



KTX SYSTEM INSTALLATION INSTRUCTIONS

READ THIS ENTIRE BOOKLET
BEFORE INSTALLATION

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1 Introduction

The KTX System allows for a maximum of 24 temperature cables, each with up to 24 thermocouple sensing points to be remotely monitored per KTX Switch (KTSW, also referred to as a MUX). Additional KTSWs can be added to monitor additional temperature cables or grain bins. The KTX System easily adapts to most existing temperature systems for add-on or renovation.

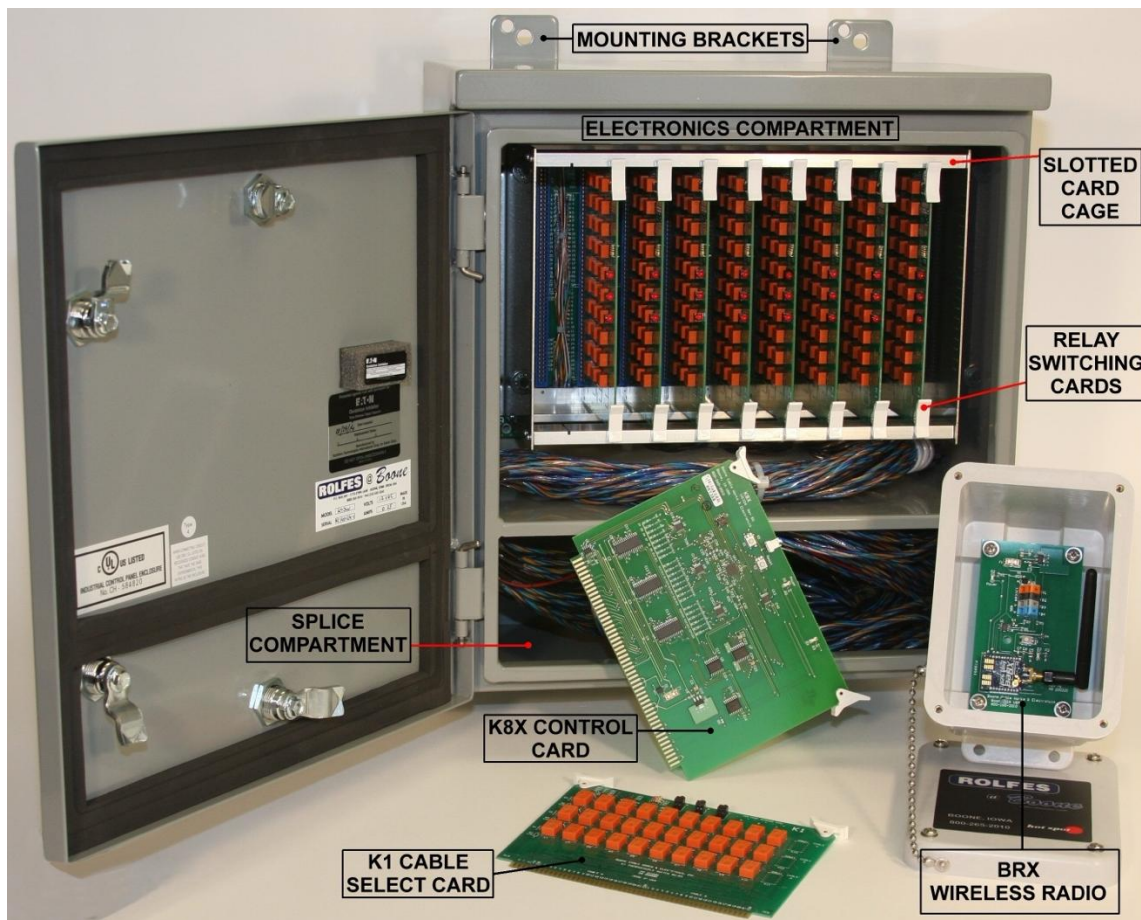


Figure 1: KTX System, Pre-Installation, Single KTSW

2 Description

The KTX System consists of a KTSW, a K8X or K8X+ control board, and one K1 cable select board for every three temperature cables. The KTSW is a compact weatherproof enclosure divided into two compartments. The bottom compartment is dedicated to wire splice connections. All wires from outside the KTSW enter the bottom compartment through electrical conduit. The bottom and top compartments are separated through a sealed epoxy barrier. The top compartment is sealed from moisture and dust to protect the electronic components. Access to the interior of the KTSW is provided by a hinged door which has a drip-shield / rain hood to protect the door gasket that closes with secure latches.

The top compartment is occupied by a cage frame that holds the K1 boards. All boards plug into the KTSW with reliable, gold-plated connections that allow for simple replacement and troubleshooting. When the KTSW is viewed as shown in Figure 1, either a K8X or K8X+ board is installed in the first slot position closest to the hinge with the primary component side of the card facing the KTSW door hinges. The remaining slots of the KTSW are populated with K1 boards with the primary component side of the boards facing the KTSW door hinges.

KTSW Specifications	
Dimensions	17" (432mm) Height 16" (406mm) Width 8.25" (210mm) Depth
Enclosure	NEMA 4, standard enclosure, watertight NEMA 4X, 304 stainless steel enclosure, watertight and corrosion resistant
Input Power	6 W, 12 VDC at 0.5 A
Thermocouple Type	Type T (Copper / Constantan)
Size	HALF MUX (1 to 12 cables) FULL MUX (1 to 24 cables)

Table 1: KTSW Specifications

3 Installation Locations

Leadwire, conduit, and electronic hardware can be kept to a minimum by carefully distributing switching devices around the facility in strategic remote locations. These locations often include the roofs of tanks and interiors of head houses shown below. Often groups of cables near each other have their leadwire conveniently routed to a single point which is a suitable location to place a KTSW. Each KTSW measures only the temperature cables connected to it, not all the temperature cables in the facility. Additional KTSWs are added as needed throughout the facility. **All power or communication lines need to be run through electrical conduit.**

