



# **BT-X Operation and Maintenance Manual**





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## Document Information

### Identification

BT-X Operation and Maintenance Manual  
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## Document Summary

This document describes the procedures for operating and maintaining the BT-X building transceiver. The manual discusses communication with Central (primary and secondary), standard maintenance and replacement of system equipment, and the product specifications. Detailed information and instructions for installing application-specific equipment for fire detection, intrusion detection, access control, and mass notification are provided in separate application-specific documents.

### For Use With

This document is for use with the following BT-X models using program chip (P/N 326-304-00), revision B.99C or higher:

| Part Number | Description   |
|-------------|---|
| 227-600-xx* | BT-XF in a 20" H x 12" W x 4" D red enclosure, with a narrowband radio and without an audio board for radio communication with Central. Specify frequency.  |
| 227-601-xx* | BT-XF in a 20" H x 16" W x 6" D NEMA 3R red enclosure with a narrowband radio and without an audio board for radio communication with Central. Specify frequency.   |
| 227-603-xx* | BT-XF in a 20" H x 25" W x 4" D double-wide enclosure with a narrowband radio and without an Audio Board for radio communication with Central. Specify frequency.   |
| 227-605-00  | BT-XF in a 20" H x 12" W x 4" D red enclosure without a narrowband radio and with an audio board installed for hardwire line communication with Central.  |
| 227-606-00  | BT-XF in a 20" H x 25" W x 4" D red enclosure without a narrowband radio and with an audio board for hard-wire line communication with Central.   |
| 227-607-00  | BT-XHF in a 20" H x 16" W x 6" D red NEMA 3R enclosure without a narrowband radio and with an audio board installed for hard-wire line communication with Central.  |
| 227-610-xx* | BT-XS, 8 on-board relay driver outputs, zones are expandable from 0 to 24 with the addition of zone cards, narrowband radio, in a 20" H x 12" W x 4" D blue enclosure; an optional audio board can be installed. Specify frequency. |



| Part Number  | Description  |
|--|--|
| 227-613-xx*  | BT-XS, 8 on-board relay driver outputs, zones are expandable from 0 to 56 with addition of zone cards, narrowband radio, in a 20" H x 25" W x 4" D blue enclosure; an optional audio board can be installed. Specify frequency.  |
| 227-615-00   | BT-XSHS, 8 on-board relay driver outputs, zones are expandable from 0 to 24 with the addition of zone cards, in a 20" H x 12" W x 4" D blue enclosure. An audio board is installed for hard-wire line communication with Central; a narrowband radio is optional.                          |
| 227-616-00   | BT-XSHS, 8 on-board relay driver outputs, zones are expandable from 0 to 56 with the addition of zone cards, hard-wire communication, in a 20" H x 25" W x 4" D blue enclosure. An audio board is installed for hard-wire line communication with Central; a narrowband radio is optional. |
| 227-621-xx*  | BT-XM: MNS in a 20" H x 25" W x 4" D red enclosure with a narrowband radio and an audio board for radio and hard-wire communication with Central. Specify frequency.   |
| 227-622-xx*  | BT-XM: MNS in a 20" H x 16" W x 6" D NEMA 3R red enclosure with a narrowband radio and an audio board for radio communication with Central. Specify frequency.   |
| 227-623-xx   | BT-XM mass notification transceiver with narrowband radio and capacity for hard-wire communication in a 20" H x 12" W x 4" D red enclosure; specify frequency. Audio board is standard.  |
| * The last two digits of this part number are frequency dependent. |  |

## Associated Documents

The following table lists the application-specific BT-X manuals, as well as manuals for the installation of optional BT-X equipment, necessary to install and operate the BT-X. If one of these manuals didn't ship with your equipment, please contact Monaco Customer Service.

| Part Number | Description  |
|-------------|--|
| 001-398-01  | "BT-X Intrusion Detection Installation Manual" describes security zone cards, possible zone behavior defined by zone types, intrusion detection application examples using zone types and intrusion detection arming/disarming devices, and how to operate the BT-X for intrusion detection. |
| 001-398-02  | "BT-X Access Control I-O-M Manual" describes how to install an AIM-4SL Reader Interface module in a BT-X enclosure, how to program the BT-X for access control, and how to wire to the AIM-4SL.  |
| 001-398-03  | "BT-X Within-Building Mass Notification I-O-M Manual" describes how to wire to Monaco Mass Notification Panels, program the BT-X for mass notification, and operate the mass notification system locally.  |
| 001-398-04  | "BT-X Fire I-O-M Manual" describes fire zone cards, fire zone and LED behavior, zone card installation, fire zone programming, testing, and operation.   |
| 001-398-05  | "BT-X Intrusion Detection Programming Guide" describes the programming of the BT-X and security zone cards for intrusion detection.  |
| 001-398-06  | "BT-X Wide-Area Mass Notification I-O-M Manual" describes how to install and operate the BT-X high-powered speaker stations for wide-area mass notification.   |
| 001-398-09  | "BT-X Communicator Plus I-O-M Supplement" describes updates made to the BT-X transceiver through the addition of the Communicator Plus RF Module.  |



| Part Number | Description  |
|-------------|--|
| 001-406-00  | “BT-X Relay Board I-O-M Manual” describes how to install, operate, and maintain the BT-X Relay Board (P/N 176-214-00).   |
| 001-407-00  | “BT-X Tamper Kit Installation Instructions” describes how to install the BT-X tamper switch (P/N 513-412-00). The tamper switch is installed at the factory on blue enclosures.                |
| 001-416-00  | “BT-X Audio Board I-O-M Manual” describes BT-X audio board installation, operation, and maintenance.   |
| 001-426-00  | “BT-X Record Configuration” and Installation Information provides a worksheet for recording the configuration details for the BT-X. Complete this document and leave it in the BT-X enclosure. |
| 001-428-00  | “BT-X iButton Keypad Station I-O-M Manual” describes how to install, configure, operate, and maintain a BT-X iButton Keypad.   |
| 001-434-00  | “BT-X Keypad I-O-M Manual” describes how to install, configure, operate, and maintain a BT-X Keypad.   |

