# Installation Instructions

## 1.0 Introduction

The C900TTL-E is designed to link an alarm panel's digital dialer to a host computer connected to a LAN/WAN via an Ethernet port by connecting one side to the Public Switched Telephone Network (PSTN) and the digital dialer's telco interface, and the other side to the host computer's Ethernet port.

When the dialer has something to report, the C900TTL-E provides the signals and voltages necessary to simulate a connection to the central station through a PSTN. The C900TTL-E then decodes the transmitted digital dialer message and delivers the decoded signals to the host computer. When the host computer acknowledges receipt of the message, the C900TTL-E transmits an appropriate acknowledge message to the dialer. True end-to-end security is maintained in this manner.

The C900TTL-E has three modular jacks. One is labeled "TELCO", and is intended for connection to an RJ31X jack. The second is labeled "PANEL", and is intended for connection to a digital dialer via a telco cord. The third, marked "ETHERNET" is for connection to the network. In "Intercept Mode," the C900TTL-E connects the house phone directly to the telephone company, and connects the digital dialer to its internal telco simulation electronics. In "Fallback Mode," the C900TTL-E connects the house phone to the dialer, and the dialer to the telephone company, shunting itself out of the phone circuit. Intercept Mode is maintained only if the C900TTL-E CPU is functioning (Output 1 held low). "Fallback Mode" is thus ensured in the event of a CPU lockup.

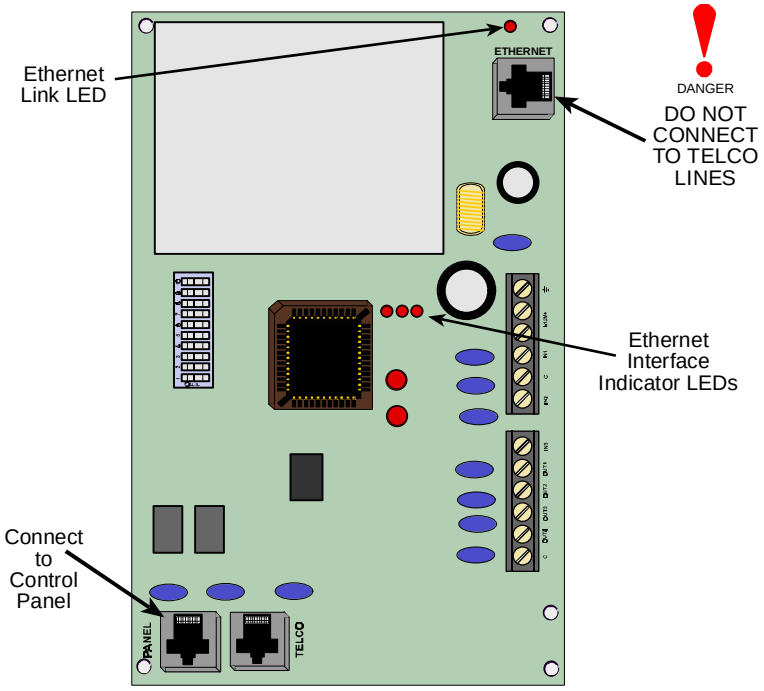


**Figure 1: Location of Major Items**

## 2.0 Installation

The C900TTL-E intercepts the phone line between the Telco service and the panel, thus rendering the panel's phone line monitor inactive. If phone line monitoring is required, an external phone line monitor, such as the Detection Systems Inc. DS7481, should be used.

Panels with internal phone line monitors may generate an error when attached to the C900TTL-E. Unless the internal phone line monitor can be disabled, do not use such a panel with the C900TTL-E.

### 2.1 Wiring

Connect the power and data wiring as shown below:

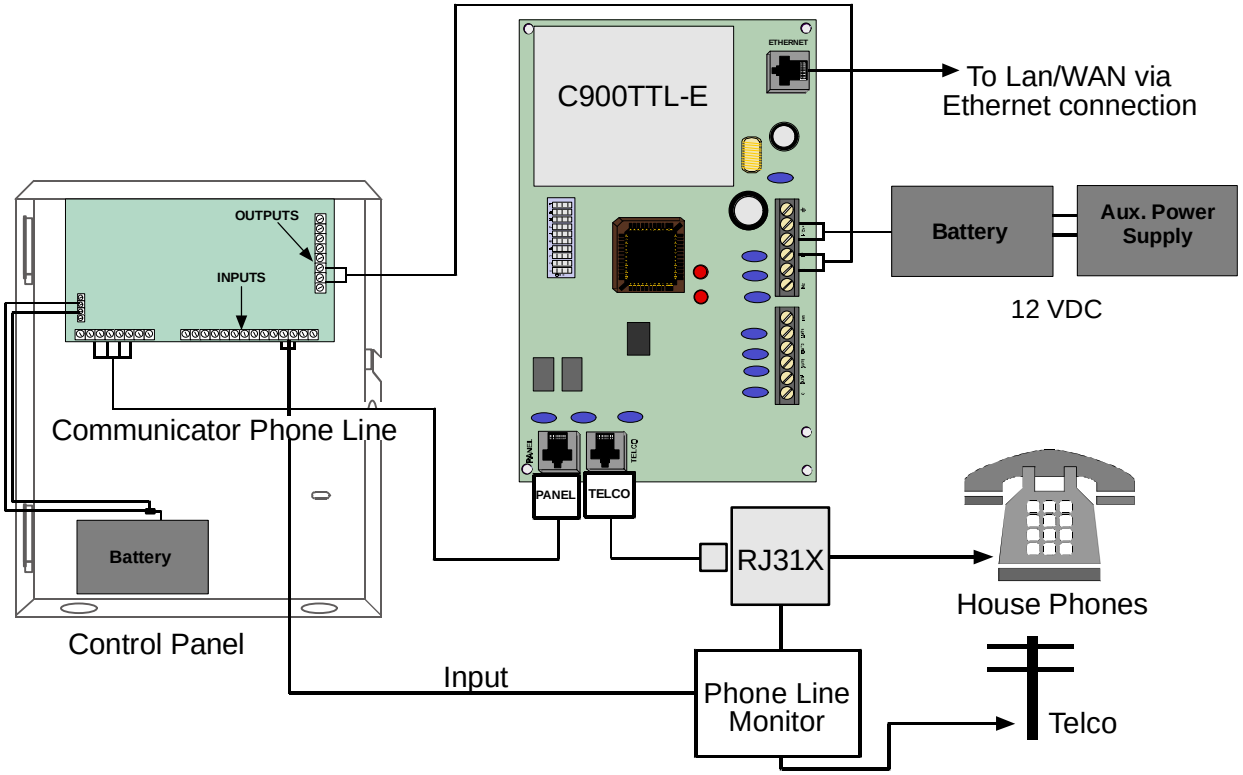


**Figure 2: Wiring the C900TTL-E**

**NOTE:** *The wiring distance between the C900TTL-E and the control panel should be less than 3 feet (0.9 m).*

## 2.2 Mounting

### 2.2.1 Standard Mounting


***The C900TTL-E is static sensitive. Make sure you touch earth ground before handling the circuit board. This will discharge any static electricity in your body.***

**EXAMPLE:** Run the ground wire to the enclosure before handling the circuit board. While holding the ground wire (or using a ground strap), install the circuit board.

1) Insert the two support posts into the circuit board retainer holes as shown in the Support Post Assembly diagram.
2) Slide the top of the circuit board into the two retainer tabs.
3) Once in the retainer tabs, the circuit board will rest on the two support posts.
4) Secure the bottom of the enclosure by screwing the bottom two holes through the support posts and through to the control retainer holes.


***Once the circuit board is installed, be sure to connect its ground wire to the top hinge of the enclosure.***

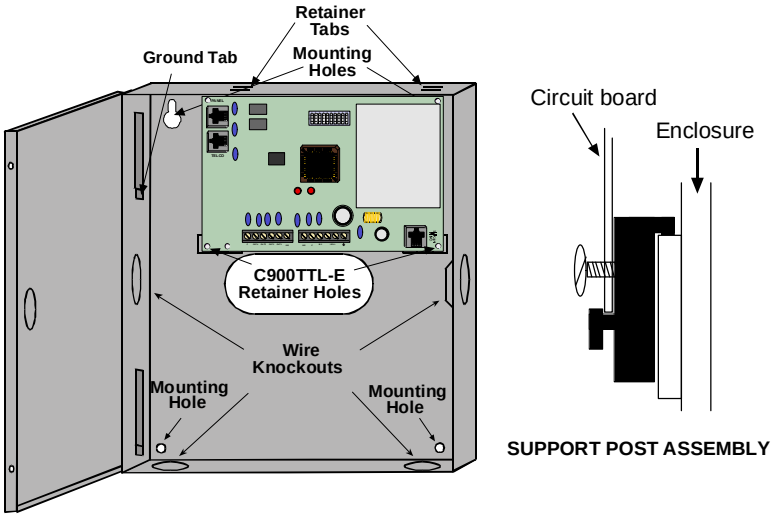


**Figure 3: C900TTL-E Standard Enclosure**

### 2.2.2 Optional Plate Mounting

An optional mounting plate is included with the C900TTL-E.