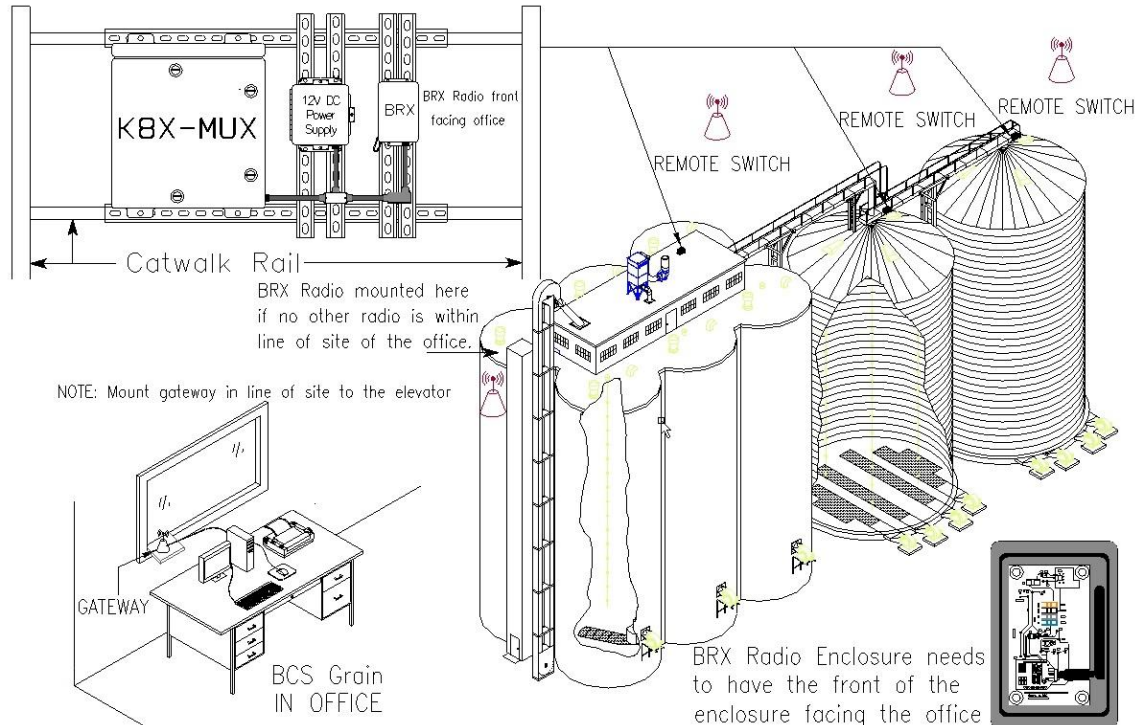


Figure 2: KTX System Locations

The KTX System is mounted using its External Mounting Brackets (See Figure 1). The installer should check the system drawings and determine the proper location of each KTX System. **The KTX System shall only be installed or used in non-hazardous locations. Hazardous locations are defined by the National Electrical Code in Article 500, under special occupancies.**

Each system should be easily accessible and free from obstruction. A fully loaded KTX System consists of either a K8X or K8X+ board and eight K1 boards (FULL MUX) and can accommodate up to 24 cables. A half loaded KTX System consists of one K8X board and four K1 boards (HALF MUX) and can accommodate up to 12 cables.

The BRX radios will be labeled according to the software's Bin configuration. For example, KTX01 will be mounted by Switch 1 (Section 1). KTX02 by Switch 2, etc. Any BRX that is labeled REPEATER or OFFICE is usually mounted close to the Gateway (Office) to improve communication between the other radios. **If the BRX radios and Gateway get mounted close to each other, a minimum distance of 10 feet between each unit is required.**

4 Connections

4.1 AC High-Voltage Connections

The RPX power supply is powered by 120 VAC mains. The 120 VAC mains must consist of a hot / line, neutral, and earth ground.

The following connections must be made:

- Hot / Line (typically black) – lower side of disconnect switch
- Neutral (typically white) – “N” terminal of 12 V power supply
- Ground (typically green) – “ $\perp$ ” terminal of 12 V power supply (create a pigtail using WAGO 221 Lever-Nut to later accommodate a second connection)
- Upper side of the disconnect switch (use same color and gauge as Hot / Line) – “L” terminal of 12 V power supply

4.2 DC Low-Voltage Connections

The KTSW is powered by 12 VDC which is supplied from the RPX power supply. **Do not make multiple wire connections within a single terminal block and instead use a WAGO 221 Lever-Nut creating a pigtail where required.**

The following connections must be made:

- 12 V power supply “+V” terminal (18 AWG red) – BRX radio 12 V (create a pigtail using WAGO 221 Lever-Nut) – KTSW 18 AWG red wire
- 12 V power supply “-V” terminal (18 AWG black) – BRX radio COM (create a pigtail using WAGO 221 Lever-Nut) – KTSW 18 AWG black wire
- 12 V power supply “ $\perp$ ” terminal (green, same gauge as 120 VAC mains) – KTSW ground lug using a tin-plated copper ring terminal suitable for a ¼” stud and the wire gauge used
- KTSW ground lug –CTL C wire green
 - Existing installations with K8X boards instead of K8X+ boards will not use this connection

Additional BRX radios labeled REPEATER or OFFICE that do not connect to a KTSW only require connections to the RPX power supply and omit the connections to the KTSW.

4.3 RS-485 Communication Connections

Use a designated RS-485 cable (3 conductor shielded) to connect a KTSW to a communication device. **Do not make multiple wire connections within a single terminal block and instead use a WAGO 221 Lever-Nut (rated for 12 to 24 AWG) creating a pigtail where required.**

4.3.1 Single Radio Connection

The following connections must be made inside of the KTSW panel:

- BRX A1– RS-485 A Black / White stripe – CTL A wire black
- BRX B1 – RS-485 B Black – CTL B wire blue
- BRX COM – RS-485 Signal Ground Green – CTL E wire yellow
 - Existing installations with K8X boards instead of K8X+ boards will not use this connection
- BRX COM – RS-485 Shield Bare
 - The RS-485 shield is only connected at this point; the other end of the shield is left floating

