



STAR-ELT Radio Fire Alarm Transmitter

Operation and Installation Manual

DRAFT R 0.6

2/1/2021



1. FCC Device Statements

FCC ID: AGJKCISTARELT0001

WARNING: Changes or modifications not expressly approved by Kingfisher Company, inc could void the user's authority to operate this equipment and void the product warranty.

FCC Notice (for U.S. Customers):

*This device complies with Part 15 of the FCC Rules:
Operation is subject to the following conditions:*

- 1. This device may not cause harmful interference, and*
- 2. This device must accept any interference received, including interference that may cause undesired operation*

*Changes and Modifications not expressly approved by **Kingfisher Company, inc** can void your authority to operate this equipment under Federal Communications Commissions rules.*

2. Caution

- Risk of Electrical Shock
- Read this manual completely before installing or servicing panels.
- Chassis must be connected to earth ground.
- Observe hot and neutral polarity when connecting AC power.
- It is recommended to install conduit into the sides of the enclosure only

3. Site Selection

- Locate and install the panel where least vibration or jarring will occur.
- Mount panel on structurally sound wall.
- Mount on a wall area where there is sufficient access to run the conduit for loop inputs, antenna, AC Power, and Earth Ground.
- Avoid installation in direct sunlight and in rain runoff paths.
- Locate panel providing clear view of the indicators, door clearance, and ease of access.
- Factory Mutual (FM Pending) approved for operation temperature range 0°C through 49°C (32°F - 120°F).
- Factory Mutual (FM Pending) approved for operation humidity < 95% non-condensing.
- Antenna gain shall not exceed zero dBd (referred to a half-wave dipole) in any horizontal direction.
- Only vertical polarization of antennas shall be permitted.
- The antenna and its supporting structure must not exceed 6.1 m (20 feet) in height above the ground

4. Introduction

The STAR-ELT Radio Fire Alarm (KCi Model 99320) is a self-contained Auxiliary Signaling Device that responds to contact closures from fire panels (FACP), emergency switch devices, supervisory switch devices and auxiliary switch devices to generate alarm messages in standard Kingfisher receiver format, and transmits those messages via radio to a compatible Kingfisher receiver. The STAR-ELT is a microprocessor-based device that utilizes state of the art software defined radio techniques to generate an appropriate alarm message and transmit the message on a software-generated VHF frequency.

The STAR-ELT is housed in a NEMA-1 cabinet and derives power from either an FM approved FACP 24VDC auxiliary power output or from an optional 120-240VAC power supply. When the optional AC supply is used the STAR-ELT also requires a backup battery. It has the capability to monitor the status of the optional battery and supply charging voltage to keep the battery fully charged. Depending on the type of battery installed, the STAR-ELT can operate from its battery in standby mode for 96 hours following a power failure. The STAR-ELT will generate a trouble message if it detects loss of AC power, disconnection of the battery, a battery that does not hold a charge, a charger that cannot properly charge the battery, or a break in any of the input field wiring connections. To prevent spurious trouble messages, a programmable confirmation wait time of up to 99 sec can be utilized to prevent excessive trouble message signals during normal maintenance, such as changing a battery or short duration power failures.

There are two basic units that make up the STAR-ELT panel. The main board can be powered from a 24VDC FACP aux power output, and regulates this down to its required operating voltage. When powered from a FACP, a standby battery is not required as the FACP aux power source is battery backed up. The main board monitors four Class B inputs. It applies debounce logic to signals on these inputs to prevent responding to external noise. When an alarm transmission is warranted the radio circuitry builds an alarm message based on the input activation which is transmitted on a preselected VHF radio frequency channel. Several alarm message formats that conform to an existing Kingfisher messaging standard can be selected. Message format specifics are selected by the alarm technician using a laptop computer. An optional AC power supply provides power and standby battery maintenance when the STAR-ELT is not powered from a FACP auxiliary 24VDC output or other FM approved 24VDC source.

The Kingfisher STAR-ELT alarm transmitter is compatible with the following Kingfisher receiving equipment:

Kingfisher Model
MCR ²

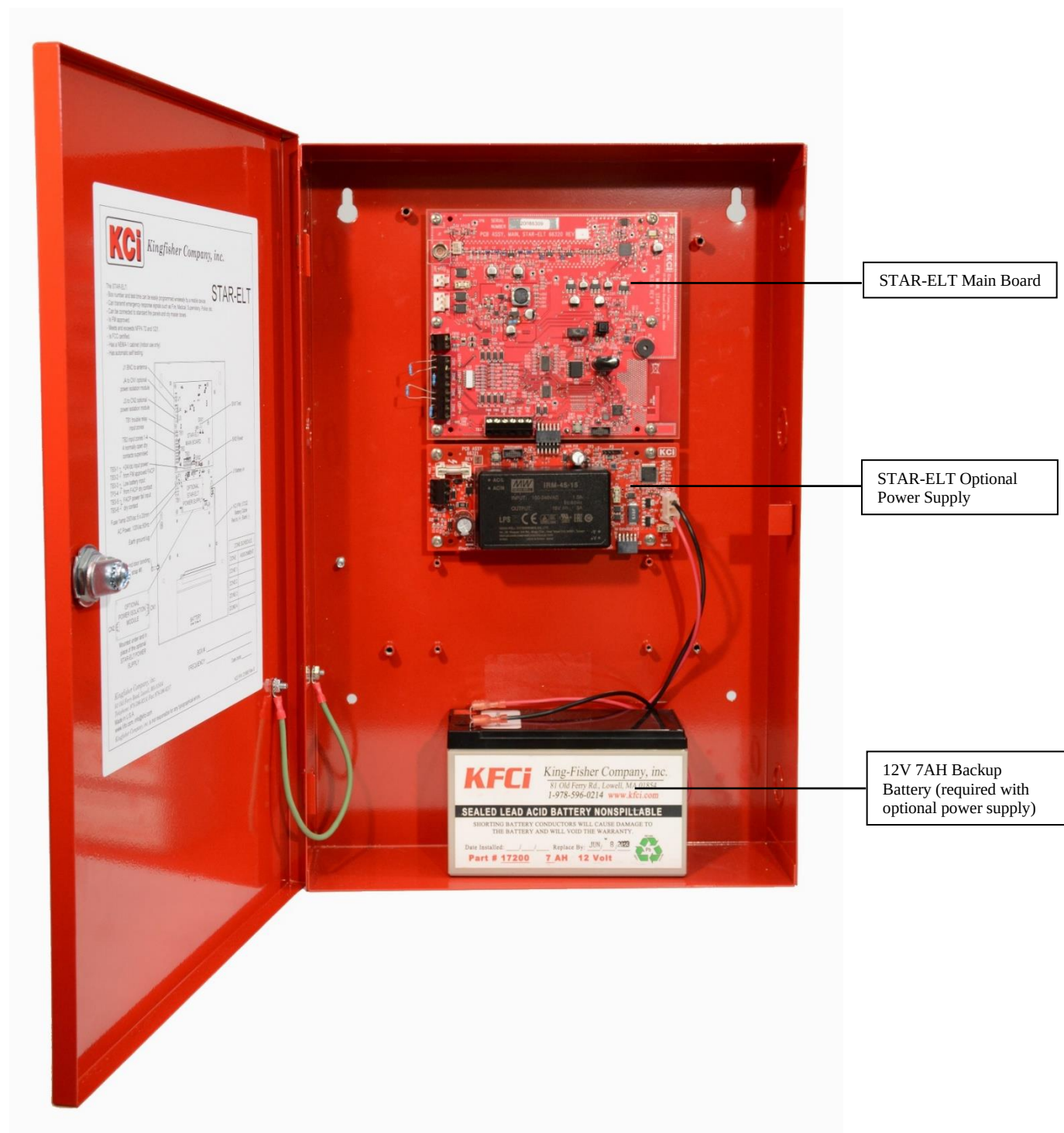


Figure 1 : STAR-ELT with Optional AC Power Supply

5. Specifications

Alarm Interface	
Monitored Dry Contact Inputs	4 (each input monitors ONE dry contact)
Ground Fault Detection Resistance	< 100 Ω
Input Debounce Time	Programmable 1-99 sec
Input Termination Resistance	10 k Ω
Dry Contact Trouble Output	1 (Energized Contact, Normally Closed) 30VDC 1A Resistive
Power Sources	
DC Power Input	
Source	24V Aux power from FM Approved FACP
Voltage Range	24V Nominal (20.4V to 26.5V)
Input Power Isolation	Optional Power Isolation Module
Power Source Fuse	2ASB (KCi #30040)
DC Current Draw – Standby	100mA average / 115mA peak
DC Current Draw – Transmission	300 mA average / 370mA peak
AC Power Input (Input)	
Optional power supply AC Voltage Range	120 / 240 VAC Nominal, Single Phase
Optional Power Supply AC Frequency	50-60 Hz
Optional Power Supply AC Current Draw	< 0.5 A
Optional Power Supply AC Fuse	1A 3AG
Optional Backup Battery Type	Sealed Lead Acid
Optional Backup Battery Voltage	12.0 V nominal
Optional Backup Battery Standby Duration	> 96 Hr (7.0 A-Hr or 5.0 A-Hr, such as KCi PN 17014)
Optional Backup Battery Recharge Duration	< 24 Hr
Optional Battery Fuse	2ASB (KCi p/n 30040)
Optional Low Battery Indication Threshold	12.6 V $\pm$ 0.1 V
Optional Battery Cutoff Threshold	11.3 V $\pm$ 0.1 V
Power Down Clock Time Retention	approximately 30 days
Indicators	
AC Power Present	Green LED on optional Power Supply Module
Power Trouble	Flashing Yellow LED on Interface Module
Alarm Input	Red LED, adjacent to each input on Interface Module

Input Trouble	Yellow LED, adjacent to each input on Interface Module
Transmission in Progress	Green LED, on solid, on Transmitter Module
Transmission Waiting	Green LED, blinking, on Transmitter Module
Transmission in Progress	Beeper on Transmitter Module
Programming Mode	Yellow LED, on solid when in programming mode
Radio	
Frequency Range: FCC	72 - 76 MHz Public Safety Band
Frequency Resolution	1 Hz
Frequency Stability	± 5 ppm
Spurious Emissions	< -50 dBc
Power Output	30dB peak (± 1dB)
Modulation	AM
Tone Frequency Range	191 Hz through 489 Hz
Tone Frequency Resolution	0.1 Hz
Tone Frequency Stability	± 5 ppm
Environmental	
Temperature Range – Operational	0°C through 50°C (32°F - 120°F)
Temperature Range – Storage	-20°C through 70°C (-4°F - 158°F)
Humidity	< 95% non-condensing

6. Definitions

AHJ	Authority Having Jurisdiction
EOLR	End of Line Resistor
FACP	Fire Alarm Control Panel
FM	Factory Mutual Approvals
KCi	Kingfisher Company, inc.
NFPA	National Fire Protection Association
NEC	NFPA 70 National Electric Code
NFC	NFPA 72 National Fire Code
NFPA 1221	Installation, Maintenance, and Use of Emergency Services Communications Systems

7. Installation of Enclosure

7.1 General

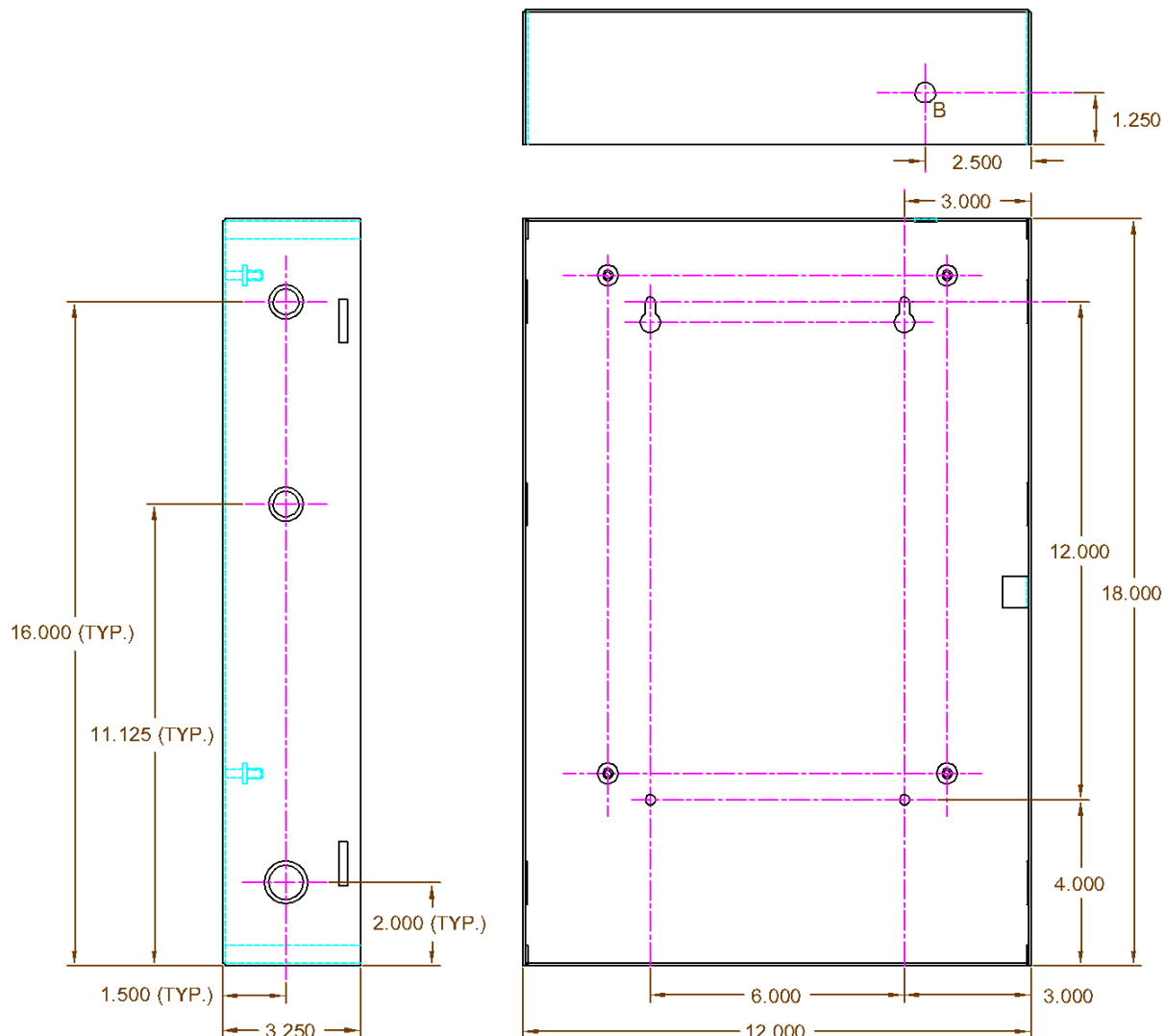
Installation shall be undertaken only by properly skilled, trained and qualified professionals who are experienced in modern industrial installations and all applicable codes and requirements.

- Kingfisher Company, inc. equipment must be installed in accordance with the NFC, the NEC, the local AHJ and KCi manuals and drawings.
- Do not connect batteries or apply power until wiring and installation are complete.

The STAR-ELT cabinet is usually mounted on a wall with external wiring brought in through conduit connected through the sides of the cabinet. The cabinet dimensions and mounting holes are shown in Figure 1.

It is recommended that conduit never be connected through the top wall of the cabinet.