## Warnings and Cautions

Your Monaco equipment may be damaged and the warranty voided by:

- Connecting or disconnecting assemblies or components (including cables and zone cards) while power is applied to them
- Incorrect wire connections
- Reversed battery polarity
- Excess battery voltage
- Applying voltage to zone input terminals
- Inadequate antistatic precautions
- Applying power before the antenna is connected

*See the precautions table on the next page.*



Observe the following precautions during all phases of installing the equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment.

| Type of Precaution    | Precaution   |
|-----------------------|--|
| <b>General Safety</b> | <b>Qualification</b> All equipment installation and electrical connections should only be made by individuals properly qualified to do so.   |
|                       | <b>Proper Ground</b> Connect equipment to an electrical ground to minimize shock hazard. Consult NFPA 70 (NEC) and local codes for grounding requirements.   |
|                       | <b>Explosive Atmosphere</b> Do not operate the equipment in the presence of flammable gases, fumes, or dust.   |
|                       | <b>Live Circuits</b> Operation personnel must not remove equipment covers or panels. Component replacement and internal adjustments must be made only by qualified maintenance personnel. Do not replace components with power applied. To avoid injuries, always disconnect power (AC and battery) and allow circuits to discharge before performing repairs. |
|                       | <b>Lightning Storms</b> Do not service or repair equipment during a lightning storm.   |
|                       | <b>Service or Adjustments</b> Have an assistant present when servicing or adjusting internal parts.  |
| <b>Equipment</b>      | <b>Removing Assemblies or Components</b> Remove individual assemblies or components only after removing power (AC and battery).  |
|                       | <b>Connection Terminations</b> To protect the field assembly from possible voltage spikes, terminate all connections to the relay driver outputs with a surge suppression diode across the relay coil.   |
|                       | <b>Specifications</b> The equipment is designed to operate within specified design parameters such as input voltage and environmental conditions. Do not exceed specifications.  |
|                       | <b>Substituting Parts or Making Modifications</b> Do not install substitute parts or perform modifications to the equipment without written permission from Monaco.  |



**WARNING** Observe these antistatic precautions when handling electronic parts:

- Avoid unnecessary touching or handling of the parts.
- Use an antistatic foam mat or bag to transport parts.
- Discharge static by touching a grounded surface before handling the parts or use an antistatic wrist strap.
- Do not slide the parts on any surface.



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## Contents

|  |    |
|--|----|
| Product Summary . . . . .                                      | 1  |
| Operating the BT-X . . . . .                                   | 1  |
| Communicating with Central . . . . .                           | 2  |
| Testing the BT-X in Monitor Mode . . . . .                     | 3  |
| Unit Status . . . . .  | 4  |
| BT-X Communicator Plus—Zone 16 Transfer Trigger . . . . .      | 5  |
| Zone Status . . . . .  | 5  |
| Primary, Secondary Communication Modes (D-21 Only) . . . . .   | 6  |
| Maintaining the BT-X . . . . .                                 | 6  |
| Test Equipment . . . . .                                       | 6  |
| Preventive Maintenance Procedures . . . . .                    | 7  |
| Testing Battery Condition . . . . .                            | 7  |
| Checking the Voltage from the Power Supply . . . . .           | 8  |
| Checking the Voltage from the Charger to the Battery . . . . . | 8  |
| Measuring Forward and Reflected Antenna Power . . . . .        | 9  |
| Calculating Voltage Standing Wave Ratio . . . . .              | 9  |
| Maintenance Procedures . . . . .                               | 10 |
| Replacing the Battery . . . . .                                | 10 |
| Replacing the BT-X Fuse . . . . .                              | 10 |
| <b>Appendix A . . . . .</b>                                    |    |
| Error Handling . . . . .                                       | 2  |
| Hardware Specifications . . . . .                              | 4  |
| Power Draw for Battery Calculations . . . . .                  | 5  |
| Spare Parts . . . . .  | 5  |



## Notes





## Product Summary

The BT-X provides a communication interface between devices connected to it and the D-21 Central Receiving System (Central). The BT-X communicates with the D-21 via a narrowband FM radio and/or hard-wire connection. When both radio and hard-wire are used, the secondary communication interface (hard-wire) takes over when the primary interface (radio) fails.

The BT-X includes four on-board fire zone inputs. The BT-X also includes eight on-board relay driver outputs that can be connected to the optional BT-X relay board to control prerecorded mass notification messages. When using the relay board (see the “BT-X Relay Board I-O-M Manual,” P/N 001-406-00, for more information), the relays can be controlled by the D-21. Some BT-X versions can support Mass Notification System (MNS) applications.

The BT-X can communicate with Central via FSK radio, FSK hard-wire, digital RS-422 multidrop, digital RS-485 multidrop, or digital RS-422 point-to-point. Primary, secondary, and primary with fallback to secondary communications modes are available if an audio board is installed. A BT-X with Communicator Plus firmware can be used with the D-21 and with an RFM 7000 modem with firmware at Revision F or later.