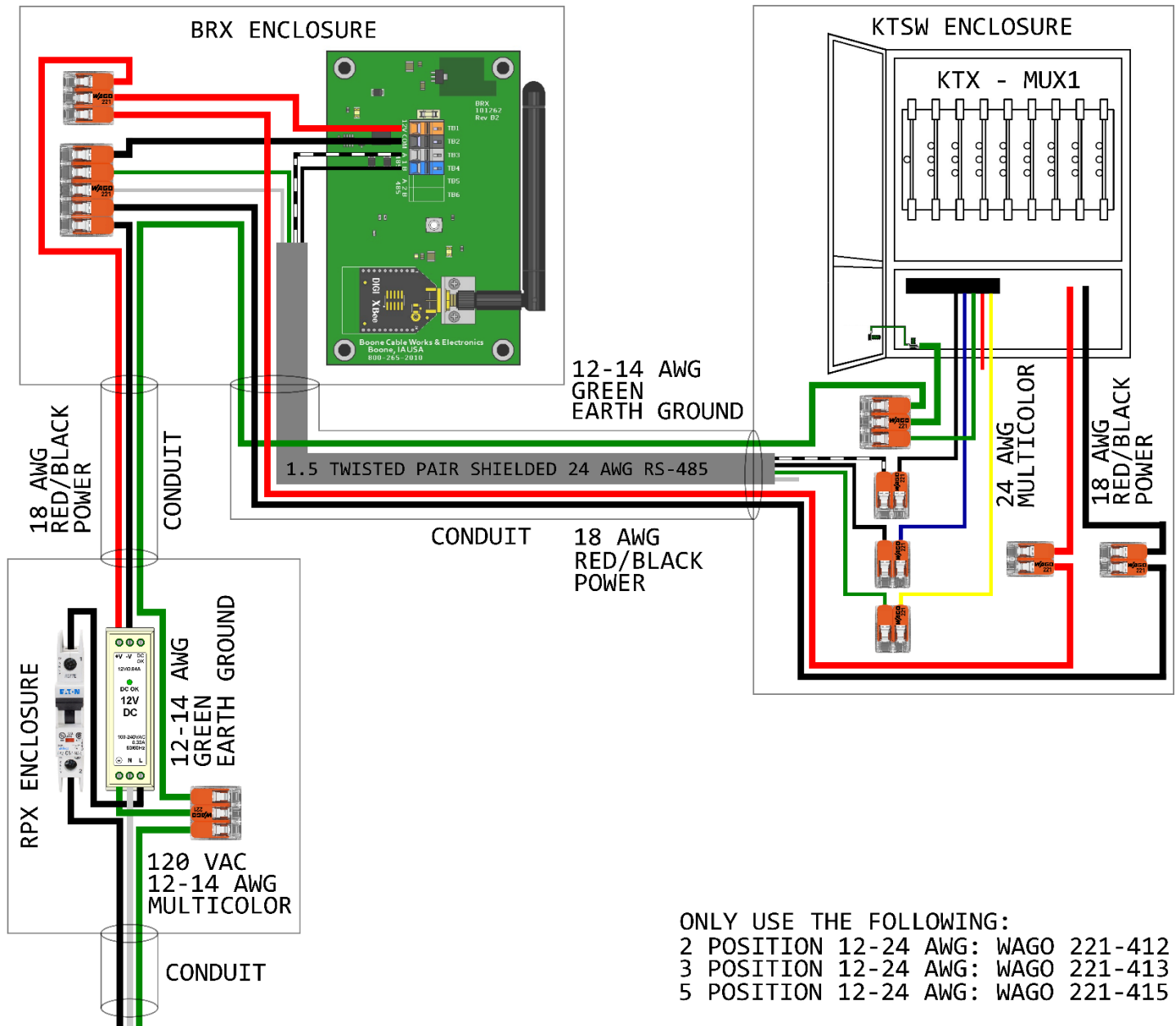


Figure 3: Single Radio Connections for Control Boards Marked "K8X+"

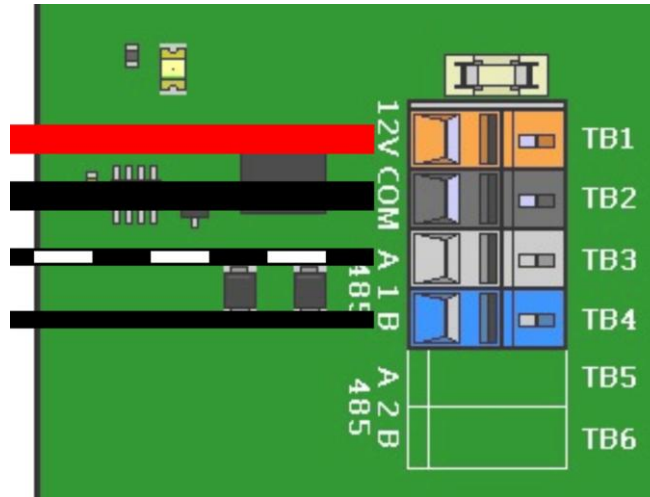


Figure 4: BRX Single Radio Connections Detail View

4.3.2 Dual Radio Connections

The dual radio installation matches the single radio installation, where the second KTSW RS-485 connections are terminated to the BRX “A2” and “B2” terminals instead of the “A1” and “B1” terminals as follows:

- BRX A2– RS-485 A Black / White stripe – CTL A wire black
- BRX B2 – RS-485 B Black – CTL B wire blue
- BRX COM – RS-485 Signal Ground Green – CTL E wire yellow
 - Existing installations with K8X boards instead of K8X+ boards will not use this connection
- BRX COM – RS-485 Shield Bare
 - The RS-485 shield is only connected at this point; the other end of the shield is left floating

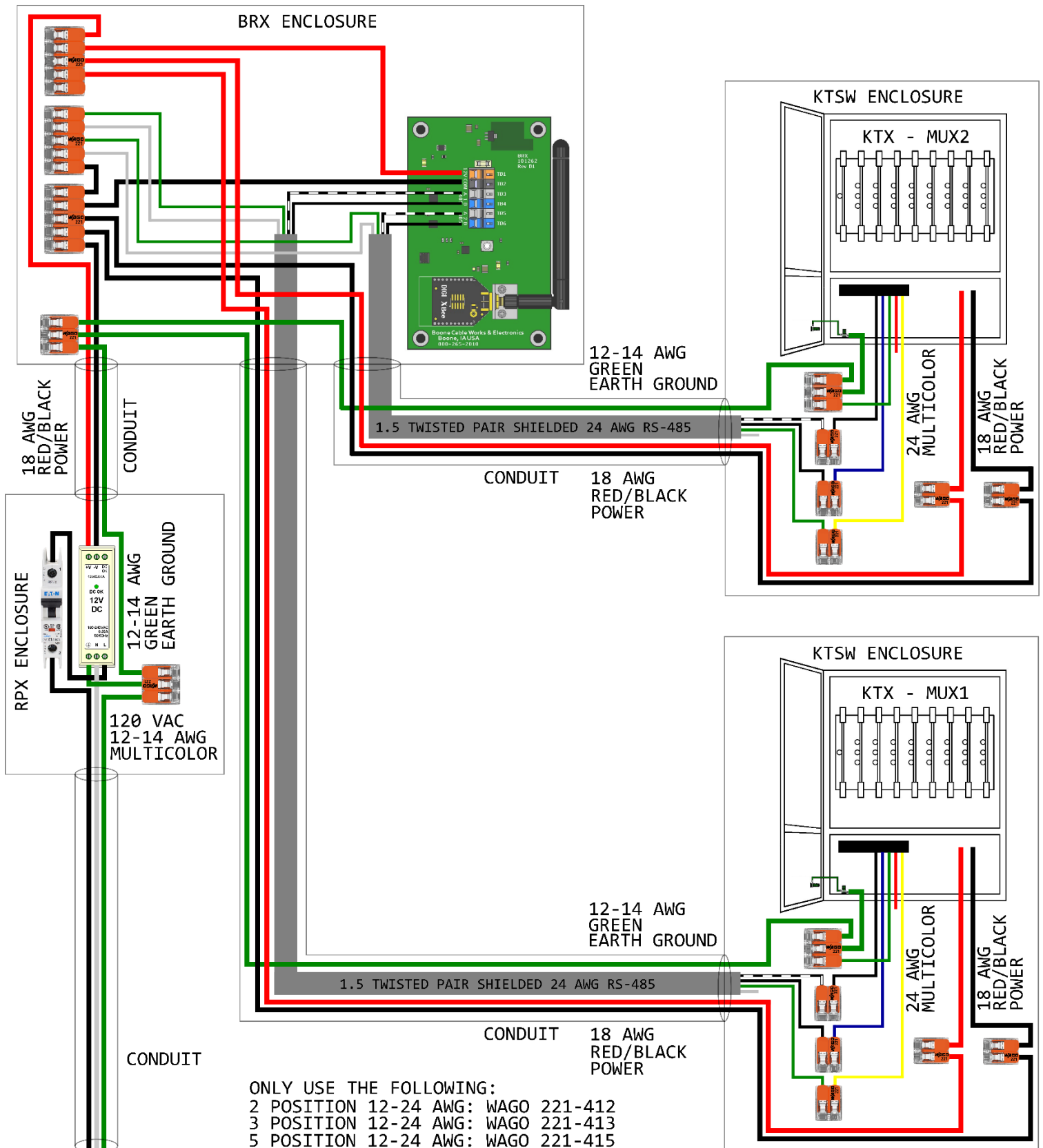


Figure 5: Dual Radio Connections for Control Boards Marked "K8X+"

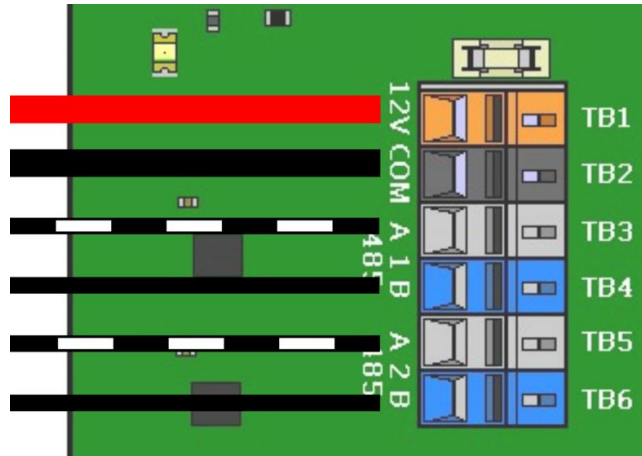


Figure 6: BRX Dual Radio Connections Detail View

5 Wiring Diagrams

The following sections will feature the more practical aspects and possibilities that may be encountered when installing the KTX System. Flexibility in the sizing of the KTX System will allow variation in the number of temperature cables attached to each KTSW.

