubles apply to shorts on all wiring in the system *except for* master phones and remote master phones.