1) Attach the support posts to the mounting plate.
2) Attach the board to the the support posts. Slide the board into the notches of the upper support posts and screw the board to the lower posts.
3) Once the board is securely attached to the mounting plate, slide the tabs at the top of the plate over the top of the enclosure door.

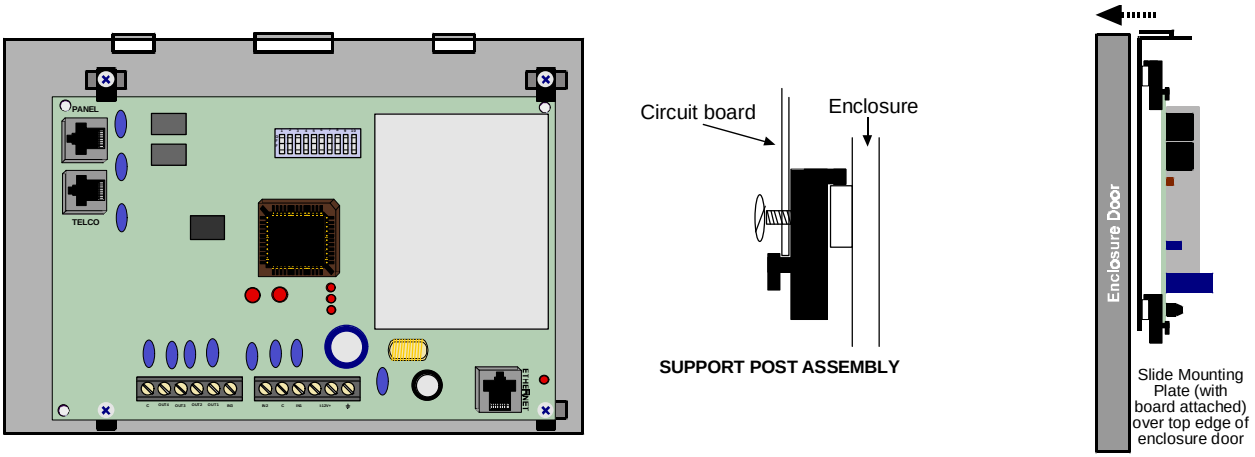


**Figure 4: Optional Plate Mount**

## 2.3 Input/Output Functions

### 2.3.1 Inputs

The C900TTL-E has 3 inputs monitored by A/D converters. They serve the following functions:

- **Input 1:** Used as an EOL supervised loop. If Input status reports are enabled by the host computer, then any voltage **above** 3.33 VDC is reported as an open condition to the host. Any voltage **below** 1.66 volts is reported as a short. Input 1 must be EOL terminated with a 10 K resistor.
- **Input 2:** Used for Intercept Inhibit. If input 2 goes **above** 1.66 volts, then the C900TTL-E is immediately forced into Fallback Mode for a minimum of 2 minutes. Input 2 must go low for **at least** 5 seconds to be considered low. Input 2 is intended for connection to a fire bell to force fire reports to be sent digitally. If input 2 is unused, it may be left disconnected.
- **Input 3:** Used for Intercept Override. If input 3 goes **above** 1.66 volts for 5 seconds, then the C900TTL-E enters into Fallback Mode. If input 3 goes low, then the C900TTL-E will return to Intercept Mode and initiate a session. If this is driven by ground start relay output, the C900 will stay in Fallback, except when the dialer wishes to dial. Input 3 cannot force an intercept if the C900 is in Fallback due to error, command, or input 2 high. If unused, this may be left disconnected.

### 2.3.2 Outputs

The C900TTL-E has 4 open-collector outputs:

- **Output 1:** Active (shorted to ground) as long as the CPU is functioning normally. If the CPU fails to operate or the CPU loses power, output 1 will be open.
- **Output 2:** Active as long as the host computer is working properly, and open when the host computer has failed.
- **Output 3:** Active whenever the C900TTL-E is in Intercept Mode.
- **Output 4:** Controlled by command from the host computer (default is open).