5.1 KTSW Control Cable

Logic	Color Code	Function
A	Black	RS-485 A Signal
B	Blue	RS-485 B Signal
C	Green	Earth Ground Connection
D	Red	No Connection
E	Yellow	RS-485 Signal Ground

Table 2: KTSW Control Cable Color Code

5.2 Thermocouple Cable

TC Number	Leadwire Color	Constantan Color Group
1	Black	White
2	Blue	White
3	Green	White
4	Red	White
5	Yellow	White
6	Clear	White
7	Black	Brown
8	Blue	Brown
9	Green	Brown
10	Red	Brown
11	Yellow	Brown
12	Clear	Brown
13	Black	Orange
14	Blue	Orange
15	Green	Orange
16	Red	Orange
17	Yellow	Orange
18	Clear	Orange

Table 3: 18 Thermocouple Cable Color Code

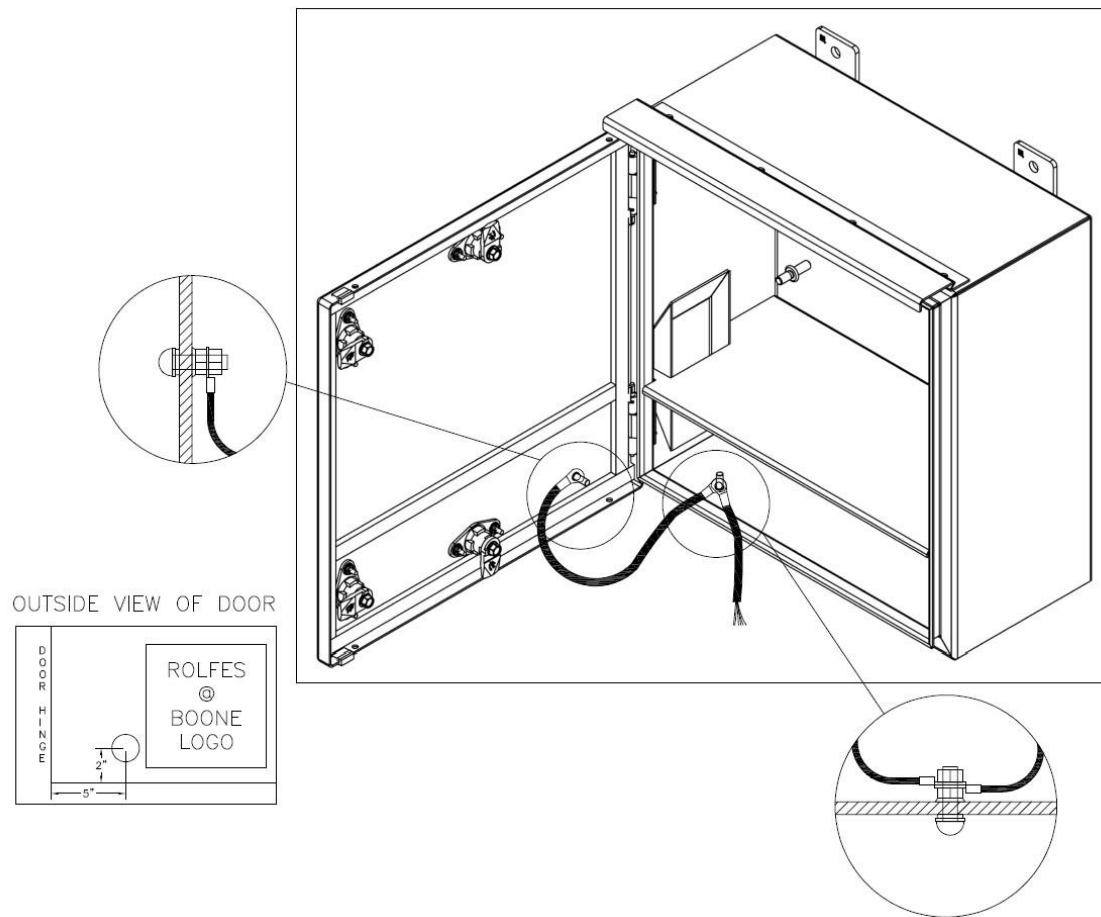


Figure 7: Grounding KTSW

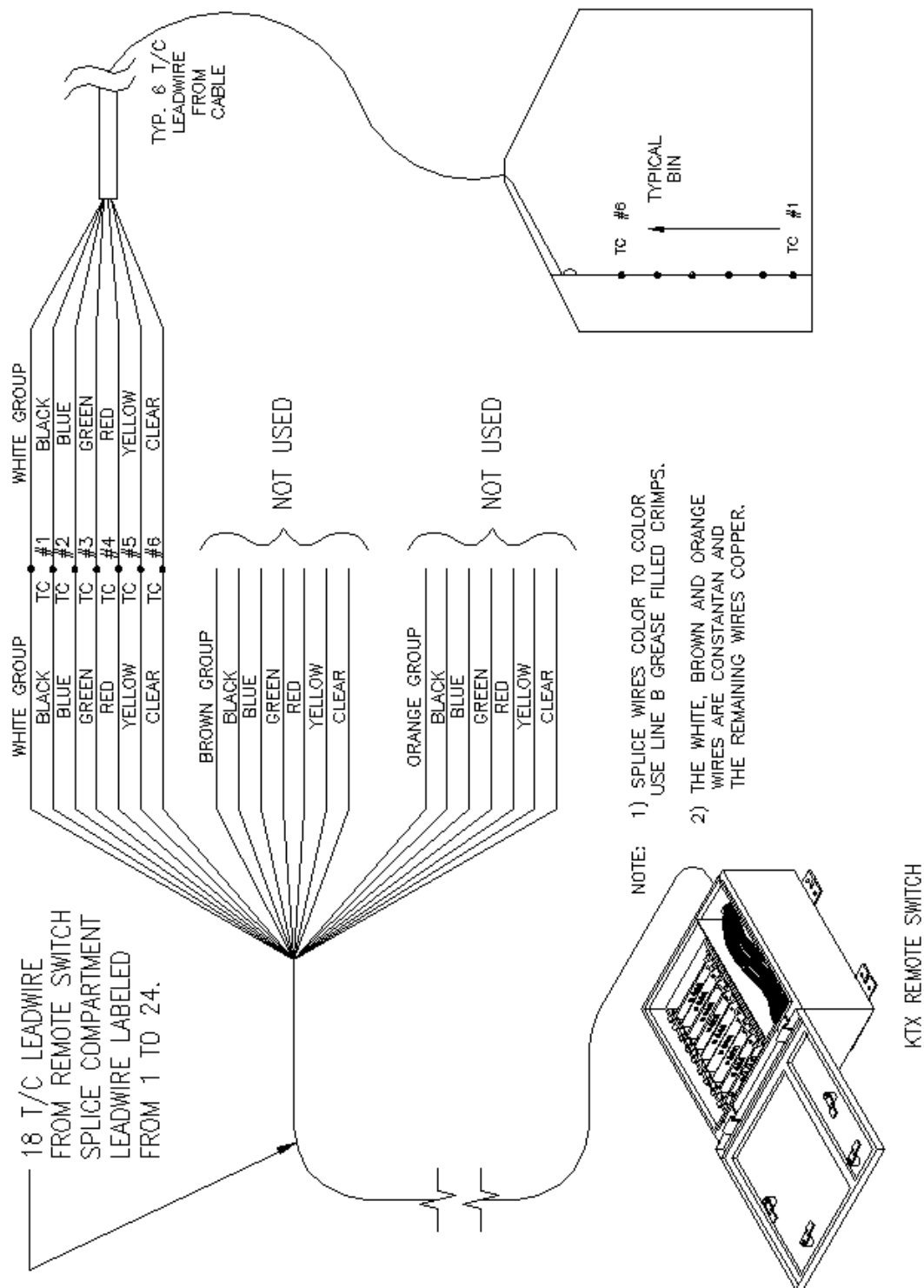


Figure 8: Wiring of an 18-TC KTSW to a 6-TC Cable

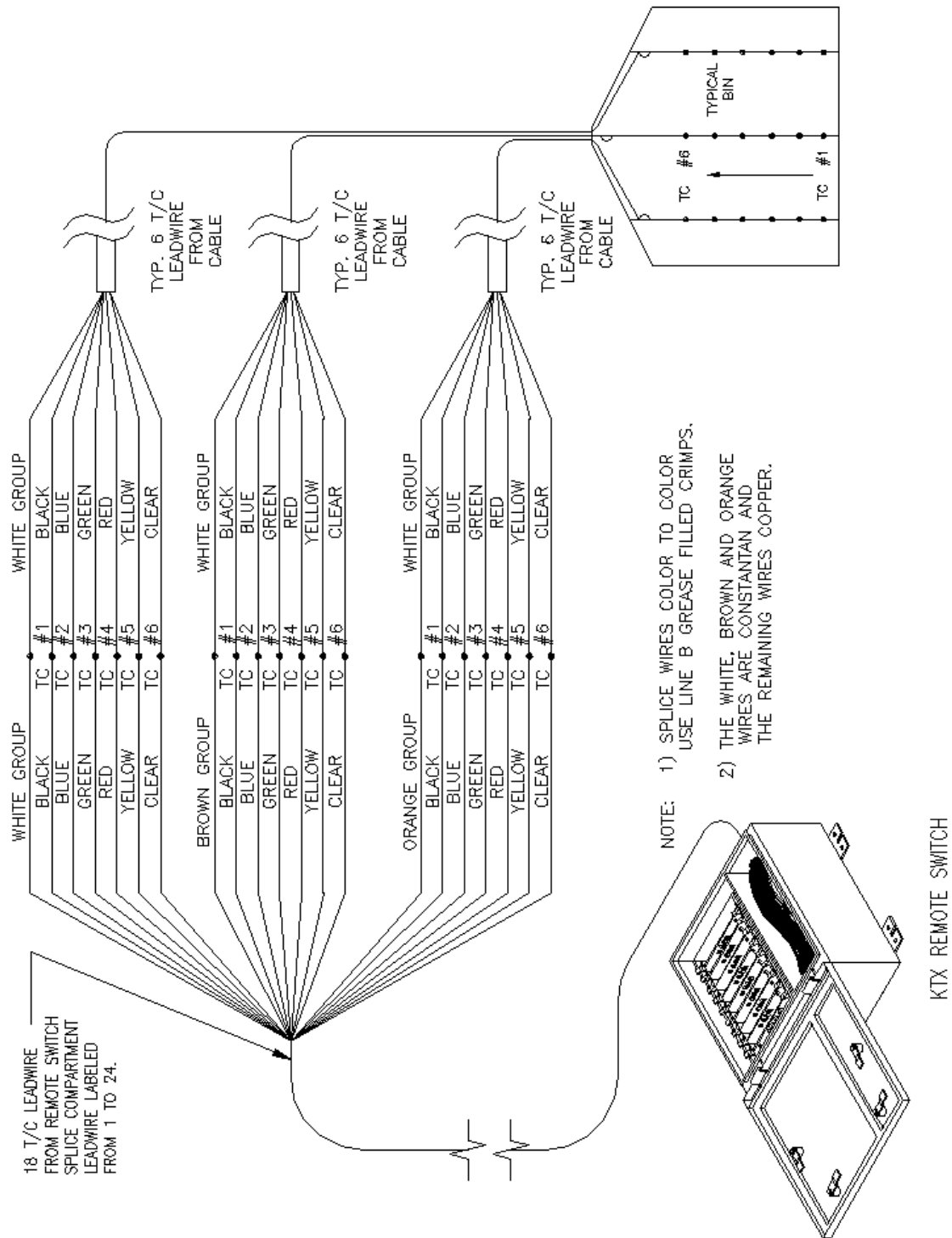


Figure 9: Wiring of an 18-TC KTX System to Three 6-TC Cables (6-TC Special)