Figure 2: STAR-ELT Enclosure with mounting dimensions



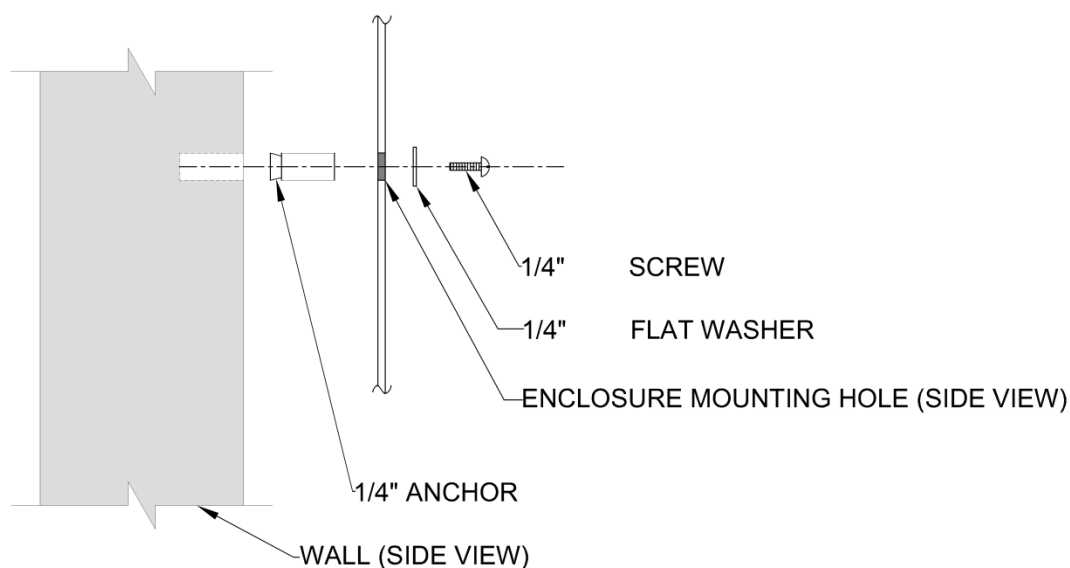


Figure 3: Wall Mounting Detail

7.2 Recommended Procedure

1. Remove enclosure from packing and open enclosure.
2. Mount the enclosure on a wall using appropriate hardware.
3. Run all conduits necessary to the enclosure. Knockouts are provided on the sides of the cabinet. Attach conduit to the enclosure using fittings with star locknuts. Conduits include: power, antenna cable, and zone inputs.
4. Verify door ground wire and proper system ground connection is attached.

8. Powering Up/Down

<u>Power-Up Procedure:</u>	<u>Power-Down Procedure:</u>
1. Connect Antenna Coax Cable to STAR-ELT Transmitter Module. 2. Connect power wiring. 3. If using the optional power supply	1. Unplug battery at battery connector. 2. Turn off AC Power at the circuit breaker or fuse connected to the panel.

a. turn on the Circuit breaker observe green AC Power LED. b. Connect batteries	3. Disconnect Antenna Coax Cable from STAR-ELT Transmitter Module
4. If powering from an FM approved 24VDC source, turn on DC power	

9. STAR-ELT Basic Connections

There are several basic field wiring connections that must be made to the STAR-ELT modules.

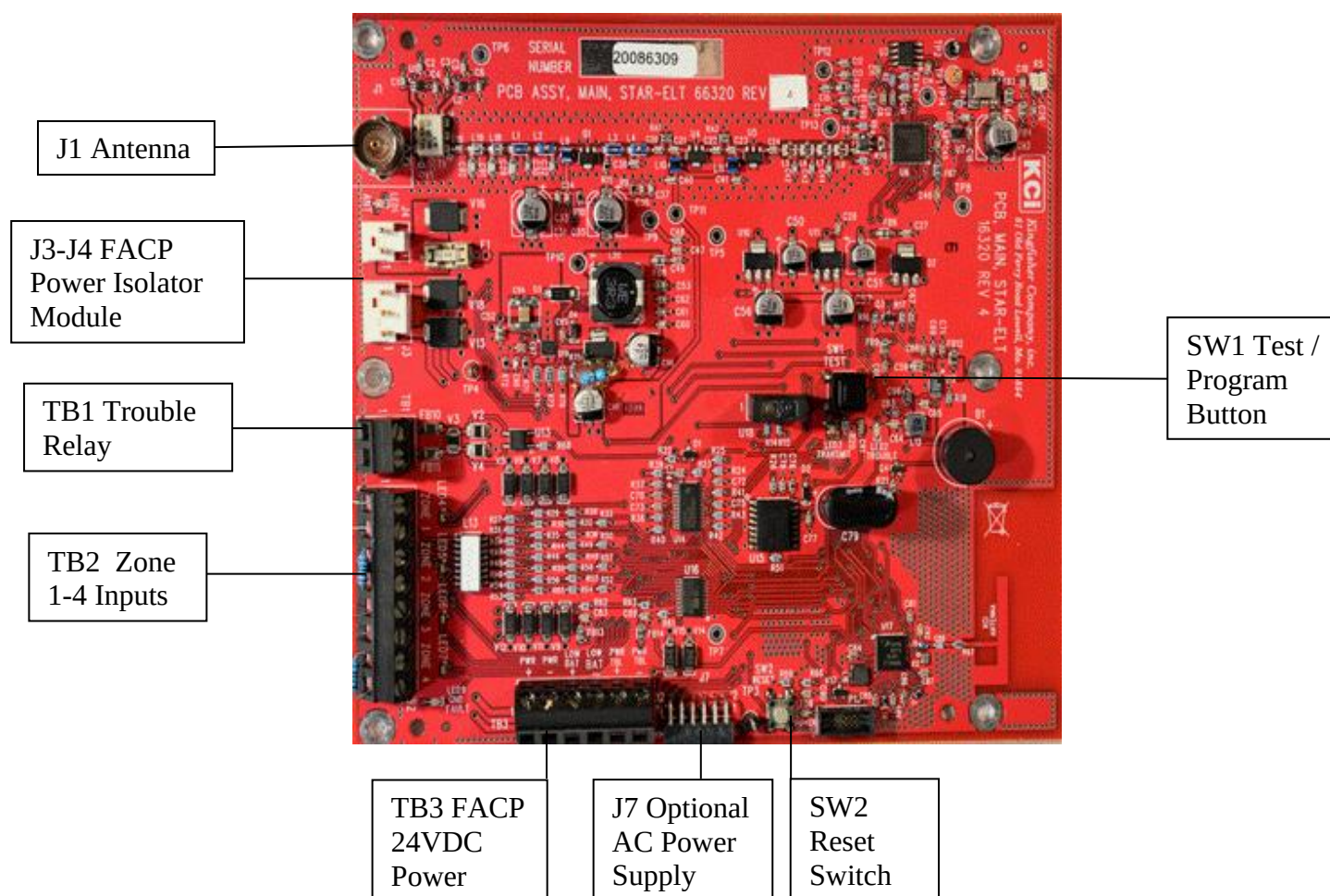


Figure 4: STAR-ELT Main Board

10. Terminal Configurations and Pinouts

Terminal	Description	Usage
TB1-1	Trouble Relay N/O when system normal, closed when trouble condition occurs	Connect to FACP monitoring device
TB1-2	Trouble Relay COM	Connect to FACP monitoring device
TB2-1	Zone 1 Input	Zone 1 dry contact trigger
TB2-2	Zone 1 Input	Zone 1 dry contact trigger
TB2-3	Zone 2 Input	Zone 2 dry contact trigger
TB2-4	Zone 2 Input	Zone 2 dry contact trigger
TB2-5	Zone 3 Input	Zone 3 dry contact trigger
TB2-6	Zone 3 Input	Zone 3 dry contact trigger
TB2-7	Zone 4 Input	Zone 4 dry contact trigger
TB2-8	Zone 4 Input	Zone 4 dry contact trigger
TB3-1	FACP DC Power +	+24VDC from FACP
TB3-2	FACP DC Power -	24VDC COM from FACP
TB3-3	FACP Low Battery +	Low battery dry contact input from FACP
TB3-4	FACP Low Battery -	Low battery dry contact input from FACP
TB3-5	FACP Power Fail +	AC Fail dry contact input from FACP
TB3-6	FACP Power Fail -	AC Fail dry contact input for FACP

11. Connections

11.1 DC Power

The STAR-ELT can be powered from +24VDC from any FM approved FACP or FM approved battery backed up auxilliary 24VDC power source by connecting power wiring to TB3-1(+) and TB3-2 (-). The STAR-ELT provides input power isolation to prevent ground faults occurring on the FACP powering the unit.