## 2.4 Power Terminal Strip

The following list describes the functions of the Power Terminal Strip:

- **12 V+:** Connect regulated 12 volt DC power to this terminal and the -12 V terminal. This power may be supplied by a separate power supply, battery, or Auxiliary power from the Control/ Communicator.
- **-12 V:** Return terminal for the 12 VDC power supply.

 is the earth ground connection.

# 3.0 Programming the DIP Switches

The C900TTL-E is programmed by a 10 position dip switch:

The following charts define dip switch settings and functions as well as expected digital dialer protocol for Dialer Format switches DF1 through DF4.

| Switch | OFF | ON |
|---|---|---|
| 1 | DF1 | |
| 2 | DF2 | |
| 3 | DF3 | |
| 4 | DF4 | |
| 5 | Disable auto fallback after intercept error[i] | Enable auto fallback after intercept error |
| 6 | No number of hang-ups will cause fallback | Third hang-up without host ACK causes error[ii] |
| 7 | Default 30 seconds idle poll[iii] | Default 240 second idle poll |
| 8 | Handshake after 1 second break in dialing[iv] | Handshake after 6 second break in dialing |
| 9 | Unused | Unused |
| 10 | 1200 baud RS-232 data rate | 9600 baud RS-232 data rate |

[i] Several errors can occur in the intercept process. Any error will force the C900TTL-E to switch the dialer to the Fallback position for 2 minutes when it next seizes the line (if enabled, and if the seize occurs within 2 minutes). Intercept errors are always reported to the host computer.

[ii] If the host computer does not acknowledge a report that was intercepted by the C900TTL-E in the proper amount of time, the digital dialer will hang up and retry the message transmission. The proper amount of time is measured in terms of a failed message transmission at the digital dialer. Based on the number of hang-ups, the C900TTL-E will switch to Fallback Mode.

[iii] The time in seconds that will elapse between Forward polls when the C900TTL-E is idle (for example, not expecting a dialer acknowledge). Default is 30 seconds.

[iv] Depending on programming, the C900TTL-E will generate the appropriate handshake either 1 second or 6 seconds after the digital dialer has finished dialing.

**Table 1: C900TTL-E Dip Switch Functions**

| DF1 | DF2 | DF3 | DF4 | Format |
|---|---|---|---|---|
| OFF | OFF | OFF | OFF | Radionics Modem Iie and Modem IIIa²™ |
| OFF | OFF | OFF | ON | Radionics Modem Iie |
| OFF | OFF | ON | OFF | Any Ademco DTMF |
| OFF | OFF | ON | ON | Any Ademco DTMF; dialer retransmits quickly |
| OFF | ON | OFF | OFF | Radionics BFSK, 2300 Hz ACK |
| OFF | ON | OFF | ON | Radionics BFSK, 14 Hz ACK |
| OFF | ON | ON | OFF | Reserved |
| OFF | ON | ON | ON | Reserved |
| ON | OFF | OFF | OFF | Any pulse, 2300 Hz ACK |
| ON | OFF | OFF | ON | Any pulse, 1400 Hz ACK |
| ON | OFF | ON | OFF | Any pulse, long 2300 Hz ACK |
| ON | OFF | ON | ON | Any pulse, long 1400 Hz ACK |
| ON | ON | OFF | OFF | Unused |
| ON | ON | OFF | ON | Unused |
| ON | ON | ON | OFF | Unused |
| ON | ON | ON | ON | Unused |

**Table 2: Digital Dialer Protocol for Switches DF1-DF4**

# 4.0 Troubleshooting

## 4.1 LED Description

The C900TTL-E has two dual-colored LEDs that indicate its status: the DIALER LED and the SYSTEM LED. There are also three red LEDs which indicate communications to the network.