The BT-X receives commands from Central and reports self status and zone input status information to Central using zone numbers. At its maximum expansion capacity with expansion backplanes and zone cards in a double-wide enclosure, the BT-X supports 60 fire zones connectable to the zones of a fire alarm control panel (FACP) or up to 56 security zones connectable to sensors.

The BT-X primary power is 115 or 230 VDC (50/60 Hz). Backup power is provided by one battery in a single-wide enclosure or two batteries in a double-wide enclosure (typically).

The BT-X is available in either a single-wide or double-wide enclosure. Both support expansion options; the double-wide enclosure accommodates more expansion options because of its size. A BT-X Tamper Kit (P/N 513-412-00) can be installed to provide notification to Central when the enclosure door is opened. An enclosure tamper switch is installed in all blue (security) enclosures, and a tamper switch kit can be purchased separately, if needed, for red (fire) enclosures. Blue enclosures are keyed alike; red enclosures are keyed alike.

## Operating the BT-X

Once installed, the BT-X operates without user intervention unless it reports a condition requiring correction at the BT-X unit, such as a low battery requiring replacement, communications problems, or wiring problems.

When an abnormal condition occurs, the BT-X will log the condition. When Central polls the transceiver continuously the BT-X reports any status changes since the last poll. When Central polls the BT-X at a specific time, the BT-X reports its complete status, not just status changes.

The status of the BT-X and expansion options installed in the enclosure are indicated visually by on-board LEDs. Refer to the BT-X status LEDs table in the “BT-X Installation Manual” (P/N 001-398-00) for detailed information on the BT-X LEDs and what they mean. LED descriptions are also provided on the BT-X enclosure label.



## Communicating with Central

The BT-X communicates with Central—through the RFM in either single- or dual-channel modes (see “Primary-Only or Secondary-Only Communications” in the “BT-X Installation Manual,” P/N 001-398-00)—using one or more of the following interfaces:

- Frequency shift key (FSK) radio
- FSK hard-wire prerecord
- Digital RS-422 multidrop
- Digital RS-485 multidrop
- Digital RS-422 point-to-point
- Digital RS-232 point-to-point

The BT-X monitors itself and circuits connected to its zone inputs for the following conditions and communicates its status to the Central when the RFM polls the BT-X:

| Text Displayed     | What This Means  |
|--------------------|--|
| ALARM              | The zone associated with the displayed unit number is in alarm.  |
| TROUBLE            | <b>Fire only</b> The fire zone associated with the displayed zone number is in Trouble.  |
| BATTERY FAULT      | One of the following: <ul style="list-style-type: none"><li>■ The battery is disconnected.</li><li>■ The BT-X has been operating on battery power continuously for 4 hours.</li><li>■ Charger rail voltage is below 13.5 VDC.</li><li>■ Battery voltage has dropped below 11.5 VDC (BT-X shuts down when battery power supply drops below 9.75 VDC).</li></ul>   |
| END BATTERY FAULT  | The condition causing the fault has been corrected.  |
| AC-FAIL            | AC power is unavailable to the BT-X.   |
| END AC-FAIL        | AC power is available to the BT-X.   |
| TAMPER             | A tamper switch is installed on the enclosure, the BT-X is programmed to send tamper messages, and the enclosure door has been opened. If the door has not been opened and the tamper condition persists then the BT-X can have failed a diagnostic self-test.   |
| END TAMPER         | The enclosure tamper switch is no longer activated.  |
| INVALID CONFIG     | There could be several reasons for this error, such as the zone-card configuration of the BT-X does not match the configuration in the Central database. The problem could have occurred because the BT-X database has been erased, or the Central database has changed and that information has not yet been downloaded to the BT-X. Downloading the configuration from Central should solve the problem. |
| END INVALID CONFIG | The condition causing the message has been corrected and the configuration of the BT-X again matches the configuration at Central.   |



| Text Displayed | What This Means  |
|----------------|--|
| NO REPLY       | <p>The BT-X did not reply to a mark poll, an extended poll, an acknowledge/status query, or a zone status download. The NO REPLY message is displayed and logged at Central along with the type of command to which the BT-X did not respond.</p> <p>A NO REPLY can indicate any of the following conditions:</p> <ul style="list-style-type: none"> <li>■ The BT-X did not receive the Central message (primary/secondary communication is bad).</li> <li>■ BT-X transceiver operation is faulty.</li> <li>■ BT-X experienced self-test failure.</li> <li>■ The BT-X is being programmed.</li> <li>■ More than one BT-X in the system has the same address.</li> <li>■ BT-X has shut down due to low battery disconnect.</li> </ul> |
| FALLBACK       | <p>Primary communication method has failed or a manual switchover to secondary communication has been initiated, but the secondary communication method is active. The message text depends on the zone description used when configuring zone 13 on the BT-X Communicator and IDS master unit in the Central database.</p>  |

## Testing the BT-X in Monitor Mode

Monitor mode is a radio traffic report. It can be accessed in the terminal mode, the “quiet” screen prior to the BT-X Programming User Menu.

### ≡ To test in monitor mode

- 1 The monitor mode report is turned on by typing “monitor” (lower case) at the terminal mode screen. Typing “monitor” will keep the report active for five minutes.
- 2 No characters will be visible on the screen as you are typing “monitor.”
- 3 After monitor mode is activated (**MON: ON** will appear on the screen), every two to three seconds a new “receive” message should appear on the screen. The receive message will look something like the following: **MON:RCV< 8a 00 00 8a**. This message represents the BT-X receiving a message from Central.