11.2 AC Power (Optional)

The STAR-ELT can be powered directly from the AC line by using an optional power supply, which also provides support for secondary backup battery power. Either 100 - 120 VAC or 220-240 VAC nominal line power, with a separate ground wire, is connected to the AC terminal block on the left hand side of the optional power supply module. The supply is wide-input and supports both voltage ranges with no configuration changes. Hot, Ground and Neutral wires should be inserted into the appropriately marked terminals, marked H, G, N and fastened tightly. Wires can be any size up to 12 AWG.

IMPORTANT: The STAR-ELT can be connected directly to 100-120VAC nominal through 220-240VAC nominal AC line power with no setup changes.

11.3 Grounding

IMPORTANT: Proper grounding is required for safe and optimal operation

The STAR-ELT enclosure contains a ground clamp located on the left hand side of the cabinet that must be connected to a dedicated earth ground, such as a ground rod located near the transmitter. A common connection to antenna ground is recommended. Grounding cable should be minimum 10 AWG and should be run with a minimum of bends in it.

11.4 Antenna

There are two ways to connect an antenna to the STAR-ELT. All antennas and feedlines must be 50Ω. The STAR-ELT is shipped with a coaxial jumper cable and a BNC-to-BNC panel-mount connector in a separate bag of parts. If desired, the knockout on the top of the cabinet can be removed and the panel-mount connector installed. The coaxial jumper cable should then be connected between the BNC jack on the upper right corner of the STAR-ELT transmitter board and the bottom of the BNC panel mount connector. A BNC antenna or feedline can be attached to this connector.

The external BNC jack should not be installed if a 50 Ω coax feedline is used. The external feedline should be brought in through conduit attached to the sides of the cabinet. If the external feedline is larger than RG-58 coaxial cable, it should be connected with the appropriate adapter (not included) to the coaxial jumper cable, which is then connected to upper left corner of the STAR-ELT transmitter board.

11.5 Lightning Arrestor

The lightning arrestor (KCi #91016) adjusted to the proper operating frequency is included. The BNC T-connector must be connected to the BNC jack on the STAR-ELT transmitter board. The top T connection must be made to the BNC jumper cable that either goes to the BNC jack mounted in the top of the cabinet or to the external coaxial cable. The lightning arrestor wire should be connected to the bottom leg of the BNC T connection with its other end clamped into the ground connection at the bottom of the enclosure along with the ground wire. If the operating frequency of the transmitter is changed, a different lightning arrestor, cut to the new frequency, must be obtained from KCi.

11.6 Battery (Optional)

When the optional AC power supply is used, a backup battery is required. This optional backup battery sits in the bottom of the cabinet and connects to the optional STAR-ELT Power Supply board with a 3-pin connector in the lower right corner (J1). A Kingfisher 12V sealed lead acid battery or standard sealed lead acid 12V gel cell must be used with a minimum capacity of 5 A-Hr. The battery should be rated for both discharging and charging over the full temperature

range that the STAR-ELT will be subjected to. Typically, this is rated from 0°C (32°F) to +50°C (+120°F). The battery connector J1 is polarized to allow for correct cable orientation.

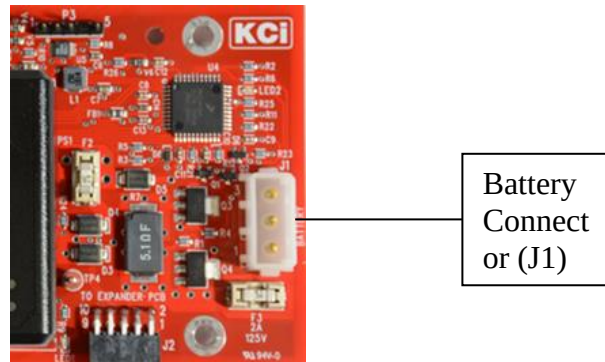


Figure 5 : Battery Connector on Optional Power Supply

11.7 Alarm Wiring

Supervised alarm wiring is connected to a terminal block on the left side of the STAR-ELT board. Termination requirements are described below.

11.8 Trouble Out Relay

A normally-closed relay is held open whenever the STAR-ELT is operating normally. This relay closes when a local trouble condition is detected, such as a ground fault, power fault, or zone wiring fault.

11.9 Zone Inputs

The STAR-ELT provides supervised contact closure inputs for up to four zone connections. Supervision is based on a 10kΩ EOL resistor, which must be installed across the contacts in the field. If an input is unused, an EOL resistor must be installed across those input terminals on the STAR-ELT. Wiring integrity troubles are transmitted when they occur. Zone inputs are normally-open, and activate when a contact closure is sensed. The type of event associated with the zone (Alarm, trouble, supervisory, security, waterflow, tamper, etc) is programmed at the receiver for each zone.

IMPORTANT: Only one dry contact must be connected to a zone input

11.10 FACP Power And Battery Trouble Inputs

The STAR-ELT provides inputs for monitoring FACP battery trouble (TB3-3, TB3-4) and FACP AC power fail (TB3-5, TB3-6) conditions. These are generally used when the STAR-ELT is powered by an FM approved FACP. These are dry contact inputs and are intended to be connected to FACP dry relay contacts that provide the FACP power status. When used, the wiring to these contacts must be in conduit and the STAR-ELT must be located in the same room and within 20 ft of the FACP.

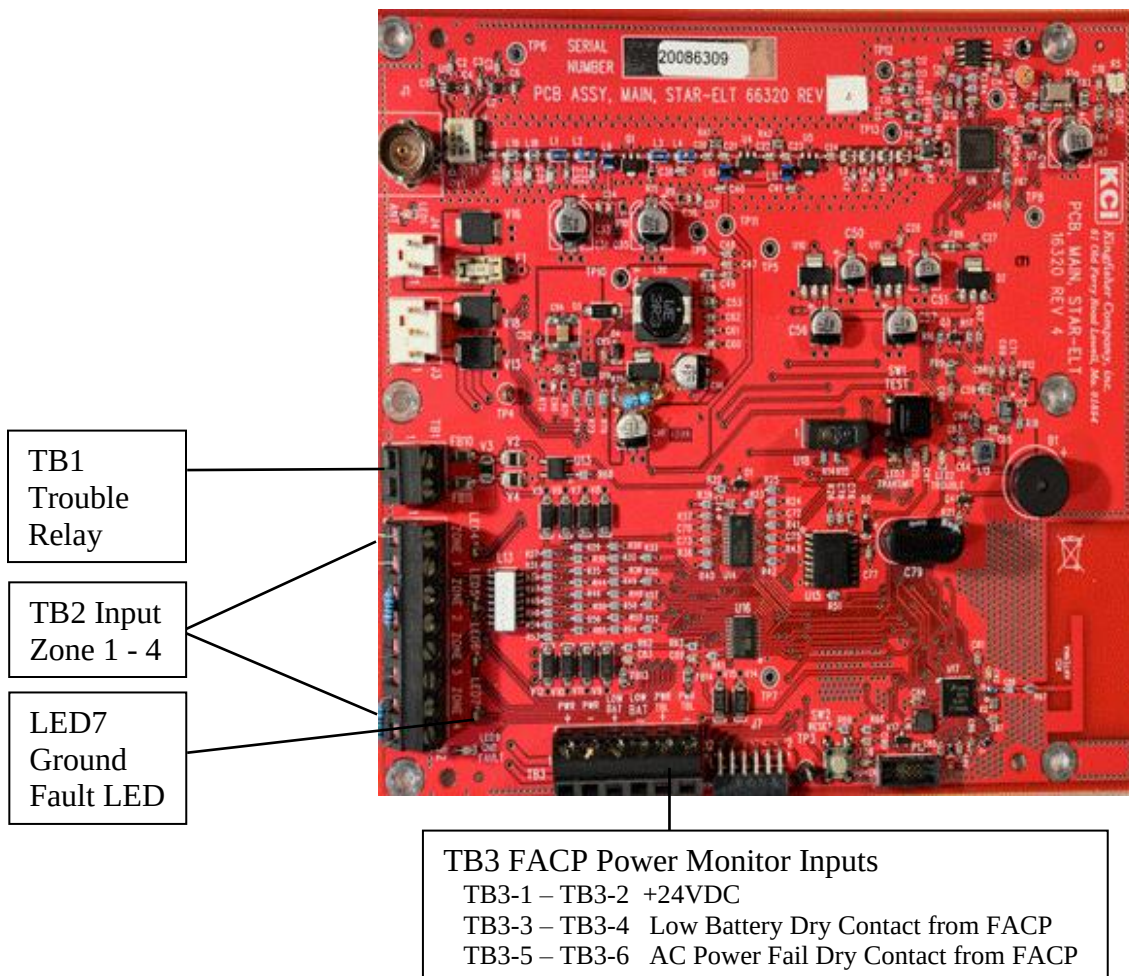


Figure 6 Zone input and trouble relay connectors

12. Leds and Indicators

12.1 Zone Indicators (LED4 – 7)

The bi-color LED adjacent to each zone input connection indicates when that zone is in trouble or in an active alarm condition. The LED will illuminate yellow to indicate a zone trouble due to a ground fault, incorrect EOL resistance, or an open circuit in the field wiring for that zone. The LED remains illuminated until the trouble condition is repaired.