### 4.1.1 Dialer LED

The Dialer LED indicates the status of the digital dialer interface (Hertz = cycles/flashes per second).

| Dialer LED Color | Function |
|---|---|
| Off | C900 is in permanent Fallback Mode due to command or no power. |
| Green | C900 is in Intercept Mode and the dialer is on-hook. |
| Blinking Green (5 Hertz) | C900 is in Intercept Mode and the dialer is off-hook. |
| Red | C900 is in Fallback Mode due to error, Intercept Inhibit or Override inputs, or command. |
| Blinking Red (5 Hertz) | The previous (or current) off-hook caused an intercept error.[i] |
| Alternating Red/Green (5 Hertz) | The dialer is off-hook, but the last message was rejected due to a bad checksum or other logical error.[ii] |

[i] If Auto Fallback After Error is enabled (Switch 5 = ON), the C900TTL-E will connect the dialer to the phone line on the next line seizure. If the dialer does not seize the line, this condition terminates after 2 minutes.

[ii] If the dialer subsequently sends a valid message, the LED will return to a blinking green status. If the dialer hangs up, an intercept error will be generated. The alternating LED also occurs when the line is currently seized, but no transaction is taking place (for example, the C900TTL-E is waiting for the dialer to return on-hook). This happens when the C900TTL-E returns to Intercept Mode, or while the dialer has seized the line.

**Table 3: Dialer LED Functions**

 

### 4.1.2 System LED

The System LED indicates the status of the host computer and the C900TTL-E itself.


***The DIALER LED is invalid, and the C900TTL-E will be in Fallback Mode and will not poll the host in the latter two cases*** *(Blinking red [repeating code]* ***or*** *Steady green, red or off).*

| System LED Color | Function |
|---|---|
| Blinking Green (5 Hertz) | The host computer is responding normally. |
| Blinking Red (5 Hertz) | The host computer is not responding. |
| Blinking Red (Repeating Code)<br><br>1 blink<br>2 blinks | A self-test has occurred. The code is a series of rapid blinks that repeat every second:<br><br>ROM checksum error<br>RAM test error |
| Steady Green, Red or Off | C900 has failed or has no power. |
| No LED | Power was lost. |

**Table 4: System LED Functions**

### 4.1.3 Status LEDs

The C900TTL-E has three Ethernet status LEDs. These LEDs will flash until the C900 connects to the Ethernet. Once the C900 is connected the LEDs will remain steady. If the LEDs continue to flash, the C900 is having trouble connecting to the Ethernet. The Ethernet Link LED should be on steady when a connection is established with the Ethernet.

## 4.2 Fallback Mode

In fallback operation, the C900TTL-E connects the house phone to the dialer and the dialer to the telco, shunting itself out of the phone circuit. Intercept mode is maintained only if the C900TTL-E processor is running, and there are no errors. Thus, “Fallback Mode” is ensured in the event of a CPU lockup.

## 4.3 Dialer Interaction

The following table shows the conditions under which the C900TTL-E will go into “Fallback Mode.” The C900TTL-E will return to intercept only when all **“Until”** conditions are met.

| What | When | Until |
|---|---|---|
| CPU fail | Immediately | C900 restart |
| Host link fail | Immediately | Link is restored |
| Host link failing (no response to last message) | Dialer goes off-hook | Link is restored |
| Intercept Disable Command | Immediately | Intercept Enable command |
| Intercept Error | Fallback after intercept error enabled, dialer goes off-hook within 2 minutes of the error occurrence | 2 minutes |
| Switch to Fallback command | Upon receipt; will not actually fallback until dialer is on-hook | One hour or Intercept Enable command |
| Input 2 (Intercept Inhibit) | High for 200 mS | Low for 5 seconds, after minimum fallback of 2 minutes |
| Input 3 (Intercept Override) | High for 5 seconds; will not actually fallback until dialer is on-hook | Low for 200 mS |

**Table 5: Dialer Interaction Conditions Forcing C900TTL-E into Fallback Mode**

## 5.0 Specifications

| C900TTL-E Specifications | |
|---|---|
| Voltage Range | 9.6 - 15.0 VDC |
| Current | 250 mA nominal |
| Dimensions | 7 in. x 4.5 in. (17.8 cm x 11.4 cm) |
| Operating Temperature | +32° to +120°F (0° to +49°C) |
| Connectors | Control Panel: RJ-45 Modular jack<br>Telco: RJ-45 Modular jack<br>LAN/WAN: RJ-45 Modular jack |
| Protocols | Input (from panel): see Table 2 Digital Dialer Protocol for SwitchesDF1-DF4<br>Output (to LAN/WAN): TCP/IP packets |
| Ringer Equivalency Number | 3B* |

* The C900TTL-E itself does not have a REN, but the panel and the phone should add up to at least 3.