▼ **Note** *When monitor mode is activated, the BT-X will display a receiver test “Error Count” if the RID is configured to run a BT-X transceiver test in the admin menu. If this test is activated, the BT-X will receive transceiver test messages and increment an error counter if test messages are missed. The “Error Count” test is only available in Communicator Plus versions of the BT-X.*

- 4 If the following message appears: **MON: None for 10 seconds** the BT-X is not communicating with Central, or the BT-X has marginal communication with the Central.
- 5 Monitor mode is unavailable when entering any of the following:
  - User menus
  - Planner transfer
  - Engineering menus



- 6 Typing “monitor” at any time after the monitor mode has been turned on will deactivate the report. When the report is turned off, the following message will appear on the screen:  
**MON: OFF.**

### Unit Status

The BT-X reports conditions that apply to the operation of the entire BT-X unit to Central using the BT-X Communicator address. If a security zone card is installed, you can also choose to report unit status using the IDS master unit address. See “Defining Unit Status Reporting Destination” in the “BT-X Installation Manual” (P/N 001-398-00) for programming instructions. Other unit status conditions, such as dual communication channel status changes, zone card failures, keypad failures, and differences between the BT-X and Central configurations, are reported on reserved zone positions 13 through 16 on respective units.

| Zone # | BT-X Communicator   | IDS Master                               | Fire/Security Application Units |
|--------|---|--|---------------------------------|
| N/A    | One or both unit addresses (provided the unit is configured for intrusion detection and has an IDS master) can be used to report the following status conditions for unit: <ul style="list-style-type: none"><li>■ Enclosure tamper</li><li>■ AC fail conditions</li><li>■ Battery faults</li></ul> |  | Always report normal            |
| 1-16   | Zone position numbers used for reporting zone status varies by unit type. See “Zone Status” on page 5.  |  |                                 |
| 13     | Fallback from primary to secondary communication method. Destination selection can be either the Communicator, IDS master (for security implementations), or both (not recommended).  |  |                                 |
| 14     | Fire card communication failure   | Security zone card communication failure |                                 |
| 15     | Not used  | Keypad communication failure             |                                 |
| 16     | Bad database. If the BT-X application database is downloaded from Central, and the configuration or the download doesn’t match what was expected, the BT-X reports this condition.  |  |                                 |

Specify the destination of AC power, battery, and enclosure tamper conditions during programming: the BT-X Communicator or the IDS master unit (if applicable), or both. Zone positions 13 through 16 always report status on respective units. See “Defining Unit Status Reporting Destination” in the “BT-X Installation Manual” (P/N 001-398-00).

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▼ **Important!** *The BT-X Communicator, IDS master unit, and zones 13 through 16 on both units must be added to the Central database for these status conditions to be displayed at the Central workstation.*

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## BT-X Communicator Plus—Zone 16 Transfer Trigger

The BT-X Communicator Plus transceiver uses Zone 16 as a plus packet transfer trigger.

Standard BT-X transceivers are capable of sending only alarm and normal status messages on Zone 16, whereas BT-X Communicator Plus transceivers will always have a trouble status on Zone 16. “Transfer trigger” means the Central has received a trouble status on Zone 16 from a BT-X. Since only a BT-X Communicator Plus will report a trouble status on Zone 16, the Central is “triggered” to interact with the unit as a Communicator Plus as opposed to a standard BT-X.

Because Zone 16 is being used as a transfer trigger, it will no longer send an alarm on Zone 16 when a bad or corrupted database is detected.

### Zone Status

The BT-X Communicator reports the logical condition of the four on-board fire zones. These zones can also be used to supervise mass notification auxiliary zone inputs, such as a common trouble from an MNS autonomous unit. The IDS master unit (created by the BT-X when security zone cards are installed) reports the status of twelve “virtual” master zones. See the BT-X Intrusion Detection Installation Manual (P/N 001-398-01) for more information. Fire and security application units report the logical status of up to 16 zone inputs each.

| Zone # | BT-X Communicator                                       | IDS Master     | Fire/Security Application Units                  |
|--------|---|----------------|--|
| 1      | On-board zones: these can only be used for fire and MNS | Master zone 1  | <b>Zone card 1</b> Logical status of zone inputs |
| 2      |   | Master zone 2  |  |
| 3      |   | Master zone 3  |  |
| 4      |   | Master zone 4  |  |
| 5      | Not used  | Master zone 5  | <b>Zone card 2</b> Logical status of zone inputs |
| 6      |   | Master zone 6  |  |
| 7      |   | Master zone 7  |  |
| 8      |   | Master zone 8  |  |
| 9      |   | Master zone 9  | <b>Zone card 3</b> Logical status of zone inputs |
| 10     |   | Master zone 10 |  |
| 11     |   | Master zone 11 |  |
| 12     |   | Master zone 12 |  |
| 13     | Zones 13-16 reserved for unit status conditions.        |                | <b>Zone card 4</b> Logical status of zone inputs |
| 14     |   |                |  |
| 15     |   |                |  |
| 16     |   |                |  |



## Primary, Secondary Communication Modes (D-21 Only)

The BT-X can communicate with Central via one or two communication channels, depending on the communication equipment installed in the BT-X and the configuration of the RFM handling communication between the BT-X and Central. If the RFM has only a single communication channel, the BT-X is configured for primary-only communication. If the RFM has dual-channel communication (an RFM-XHR), it has a primary and secondary channel, in which case a BT-X can be configured to communicate with Central on either the primary channel, the secondary channel, or both (primary with fallback to secondary).