The LED will illuminate red to indicate a short circuit / contact closure between the terminals of that zone. The LED remains illuminated as long as that zone's contact are shorted together.

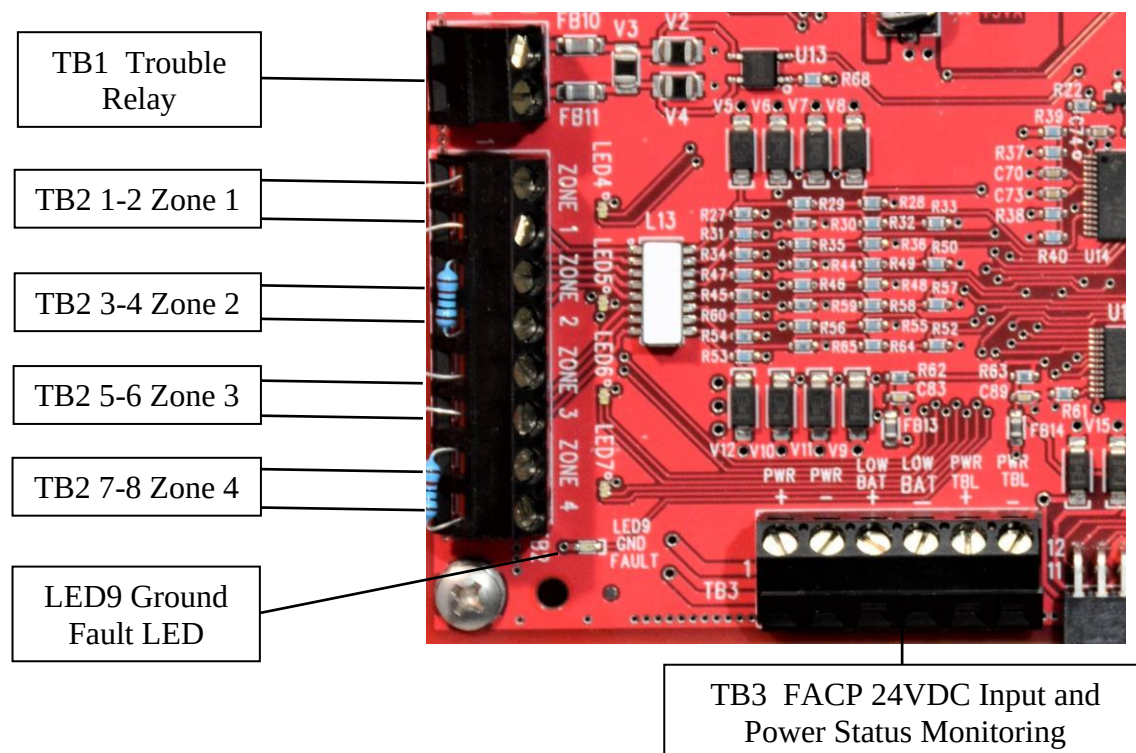


Figure 7 Lower Left Corner of Main PCB - Zone Inputs

12.2 Ground Fault Indicator (LED9)

When a ground fault is detected on any input zone wiring, the zone indicator LED will illuminate yellow to indicate a trouble condition on that zone, and the Ground Fault LED in the lower left hand corner of the board will illuminate as well.

11.3 Test / Program (LED3)

This led is located next to the TEST / PROGRAM switch. This LED will illuminate GREEN when the Test / Program switch is pressed momentarily, indicating that the unit is in programming mode. This LED will illuminate YELLOW when the Test / Programming button is depressed for 3 seconds to indicate that the unit is in TEST mode and sending a test transmission.

11.4 Antenna Supervision (LED1)

Located next to the antenna BNC connector. This LED illuminates YELLOW to indicate an antenna supervision fault condition.

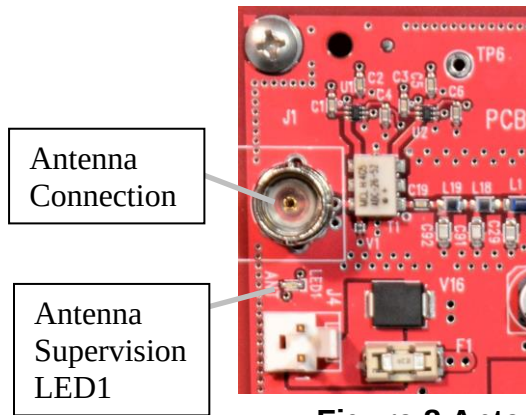


Figure 8 Antenna Connection and Supervision LED

13. Optional AC Power Supply

The STAR-ELT can be powered from an optional AC power supply. This module also supervises and charges the optional backup battery, which must be used with this module is applied. AC line power is supplied to the power supply and must be in the range 120VAC nominal. The power supply generates the desired operational DC voltage of the STAR-ELT and what is required to properly charge the battery, typically 13.8 – 14.2 VDC.

The power supply monitors AC voltage and switches from the AC-to-DC power supply to the battery when it detects either a brownout condition or total loss of AC voltage. Upon detecting either of these conditions, the yellow Power Fault LED flashes every second.

When operating from battery power, the power module continues to monitor both the AC voltage, to look for return of AC power, and the DC voltage, to ensure that the battery does not become so depleted that it is damaged. There are two operational battery levels that are acted upon by the STAR-ELT. When the battery reaches the Low Battery threshold, all messages sent by the STAR-ELT are encoded to also report a Low Battery condition. Later, when the battery is further depleted, and its voltage reaches the Battery Cutoff threshold, the STAR-ELT shuts itself down to prevent excessive depletion of the battery. Note that even after the battery is not being drained by the STAR-ELT, its internal resistance causes it to continue to lose charge slowly. It is important to recharge the battery soon after shutdown to prevent damage to its cells. In this condition the trouble contacts are closed and can be used to indicate to the associated panel that the STAR-ELT is no longer operational. This feature also ensures that transmissions will only be sent within the proper operating range of the product, thus ensuring correct signals will be transmitted.



Figure 9 : STAR-ELT Optional AC Power Supply

13.1 Battery

Battery terminals allows the connection of a standard 7AH sealed lead acid gel cell for use as a secondary power source. This battery is charged and monitored by the optional power supply.

13.2 Battery Fuse (F3)

Battery Fuse 2ASB (KCi #30040) is located in the lower right hand corner of the power supply board. This fuse protects the board in the event of a battery overcurrent or reversed connection condition.

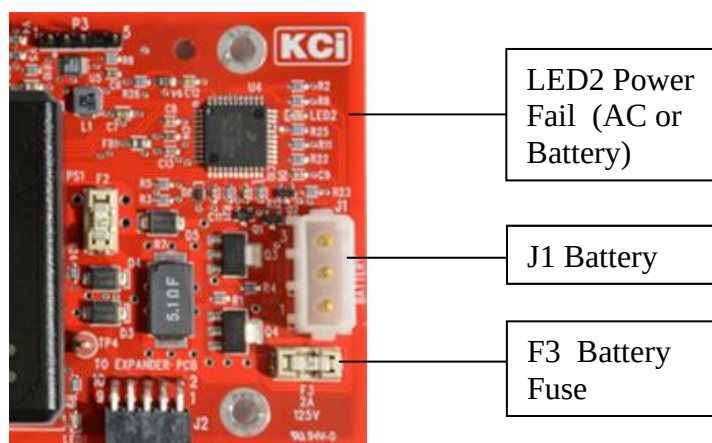


Figure 10 : STAR-ELT Battery Connector and Fuse (Optional AC Supply)

13.3 AC Power Indicator (LED1)

The green LED is constantly illuminated when AC power is provided to the interface board.