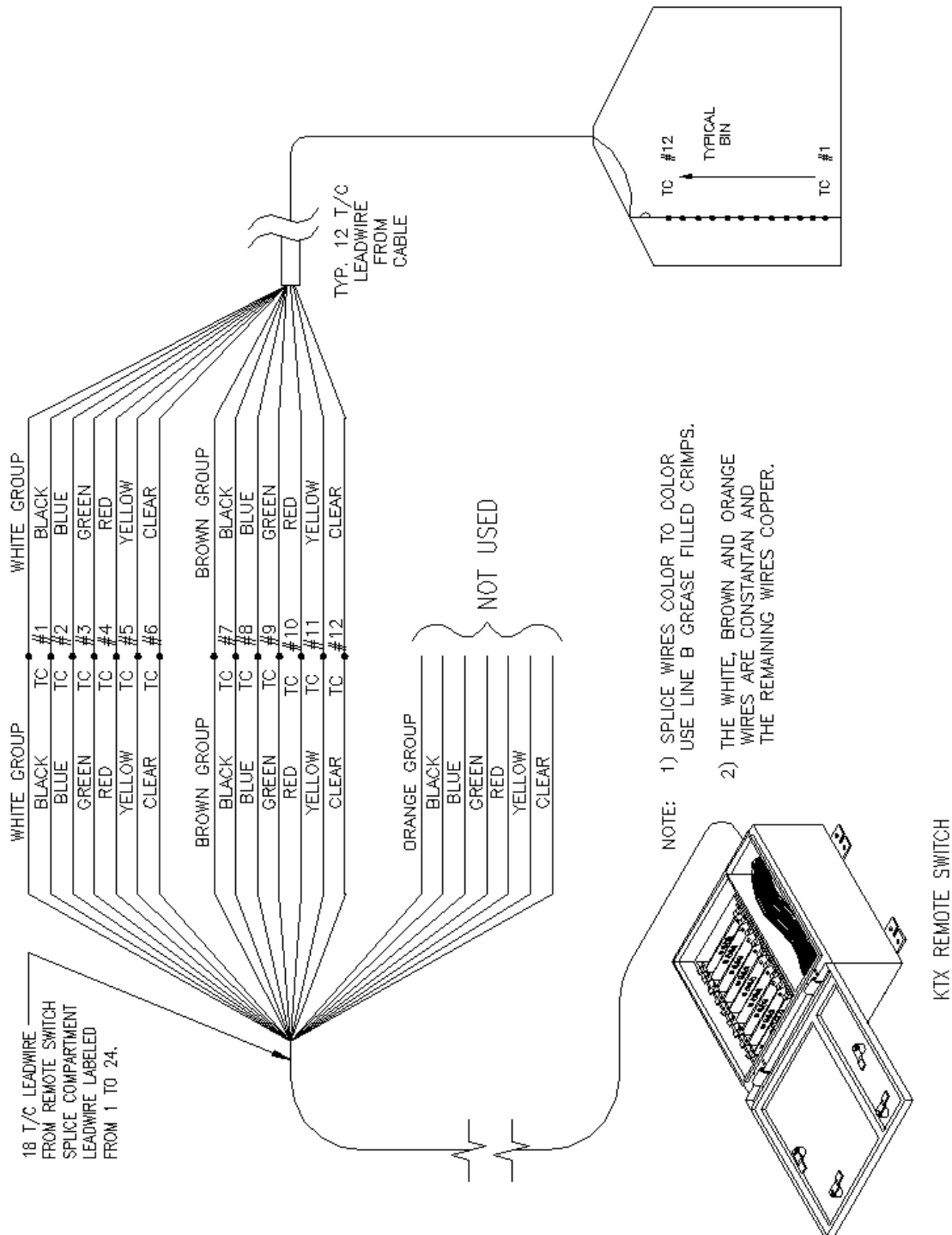


Figure 10: Wiring of an 18-TC KTX System to a 12-TC Cable

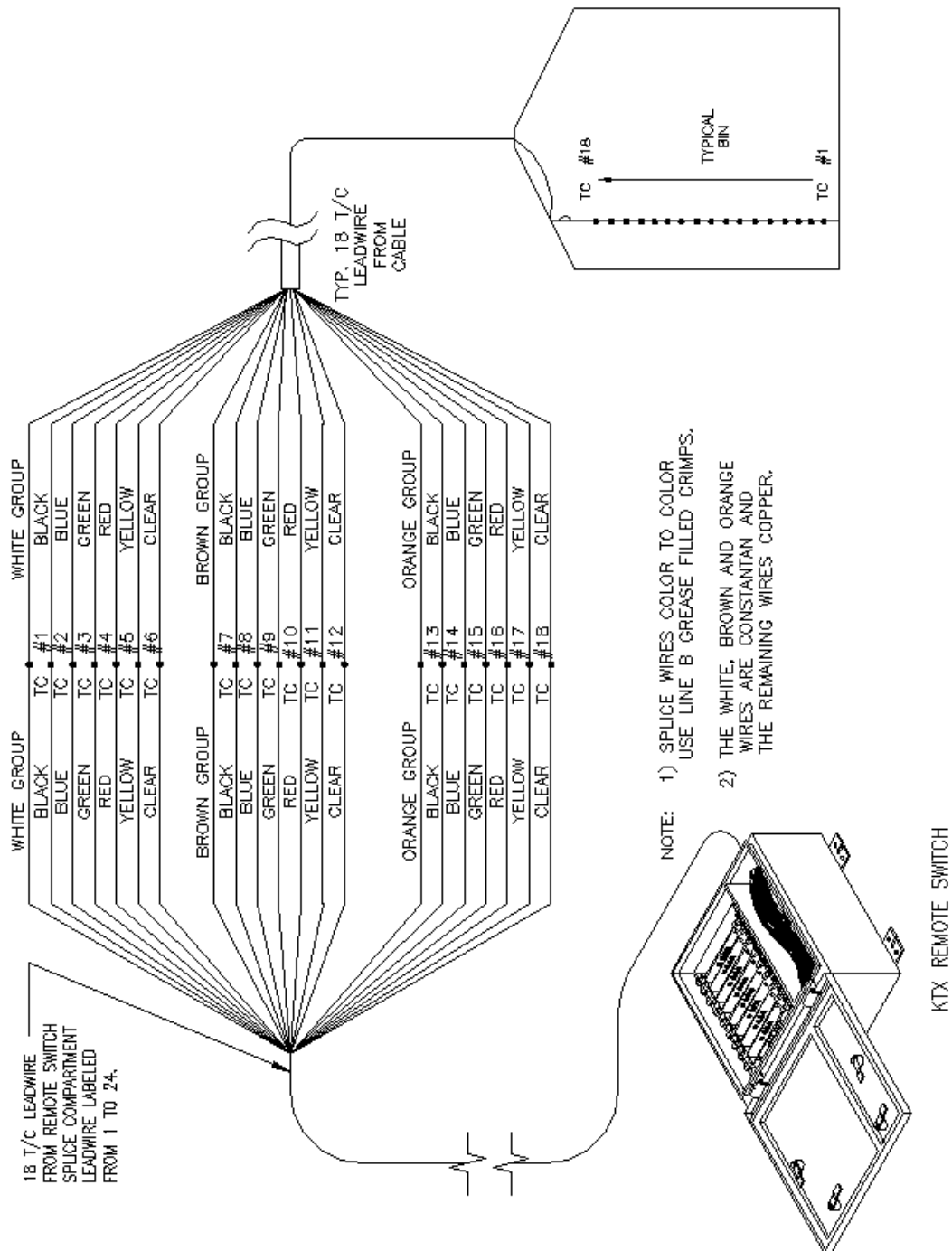


Figure 11: Wiring of an 18-TC KTX System to an 18-TC Cable

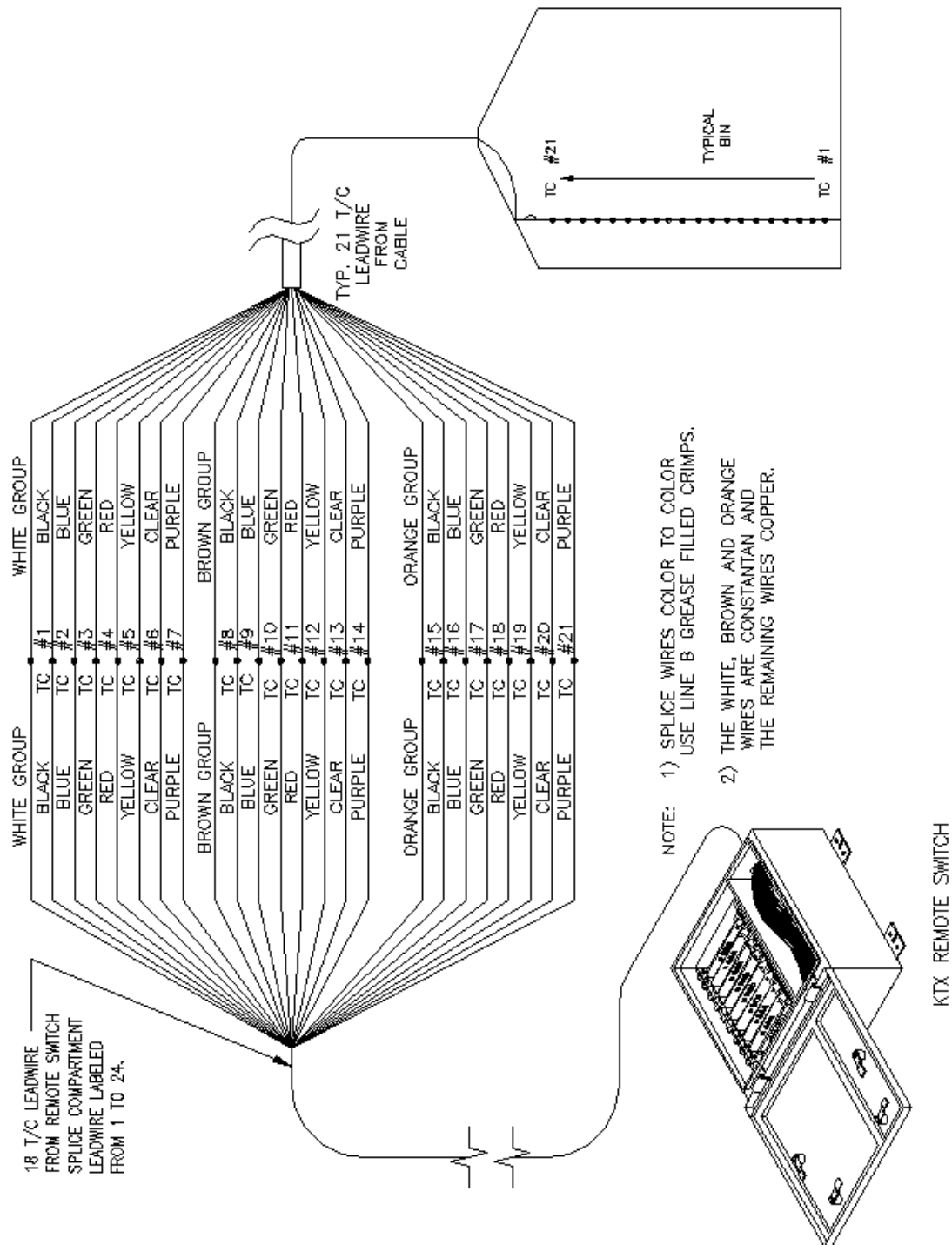


Figure 12: Wiring of a 21-TC KTX System to a 21-TC Cable

6 K1 Cable Select Board

6.1 Description

The K1 cable select boards are the switching elements that allow multiple cables and thermocouples to be read by the KTSW. Each K1 allows for 3 cables to be read. The installation of K1 boards allows flexibility in the sizing of the KTSW.

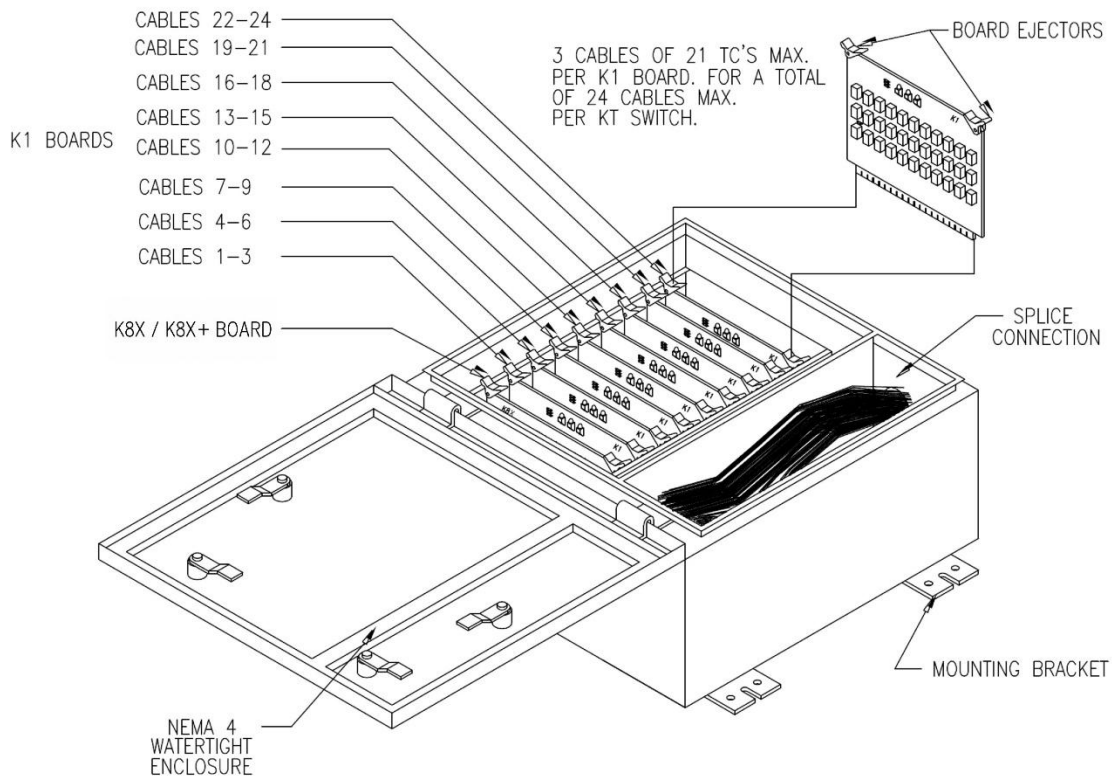


Figure 13: K1 Cable Select Boards Installed in KTSW

6.2 Troubleshooting

While reading the temperature cables, red LEDs on the edge of the K1s will be illuminated. Each LED will light in unison as the relays click through the temperature cables. Only one LED should be illuminated at a time. If an LED is skipped during the read, ensure all boards are fully seated into the KTSW by pushing firmly on the exposed card edge and power cycling the KTSW using the circuit breaker for 10 seconds.

7 K8X / K8X+ Control Board

7.1 Description

The K8X / K8X+ control board is the main controller of the KTSW and communicates over RS-485. The K8X / K8X+ performs the functions of cable selection (controlling K1 cable select boards), temperature measurement, and communication over RS-485.

The K8X+ board can be differentiated from the discontinued K8X board by the part number printed on the top left side of the board shown in dark blue below.