When the BT-X is configured for primary with fallback to secondary communication, if the BT-X fails to hear Central communication via the primary communication mode for 200 seconds, or if Central requests a switch to secondary communication, the BT-X falls back to the secondary mode and sends a communication failure message to Central on zone position 13 of the BT-X Communicator unit and/or zone position 13 of the IDS master unit, if security zone cards are installed. See “Defining Unit Status Reporting Destination” in the “BT-X Installation Manual” (P/N 001-398-00) for notification configuration. Zone 13 must be configured on the BT-X Communicator unit, and it must exist on the units selected at the BT-X and the IDS master unit in the Central database for Central to display the messages. Otherwise, a configuration error will occur.

Commands are provided at Central to manually switch communication modes, to disable the primary or secondary mode, to restore primary communication, and to test the dual communication mode.

Use the LEDs on the BT-X field assembly and on the audio board, if installed, to identify the current communication status. See the tables for “Field Assembly LEDs” and “Audio Board LEDs” in the “BT-X Installation Manual” (P/N 001-398-00).

## Maintaining the BT-X

### Test Equipment

The following test equipment is required to perform BT-X tests:

- RF wattmeter (P/N 290-050-01)
- Multimeter (P/N 290-701-01)
- Programmable scanner (P/N 196-100-00) to detect possible interference on the system frequency

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**▼ Important!** *Inform Central before performing any tests that cause a transmission.*

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## Preventive Maintenance Procedures

| Frequency  | Tasks  |
|------------|--|
| Daily      | <ul style="list-style-type: none"> <li>■ Check the Central Printer log for transceivers listed as No Reply. Immediately investigate a BT-X that does not reply to a poll or command, since it cannot report alarms.</li> <li>■ Check the Central Extended Poll report for off-normal conditions. If the BT-X has been operating on battery power for some time, the battery is being depleted and will eventually become discharged to the point where the BT-X can no longer operate. If there has not been an AC power failure, a battery fault could indicate high or low charging voltage, an open fuse, or that the battery has been removed.</li> <li>■ Check battery fault reports at Central. If the BT-X has been in an AC power failure condition, the battery must be replaced or AC power restored so the BT-X can continue operating. If the BT-X has not reported an AC power failure, the battery charger output can be too high or the battery can be disconnected.</li> </ul> |
| Monthly    | <ul style="list-style-type: none"> <li>■ Inspect the BT-X and antenna/lightning arrestor/coaxial assemblies for battery leakage, corrosion, vandalism, electrical storm damage, water damage, loose connections, frayed wires, or burned or discolored components.</li> <li>■ Test the BT-X by pressing the test switch. All LEDs except the RCV LED light and a test transmission is generated (this will not result in a message at Central because the transmission is not a valid system message).</li> <li>■ Disconnect AC input power at the circuit breaker. Measure battery voltage under load. If the battery is below 12V, use a battery analyzer to test and replace if necessary.</li> <li>■ Secure any loose wiring or cable connections.</li> </ul>  |
| Semiannual | <ul style="list-style-type: none"> <li>■ Measure and record AC line voltage. VAC should range between 115 and 230 volts.</li> <li>■ Measure and record battery charging voltage. See <a href="#">“To test the battery” on page 7</a>.</li> <li>■ Measure transmitter power. See <a href="#">“To measure forward and reflected power” on page 9</a>.</li> <li>■ Calculate the voltage standing wave ratio. See <a href="#">“To calculate VSWR” on page 10</a>.</li> <li>■ Perform the daily and monthly tests.</li> </ul>   |
| Annual     | <ul style="list-style-type: none"> <li>■ Inspect the antenna system for damage or corrosion.</li> <li>■ Measure and record the power supply/charger voltages. See <a href="#">“Checking the Voltage from the Power Supply” on page 8</a>.</li> <li>■ Perform the daily, monthly, and semiannual tests.</li> <li>■ Initiate AC fail, battery fault, and tamper transmissions and ensure they are received at Central.</li> <li>■ Initiate an open or short circuit on all active input zones and ensure they are received at Central.</li> </ul>  |

## Testing Battery Condition

Inspect and test the battery periodically with a dynamic battery analyzer (P/N 297-300-00) to ensure reliability.

### ≡ To test the battery

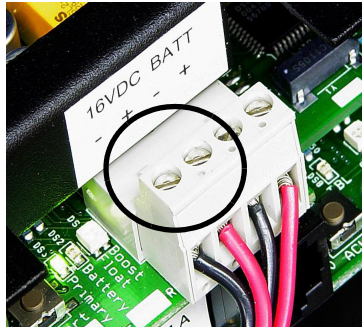
- 1 Remove AC power from the BT-X by tripping the dedicated circuit breaker.
- 2 After operating on battery for a few minutes, interrogate the BT-X from Central.
- 3 Measure battery voltage with a dynamic battery analyzer. Replace the battery if the analyzer indicates the battery is bad or if physical damage or deterioration is observed. See [“Replacing the Battery” on page 10](#).



## Checking the Voltage from the Power Supply

### ≡ To check the voltage from the power supply to the charger

- 1 Disconnect the battery leads at the battery.
- 2 Place the leads of a multimeter on the power terminal block screws labeled 16 VDC. See “Field Assembly Connections” in the “BT-X Installation Manual” (P/N 001-398-00).



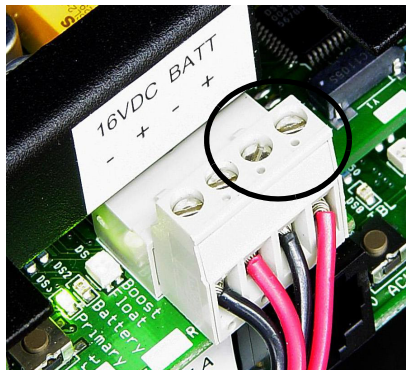
Test voltage from the power supply to the BT-X by placing multimeter leads on these screwheads after removing the battery leads.