13.4 Power Trouble Indicator (LED2)

The STAR-ELT monitors AC voltage and switches to the battery when it detects either a brownout condition or total loss of AC voltage. Upon detecting these conditions, the Yellow Power Fault indicator LED2 flashes every second.

When AC is present, the STAR-ELT periodically removes the battery charging voltage and tests to see if the battery is holding a charge. If not, the implication is either that the battery is faulty and needs to be replaced or that the battery has been removed, one of its wires has broken, or the battery fuse is blown. Any of these conditions requires attention. The STAR-ELT indicates power trouble with the flashing Yellow LED. It transmits a trouble message when the fault is first detected and then with every daily test transmission for as long as the condition persists.

The same Yellow LED is illuminated under two other conditions. When the STAR-ELT is first powered up, or is reset by pressing the reset button the LED flashes to indicate the firmware version installed. The version number is in the format of X.YY and the LED flashes to indicate X, pauses, and then flashes to indicate YY.

When the STAR-ELT is communicating with a programming device the Yellow LED is illuminated solidly.

14. Hardware Startup

From an OFF condition the STAR-ELT is typically started up by applying DC power from an FM approved fire control panel or auxiliary power supply, or applying AC power to the optional AC Power Supply Module. Generally, attaching a charged battery before system power is applied does not cause the operation of the hardware to start. This sequence of events helps to protect the battery from damage when its voltage gets low and ensures proper operation of the STAR-ELT.

When the STAR-ELT is first started up or reset, it flashes two messages on the Yellow Trouble LED. The first message is the version of the firmware, where the LED flashes x times for the major version number, pauses momentarily, and then flashes y times for the minor version number. The second message indicates what caused the Interface to reset. Pushing the RESET button (SW2) causes the LED to flash 1 time. If all power is removed from the Interface, the restart message will flash 3 times when power resumes.

The STAR-ELT next scans its entire program memory and compares a checksum calculated from all the values in it to the checksum that was calculated when the device was originally programmed. If these are different the program memory is assumed to be corrupted and the processor solidly lights the Yellow Trouble LED and repeatedly prints the message: “Bad Checksum” over its communication port until the problem is corrected.

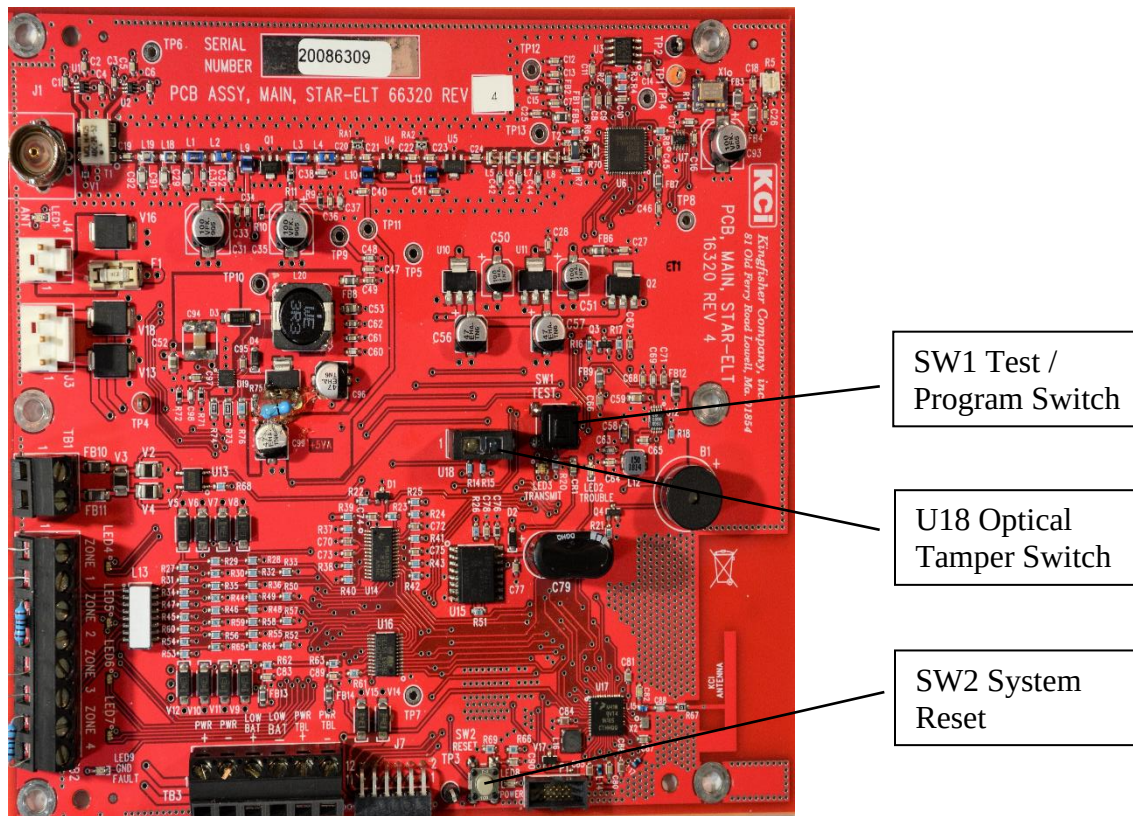


Figure 11 STAR-ELT Main Board Primary Controls

14.1 System Reset Button

Initiates reset of the interface board. The Yellow Power Trouble LED flashes the firmware version number after this button is pushed.

14.2 Test Signal

Press the Test / Program button SW1 for 3 seconds to transmit a test message. Power troubles on the STAR-ELT will be transmitted after the test signal transmits if applicable. Test / Program led will illuminate Yellow.

14.3 Tamper Function

The STAR-ELT contains an integral optical tamper sensor that continuously monitors the state of the cabinet door. When the door is opened, the STAR-ELT will automatically transmit a Tamper signal to the receiving station. This feature can be enabled or disabled via programming.