- 3 Read the voltage being supplied to the charger.
  - Normal range is 15.5 to 16.5 VDC
  - If the reading is outside this range, contact Monaco
- 4 Reconnect the battery leads.

## Checking the Voltage from the Charger to the Battery

### ≡ To check the voltage from the charger to the battery

- 1 Apply AC and DCVDC power to the BT-X.
- 2 Ensure the battery is fully charged.
- 3 Test the condition of the battery. See “To test the battery” on page 7.
- 4 Place the leads of a multimeter on the terminal block screws labeled BATT. This is part of the power terminal block. See “Field Assembly Connections” in the BT-X Installation Manual (P/N 001-398-00).



Test voltage from the charger to the battery by placing the multimeter leads on these screw heads.

- 5 Read the voltage supplied to the battery.
  - Normal range is 13.7 to 13.9 VDC when the float LED is lightd.
  - If the reading is outside this range, contact Monaco.

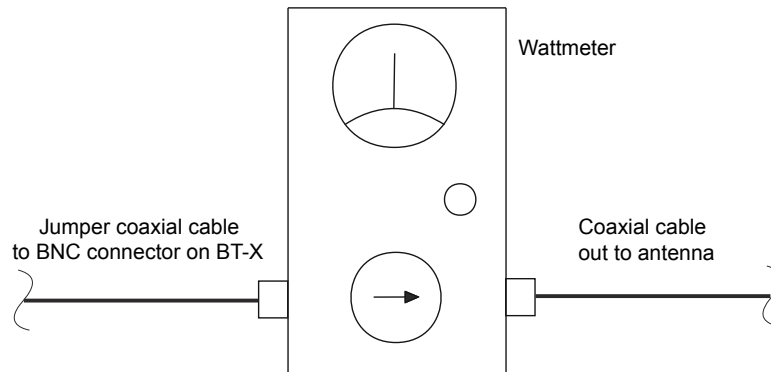




## Measuring Forward and Reflected Antenna Power

### ≡ To measure forward and reflected power

- 1 Disconnect all power from the BT-X by unplugging the power terminal on the BT-X field assembly. See “Field Assembly Connections” in the “BT-X Installation Manual” (P/N 001-398-00) for the location of the power terminals.
- 2 Install the RF wattmeter in the antenna line as shown below.



- 3 Set the meter to read forward power. Forward power should be a nominal 4 to 5 watts.
- 4 Power the BT-X and press and hold the TEST switch for a moment. The meter performs a 15-second key-up test and all LEDs light.
- 5 Record the forward power.
- 6 Set the meter to read reflected power.
- 7 Momentarily press the TEST switch again to measure the reflected power. A typical measurement of reflected power is 0.2 watt or less.
- 8 Record the reflected power.

▼ **Note** *The BT-X radio interrupt circuitry shuts down the transmitter after 30 seconds of continuous transmission. Transceiver power drops if left on for more than 30 seconds.*

## Calculating Voltage Standing Wave Ratio

Voltage Standing Wave Ratio (VSWR) is a formula used to indicate the efficiency of the antenna. The VSWR formula compares forward power with reflected power and expresses it as a ratio. The ideal VSWR ratio is 1:1. VSWR above 2:1 is unacceptable.



### ≡ To calculate VSWR

- 1 Measure the forward and reflected power (see previous section).
- 2 Use the following formula to calculate VSWR:

$$\text{VSWR} = \frac{1 + \sqrt{x}}{1 - \sqrt{x}}, \text{ where } x = \frac{\text{Reverse Power}}{\text{Forward Power}}$$

For example, if 4 watts forward power and 0.2 watt reverse power:

$$x = \frac{0.2}{4} = 0.05, \text{ so } \text{VSWR} = \frac{1 + \sqrt{0.05}}{1 - \sqrt{0.05}} = \frac{1.22}{0.78} = 1.56$$

$$\text{VSWR} = 1.56:1$$

## Maintenance Procedures

### Replacing the Battery

The power supply charges the battery when AC is normal. During an AC fail condition, the BT-X monitors the battery voltage and performance. If the battery is not operating properly or the charge capacity has diminished significantly, the battery LED lights and a battery fault message transmits to Central.

Batteries should be load tested during the yearly PMI or when the panel indicates a battery fault and replaced if they fail the load test. Batteries should typically be replaced after every 3 to 5 years of normal service. On panels with multiple batteries, all batteries should be replaced at the same time.

### ≡ To replace the battery

- 1 Remove AC power from the BT-X and disconnect the battery cables from the battery.
- 2 Discard the battery according to local regulations and recycling availability.
- 3 Place a new battery in the BT-X enclosure. Make sure the battery installed is of the same ampere hour capacity and voltage rating as the one replaced.
- 4 Connect the battery cable to the new battery, observing correct cable/battery polarity.
- 5 Restore AC power.

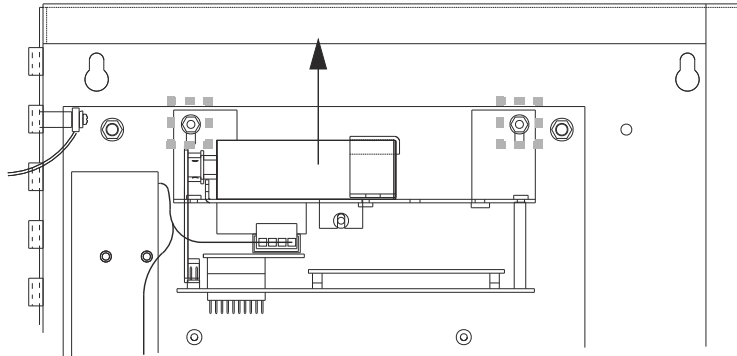
### Replacing the BT-X Fuse

When the BT-X fuse is blown, the BT-X reports a battery fault to Central and the battery charge voltage at the terminal block measures zero volts. The fuse is a 6.3A slow-blow 5 x 20 mm (P/N 504-624-00) and is located on the field assembly.



### ☰ To replace a fuse

- 1 Unplug the power terminal block from the field assembly—see “Field Assembly Connections” in the “BT-X Installation Manual” (P/N 001-398-00).
- 2 Disconnect the coaxial cable from the antenna port on the radio.
- 3 Use a 5/16 in. socket wrench to remove the two lock nuts that fasten the BT-X to the mounting plate.



- 4 Slide the field assembly up until the mounting studs, to which the lock nuts were attached, are at the bottom of the slot. This disconnects the field assembly pins from the expansion backplane or other component connector beneath it.
- 5 Pull the field assembly toward you and place it on an antistatic surface.
- 6 If present, remove the radio:
  - a Remove the bracket holding the radio by unscrewing and removing the Phillips screw that holds it to the field assembly.
  - b Slide the radio to the right until it disconnects from the radio port and remove it. The fuse is visible below the hole on top of the field assembly metal frame.
- 7 From the right side, use a flathead screwdriver to gently pry the end of the fuse out of the metal clamp and then lift it out. Gently squeeze the fuse holder “ears” together before installing a new fuse to ensure a tight fit.





## Appendix A Miscellaneous

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### Contents

|   |   |
|---|---|
| Error Handling .....                      | 2 |
| Hardware Specifications .....             | 4 |
| Power Draw for Battery Calculations ..... | 5 |
| Spare Parts .....                         | 5 |



## Error Handling

| BT-X Condition                              | Description   |
|---|---|
| BT-X does not reply to a query from Central | <p>If a BT-X does not reply, a <code>No Reply</code> message is displayed and logged at Central. A <code>No Reply</code> can indicate any of the following conditions at the BT-X:</p> <ul style="list-style-type: none"> <li>■ The BT-X did not receive the query message</li> <li>■ Faulty BT-X transmitter/receiver operation</li> <li>■ BT-X self-test failure</li> <li>■ More than one transceiver in the system has the same address</li> <li>■ BT-X shutdown due to low-battery disconnect</li> <li>■ Antenna problems with a high VSWR</li> </ul>   |
| Primary power to the BT-X fails             | <p>When an AC power failure occurs, the BT-X automatically switches to battery power; if the failure remains constant for 60 seconds, the AC LED turns off.</p> <p>If the BT-X is programmed to report an AC fail message, the BT-X AC Fail message is sent to Central. If alarms, status changes, or other BT-X troubles occur while the BT-X is in the AC fail condition, the appropriate message is transmitted to Central and the AC LED remains off. When AC power is restored, the AC LED automatically returns to steady on, the BT-X status indication LEDs illuminate appropriately, and an End AC Fail message is sent to Central.</p> <p>When operating on battery power, battery voltage may fluctuate due to variations in the power requirements of the BT-X. Transmitter activation, for instance, requires additional power. Sometimes this can cause the battery voltage level to oscillate below the low battery trip value. If a low battery condition occurred during the AC failure, an End Battery Fault message is also sent once the battery voltage has returned to a voltage above the low battery value. This message may occur either before or after the End AC Fail Message is received.</p> <p>When AC failure is detected, an AC Fail message is sent to the Central after a 60-second delay. If a low battery condition occurs before AC power is restored, a Battery Fault message is also sent. Once AC power is restored, the End AC Fail Message will be sent after a 60-second delay.</p> |
| BT-X battery voltage is too low             | <p>If the BT-X is operating on DC power and the battery voltage drops below approximately 9.7 VDC, the unit shuts down. Replace the battery per the instructions in the main text of this manual and press the Batt Start switch on the field assembly to reset the BT-X.</p> <p>The BT-X reports a low or disconnected battery as a battery fault; use the battery LED indications to determine the specific reason for the battery fault message (see "Field Assembly LEDs" in the BT-X Installation Manual, P/N 001-398-00). A poll reply will include the battery fault if the trouble condition still exists.</p> <p>Sixty seconds after power is restored from an AC fail condition, the BT-X sends an End AC Fail message to Central. If the battery voltage level is above the low battery trip point, the battery LED will turn off and an End Battery Fault message is sent to Central.</p>   |