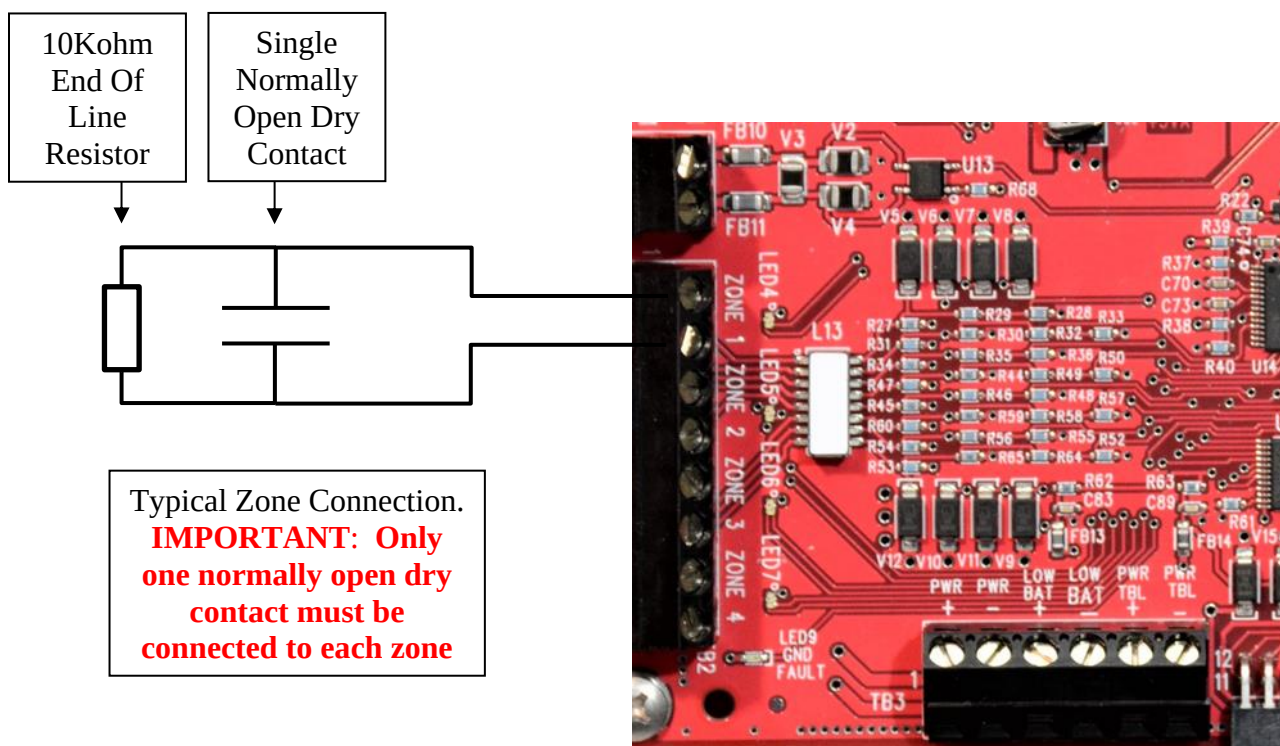
14.4 Connecting Alarm Inputs

An 8-position terminal block on the lower left edge of the STAR-ELT is used to connect to dry contacts from a fire panel. Each pair of zone inputs should be connected to the two sides of one normally open dry contact at the panel. There is no preferred polarity to this connection. There are four such “zones” in the 8 connection points.

A bi-color indicator LED is located immediately to the right of each pair of contacts on the terminal strip: Red indicates when the input is in an Alarm condition (dry contact closure); Yellow indicates when the input is in a Trouble condition (wire breakage or ground fault). Opens, shorts and ground faults are detected individually by each input zone.

All input zones must be connected to a 10 k Ω termination resistor at the end of the last open contact device being monitored. The termination resistor must be placed across the dry contacts at the end of the last device. If an input zone is not used the termination resistor leads must be inserted directly into the terminal strip for that zone, if no termination resistor is connected to an input that zone will be in a trouble condition.

All of the trouble indications are combined to create a single input trouble condition. These trouble conditions can be transmitted as any function in the wireless system with a response delay of up to 65 seconds. Thus, the STAR-ELT can be programmed not to respond to a trouble condition unless it remains in trouble for a period of time. This feature serves to prevent spurious trouble messages when work is being done on the system.



14.5 Transmit Indicator

This Green LED is illuminated continuously during transmit. When the Green LED is blinking, there are messages in the buffer waiting to transmit. Transmit Audible Indicator
This produces an audible tone for the entire length of each transmission.

15. Checkout Procedure

These tests should be performed only by those who are knowledgeable in the installation, operations, and maintenance of KCi equipment.

NOTE: Whenever the following procedure produces a transmission, wait at least one minute after the third round is transmitted before proceeding to the next step.

- **CONNECT** antenna. Ensure that the lightening arrestor is connected properly.
- **CONNECT POWER** - If the STAR-ELT is powered from an FM approved FACP or booster panel, connect +24VDC from the power source to the STAR-ELT using the power isolation module if ground fault isolation is required.
- **IF THE OPTIONAL AC POWER SUPPLY IS USED** –
 - **CONNECT** AC Power to the optional power supply – The green AC Power LED will illuminate.
 - **CHECK** the battery voltage before connecting to the STAR-ELT – The voltage across the battery terminals should be between 12 and 15 volts.
 - **CONNECT** the 12v battery to the BATTERY terminals on the power supply board – The Power Trouble LED should turn off after timeout, leaving only the green AC power LED on, indicating everything is operating normally.
- **TRIP** each zone (Zone 1 to Zone 4) by placing each zone's alarm initiating device into the alarm mode – Confirm reception at the receiving station.
- **REMOVE AC** power and check the operation of the panel on battery backup. Re-install AC power after test.

NOTE: Before leaving the panel, check to make sure: all alarm and trouble indicators are off, and only the Green AC Power LED is illuminated if the optional power supply is used.

16. Troubleshooting

SYMPTOM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Blows Fuse	1. Interface Board (KCi #66951)	Isolate boards by moving battery from interface jack direct to transmitter jack. Replace board.

SYMPTOM	POSSIBLE CAUSE	POSSIBLE SOLUTION
	2. Transmitter Board (KCi #66950)	Isolate boards by moving battery from interface jack direct to transmitter jack. Replace board.
Will not Transmit	1. Fuse	Replace
	2. Transmitter Board	Replace board
	3. Battery	When battery voltage is less than 11.8 volts replace battery
Weak Transmit (Misses Occasionally)	1. Antenna SWR Check	Check Antenna installation
	2. Antenna Location	Try a different antenna location
	3. Coax Connectors	Gently twist BNC connector. Look for rotation or other indications of improperly installed connectors.
TRANSMITTER shows up on the Missing Box report.		Check fuse
		Verify 25.000000 ± 0.000050 MHz at TP1 after pressing Program button. (Adjust R20 at Factory Only)
		Check Console for “LB” normal battery shut-down
		Check battery voltage under load, it should be above 11.8 VDC
		If transmitter “beeps” analyze signal by listening to speaker & watching Signal Meter on Console
		Check test time on Console printer tape; avoid other transmitter auto test times
		Check antenna connector and perform SWR and Power test. SWR should be $< 1.5:1$. Power out should be 0.5-1.0 Watt
		Try a different address code
		Substitute electronics from another “working” transmitter
TRANSMITTER sends an unexpected zone message every time another message, such as test, is sent. The same zone message is sent immediately after the Reset Button is pressed.		First, with the ribbon cable removed, measure the voltage on all pins of the bottom row of J5. Each pin should measure approximately 3.0 VDC; no pin should be less than 2.4 VDC. If any of them is lower, replace the transmitter board.
		Next check for ribbon cable short circuit. Unplug the ribbon cable from J1 on the Interface module and press the Reset Button on the Transmitter module to see if the zone transmits. If so, replace the ribbon cable.

16.1 Monitoring Hardware Errors

Three hardware errors are monitored by the microprocessor and when detected will prevent the transmitter from operating. When any of these hardware errors is detected the transmitter shuts down all circuitry that it can and sends a continuous stream of characters out of its Bluetooth connection. It does so infinitely until the problem is corrected by human intervention. Connecting the terminal program to the Bluetooth port will show text that indicates the specific problem that was detected.

When the transmitter is first started up, or reset, it scans the entire program memory and compares a checksum of the values in it to the checksum that was calculated when the device was originally programmed. If these are different the program memory is assumed to be corrupted and the processor sends the message: “Bad Checksum” repeatedly until the problem is corrected.

Every time the transmitter is called upon to transmit an alarm, trouble, or test message it sets up the RF circuitry with the proper parameters. It then reads back the RF programming and if there is a discrepancy the processor stops trying to transmit and prints the message: “RF Circuitry Error” repeatedly until the problem is corrected.

After the transmitter sets up the RF circuitry but before it transmits anything it checks to see if any RF energy is being sent to the antenna. If so, this indicates a hardware error that would cause the transmitter to tie up the frequency when it is not meant to send a message. In this case, it shuts down power to the RF circuitry and prints the message: “Unintended RF Transmission” repeatedly until the problem is corrected.

If any of these conditions occurs, replace the transmitter board immediately.

17. Preventive Maintenance

17.1 Annual Maintenance

- Physically inspect STAR
- Verify tight connections
- Check Battery Voltage – No load, 13.0 VDC or greater
- Check Charging Voltage – 13.8-14.2 VDC with battery connected (A battery charged for a minimum of 2 Hrs.)
- Check Battery Voltage – With AC turned off and while a message is being transmitted.
- Using the programming app, send a Test transmission and verify proper SWR
- Verify expected RSS at the receiver (MCR2 only)

17.2 Stock Parts

- Extra STAR-ELT main board
- Extra STAR-ELT Optional AC Power Supply
- Extra battery for quick replacement
 - KCi#:17002 12 Volt, 7 AH, Rechargeable Sealed Lead-Acid Gel Cell
 - KCi#:17007 12 Volt, 2.5 AH, Rechargeable Pure Lead-Acid Battery
 - KCi#:17014 12 Volt, 5 AH, Rechargeable Pure Lead-Acid Battery
- Extra Fuse 2ASB (KCi #30040) Battery
- Extra Fuse 1A 3AG (KCi #30002) AC

18. STAR-ELT Transmitter Programming

The STAR-ELT supports an integral Bluetooth interface for programming. The KCi Wireless Programming App must be installed on either an iOS handheld device, Android handheld device, or Windows 10 laptop. Pressing the Test / Program button SW1 on the STAR-ELT and holding it in for 3 seconds will activate the Bluetooth interface and allow the programming app to connect.