| BT-X Condition                               | Description   |
|--|---|
| BT-X fails its self-test                     | <p>When a self-test fails, the unit is in a persistent tamper condition. Therefore, if the tamper condition cannot be cleared, a diagnostic test failed. Determine which diagnostic failed by noting the beep code (number of beeps) at power-up.</p> <p>3 beeps = failed memory device<br/>                     4 beeps = failed external UART<br/>                     5 beeps = real-time clock failure</p> <p>Once the beep code is recorded, contact Monaco for assistance.</p>  |
| BT-X radio fails                             | <p>When a radio failure occurs and a stuck radio transmitter is detected, the COMM LED lights red. If the BT-X is configured for fallback to secondary communications, the BT-X sends a message to Central when the change to the secondary communication channel is successful.</p>  |
| No Communication from Central                |   |
| 200 seconds of no communication from Central | <p>With primary only (radio) or secondary only (hard-wire) communication, 200 seconds of no communication from Central causes the BT-X to go into a comm fail state: the COMM LED on the BT-X turns off and any alarms are sent blindly twelve times each at intervals designed to overcome multiple units which are also sending (whether blind or not).</p> <p>With primary (radio) with fallback to secondary (hard-wire) communication, 200 seconds of no communication from Central causes the communication interface to fallback to the secondary communication (hard-wire) and the timer is restarted. The communications LED will turn yellow/orange. If 200 seconds again pass with no communication from Central, the COMM LED on the BT-X turns green again and the primary communications channel is selected and any alarms are sent blindly twelve times each (on both channels, as they are switched) at intervals designed to overcome multiple units which are also sending (whether blind or not). Transmissions may oscillate between primary and secondary channels.</p> <p>When switching back to a communication mode that has previously failed for 200 seconds, and is continuing to fail, the COMM LED will blink on and off every three seconds. This indicates both communication modes have been in failure mode for at least 200 seconds each, and are currently still failing.</p> |
| BT-X processor isn't working                 | <p>If the processor for the BT-X is not working, the BT-X audible alert sounds and it cannot be silenced or acknowledged. Contact Monaco for assistance.</p>  |
| Zone setup didn't download                   | <p>Perform the Transmit and Receive test. See "Testing Radio Signal Transmission and Reception" in the BT-X Installation Manual (P/N 001-398-00).</p>   |



## Hardware Specifications

| Specification                               | Description  |
|---|--|
| Radio (if installed)                        |  |
| Type  | Synthesized, narrowband, FM  |
| Frequency Range                             | FCC assigned, factory programmed to single channel   |
| Required Signal Strength                    | 5 $\mu$ V minimum  |
| Duty Cycle                                  | 50%, 30-second maximum transmit  |
| RF Input/Output Impedance                   | 50 ohms nominal  |
| RF Connector                                | BNC  |
| Modulation                                  | Frequency shift keying (FSK)   |
| Power                                       |  |
| Power Input                                 | 115 or 230 VAC, 50/60 Hz   |
| Internal Outputs                            | <b>To charger from power supply</b> 16 VDC nonadjustable; factory set<br><b>From battery to BT-X when in AC fail</b> 13.8 VDC factory set: 13.8 float and 14.5 boost   |
| Nominal Current with 6 zone Cards Installed | 175 mA normal<br>1.5A transmit   |
| Low Battery Signal                          | 11.5 VDC   |
| Low Battery Shutdown                        | 9.75 VDC   |
| Fuse  | 6.5A fast-blow fuse 5 x 20 mm  |
| Enclosure                                   | 16 gauge steel, painted, red or blue. All Monaco red enclosures are keyed alike; likewise, all Monaco blue enclosures are keyed alike. Tamper switch kits can be purchased separately if needed for red enclosures. Blue enclosures are shipped with installed enclosure tamper switch. Red enclosures have knockouts, blue enclosures do not.<br><b>Single-wide enclosure</b> 20" H x 12" W x 4" D (50.8 x 30.48 x 10.16 cm)<br><b>Double-wide enclosure</b> 20" H x 25" W x 4" D (50.8 x 63.5 x 10.16 cm). |
| Onboard Zone Inputs                         | Four on-board zone inputs can be configured as Class B Initiating Device Circuits for fire detection or mass notification panels.  |
| Temperature                                 | -22 to 140°F (-30 to 60°C)   |
| Relative Humidity                           | 0-90% noncondensing  |





## Power Draw for Battery Calculations

| Part Number | Description              | Standby Current (amps)<br>(for each unit installed) | Alarm Current (amps)<br>(for each unit installed)       |
|-------------|--------------------------|---|---|
| 176-206-xx  | Zone Card                | 0.003   | 0.003   |
| 176-208-00  | Audio Board              | 0.055   | 0.055   |
| 176-212-00  | Expansion Backplane      | 0.001   | 0.001   |
| 176-214-00  | BT-X Relay Board         | 0.000   | 0.056 per relay (0.448 with all eight relays energized) |
| 227-618-00  | BT-X iButton Keypad      | 0.050   | 0.050   |
| 227-44x-xx  | RF Module                | 0.090   | 0.090   |
| 227-630-xx  | BT-X Communicator        | 0.075   | 0.076   |
| 803-119-01  | AIM-4SL Reader Interface | 0.100   | 0.100   |

## Spare Parts

| Part Number | Description  |
|-------------|--|
| 176-206-00  | BT-X fire zone card  |
| 176-206-01  | BT-X security zone card (intrusion detection zones)              |
| 176-208-00  | BT-X audio board   |
| 176-212-00  | BT-X expansion backplane   |
| 176-214-00  | BT-X relay board   |
| 227-574-00  | Communication cable and adapter used to program the BT-X         |
| 227-630-xx  | BT-X field assembly replacement                                  |
| 290-050-01  | Wattmeter kit  |
| 290-701-01  | Multimeter kit   |
| 297-300-00  | Dynamic battery analyzer   |
| 504-624-00  | 6.3A 5 x 20 mm slow-blow fuse                                    |
| 513-412-00  | BT-X tamper kit  |
| 625-070-00  | Ground cable for enclosure                                       |
| 625-108-00  | Battery/power cable  |
| 625-109-00  | BT-X relay driver cable  |
| 625-122-00  | BT-X relay driver pigtail cable for connection to remote devices |