Programming functions via the app include

- Setting the box number
- Setting the number of function digits
- Setting the transmitter frequency
- Setting the test time and interval
- Sending a test message and measuring antenna health
- Setting the time and date
- Zone disconnect / bypass and re-enable

Press the PROGRAM button until the adjacent LED turns RED. This will place the unit in programming mode and allow you to connect using the iOS or Android programming app. When the Radio Transmitter is in Program mode it is not able to function as an alarm transmitter. In case the Program button is pushed accidentally or Program mode is not exited, a timer in the transmitter automatically exits from Program mode and returns the transmitter to normal use if there is no activity for 30 seconds. Be aware that this may also occur before programming is complete and it will be necessary to reenter program mode before saving the updated parameters to the transmitter.

The basic programming sequence is

- Connect to the device
- Download parameters
- Modify parameters
- Upload to the device

Parameter Download:

Open the Kingfisher Cordless Programmer app (iOS or Android), select the Bluetooth device associated with the STAR-ELT, enter the programming password, and download system parameters.

Parameter Modification :

Modify parameters in the “Parameters” tab according to the following table

Programming Complete

In the Upload / Download tab, select “Upload” to send the new parameters to the device.

18.1 Table 1: STAR-ELT Transmitter Parameters

Accessibility is from the three different functional levels, each accessible with a different password. “S” means that the parameter can be set from a given level. “V” means that the parameter can be viewed from a given level but not changed. A blank field means that the parameter cannot be changed or viewed at that functional level.

STAR Transmitter Parameter	Description	Factory	Maintenance	Field
Firmware Version	The version number of the firmware that is currently loaded into the transmitter.	V	V	V
Last SWR	The Standing Wave Ratio measured that last time a signal was transmitted. A high number means there might be a problem with the feed line or antenna. The best value is 1. If 0, recent data are not available.	V	V	V
Battery Voltage	The battery voltage measured the last time a signal was transmitted. This is not meaningful if power is supplied by AC voltage.	V	V	V
3.3V Supply Voltage	The measured value of the 3.3V supply. Should be within 5%.	V	V	
1.8V Supply Voltage	The measured value of the 1.8V supply. Should be within 5%.	V	V	
Frequency (MHz)	The frequency that is used to transmit the alarm (must match the frequency for the entire alarm system). This value can only be set at the factory or by an authorized distributor; proper transmission must be confirmed after this value is changed.	S	V	V
Transmitter Address	The numerical address of this transmitter. See “# Addr Digits” for more information	S	S	S
# Addr Digits	The number of digits in the Transmitter Address (must match the setting for the entire system).	S	S	V

STAR Transmitter Parameter	Description	Factory	Maintenance	Field
# Fcn Digits	The number of digits used to send alarm function codes (must match the setting for the entire system).	S	S	V
# Alarm Rounds	The number of times each alarm message is transmitted. This value, usually 3, may be dictated by regulatory standards.	S	S	
# Test Rounds	The number of times each test message is transmitted.	S	S	
Time Between Rounds (Round 1-2 and Round 2-3)	The number of seconds that elapse between sending multiple rounds of Alarm or Test. These values are automatically generated randomly based on the “Transmitter Address” but can also be forced to any values between 2 sec and 12 sec if desired.	S	V	V
Next Test Time	The time, in 24-hour clock format, that the next test will be sent.	S	S	S
Current Time	The current local time, in 24-hour clock format. See “Synchronize with Computer Time”	S	S	S
Synchronize with Computer Time	When checked, the current time written to the transmitter is equal to the time set in the computer. When checked, the “Current Time” box is not visible.	S	S	S
Time Between Tests (Hours, Mins)	Set the time that elapses between transmitting an automatic test message. Usually this is set to 24 hours, 0 min. It should <u>never</u> be set to less than 0 hours, 2 min or greater than 24 hours, 0 min	S	S	S

STAR Transmitter Parameter	Description	Factory	Maintenance	Field
Use P-Tone for Repeater	When checked, a P-Tone is transmitted before each message, enabling re-transmission by a legacy Kingfisher Redundant Repeater	S	S	S
Send Checksum	When checked, a checksum of each message is calculated and transmitted following the message. The receiver must be set accordingly.	S	S	V
Enable Return to Normal	When checked, a message is sent when a previously sent alarm or trouble is cleared. The receiver must be set accordingly.	S	S	V
Security Panel	Check this box when using the STAR with a Security Panel (NOT a Fire Alarm). This control silences the audible beep that usually occurs with every transmission.	S	S	S
Input Type	Select the input circuitry that is used to trigger the transmitter. For the STAR this should be set to “STAR Interface”	S	S	S
Inter-Transmit Delay	The number of seconds that must elapse between the end of one message and the beginning of the next. This is usually set to 60, as required by FCC regulations when they apply.	S		
Tone Length	The length of time that each tone is transmitted under normal conditions. This is usually set to 60 msec and changing it may cause an unpredictable reaction by the receiver.	S		

STAR Transmitter Parameter	Description	Factory	Maintenance	Field
Low Battery Length	The length of time that each function tone is transmitted when the battery level is low. This is usually set to 120 msec and changing it may cause an unpredictable reaction by the receiver.	S		

19. References and Part Numbers

19.1 Manual Numbers

- 99320-MAN STAR-ELT Manual
- 75092 Antenna Technical Manual

19.2 Replaceable Parts List

- 17002 12 Volt, 7.0 AH, Rechargeable Sealed Lead-Acid Gel Cell Battery
- 17007 12 Volt, 2.5 AH, Rechargeable Lead-Acid Battery
- 17014 12 Volt, 5 AH, Rechargeable Lead-Acid Battery
- 30002 Fuse 1A 3AG
- 30040 Fuse 2ASB
- 53014 10k Ohm End of Line Resistor
- 91016 BNC Lightning Arrestor
- 66320 STAR-ELT main board
- 66321 STAR-ELT Power Supply Board (optional)

19.3 Ordering Information

KCi #	Model #	Description
99420	STAR-ELT-PSE	STAR-ELT Transmitter— 120VAC Line Power (backup battery required)
99421	STAR-ELT	STAR-ELT Transmitter— +24VDC Power from FM Approved FACP
Options		
66320	STAR-ELT-MB	STAR-ELT Main Board—Field Replacement Kit
66321	STAR-ELT-PS	STAR-ELT 120VAC Power Supply— Field Replacement Kit
66324	STAR-ELT-IM	STAR-ELT 24VDC Power Isolation Module—Field Replacement Kit
97953	FPF	Factory Programmed Frequency—Required at time of order (no charge)

Kingfisher Company, inc. products must be used within their published specifications and must be PROPERLY specified, applied, installed, operated, maintained, and operationally tested in accordance with their installation instructions at the time of installation and at least twice a year or more often and in accordance with local, state, and federal codes, regulations, and laws. Specification, application, installation, operation, maintenance and testing must be performed by qualified personnel for proper operation in accordance with all of the latest National Fire Protection Association (NFPA), Underwriters' Laboratories (UL), National Electrical Code (NEC), Occupational Safety and Health Administration (OSHA), local, state, county, province, district, federal and other applicable building and fire standards, guidelines, regulations, laws and codes including, but not limited to, all appendices and amendments and the requirements of the local authority having jurisdiction (AHJ).

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Kingfisher Company, inc. 81 Old Ferry Road - Lowell, MA 01854
 Phone: 978-596-0214 Fax: 978-596-0217 www.kfci.com