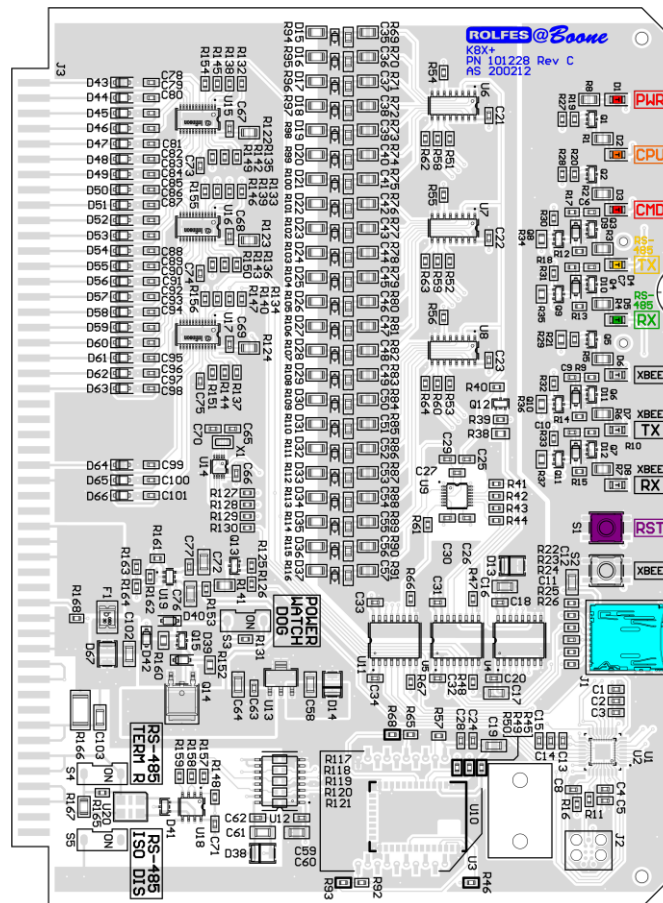


Figure 14: K8X+ Board Top Side

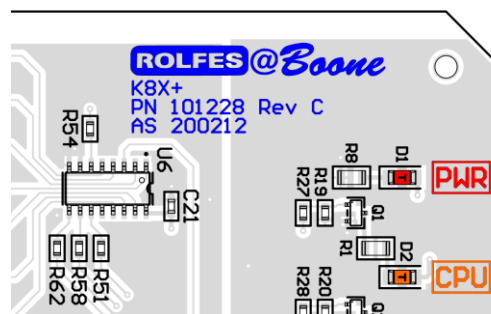


Figure 15: K8X+ Markings

7.2 Handling Precautions

The K8X / K8X+ boards are sensitive to electrostatic discharge (ESD). Uninstalled K8X / K8X+ boards must be kept inside of their static shielding bags until they are installed into the KTSW. When handling the K8X / K8X+ boards outside of the foil static shielding bag, touch a desk, KTSW, or surface the K8X / K8X+ is resting on to allow any static on your body to discharge *not* through the sensitive K8X / K8X+ board. Handle the board by its edges and avoid touching any of the circuitry on the board.

ESD is more prevalent in the winter months when humidity is lower, allowing static to build up and extra caution should be applied at these times.

Apply caution and avoid resting the K8X+ card on metal surfaces to prevent short circuiting the coin cell battery or any sub-circuits powered by it.

7.3 Coin Cell Battery

The K8X+ uses a coin cell battery for the purpose of timekeeping to allow timestamping its log files. Do not remove the CR2032 coin cell battery unless the K8X+ is installed in the KTSW and powered on, otherwise the real-time clock (RTC) will lose its programmed time. This will affect diagnostic logging to the Micro-SD card. The positive terminal of the battery must be installed as shown below.

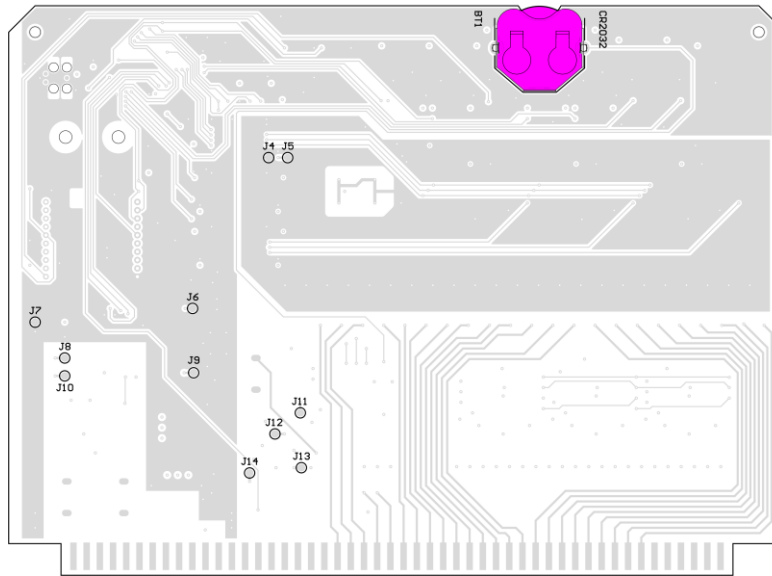


Figure 16: K8X+ Bottom Side

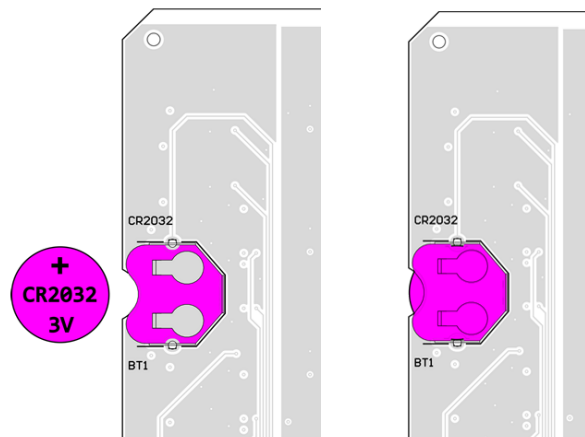


Figure 17: Coin Cell Battery Installation

7.4 Micro-SD Card

The K8X+ utilizes a Micro-SD card for the purpose of diagnostic logging and firmware update. The Micro-SD card required is 8 GB rated for the industrial temperature range (-40 to 85°C). Push the Micro-SD card into the socket until it clicks to lock the card into place. Push the Micro-SD card into the socket until it clicks again to unlock the card and allow it to be removed. The text side of the card is installed as shown below.

Apply caution when installing the K8X+ into the KTSW and avoid unintentionally ejecting the Micro-SD card from its socket.

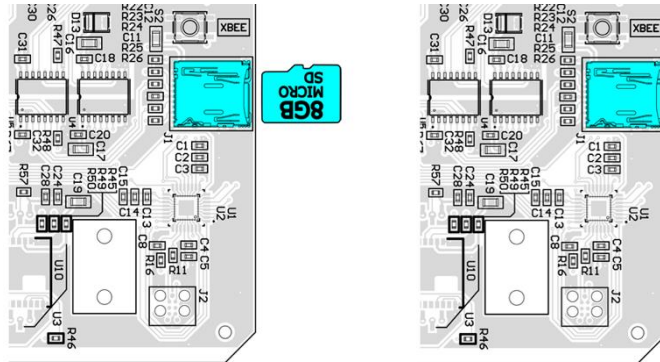


Figure 18: Micro-SD Card Installation

7.5 Reset

At times during troubleshooting or firmware updates, the K8X+ may require a reset.

The K8X+ has a reset button ("RST") indicated below. A brief press of the reset button performs a firmware reset, initiating the boot sequence. A long press of the reset button until all LEDs on the board turn off initiates a local power cycle of the K8X+, although this mechanism is rarely required and it is instead best to power cycle the KTSW through the circuit breaker for 10 seconds instead.

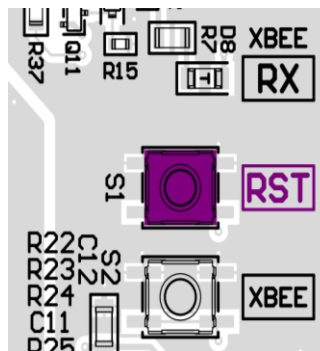


Figure 19: K8X+ Reset Button

7.6 Temperature Cable Static Dissipation

The K8X+ rapidly cycles through the K1 boards once per hour. This is performed to prevent static buildup on the thermocouple cables which may pose a risk to the K8X+. The rapid cycling through the K1 boards will sound to a bystander as electrical arcing. This is not arcing and is the sound emitted from the normal operation of the relays occurring in rapid succession.

7.7 K8X+ Commands, Responses, and Error Codes

The K8X+ takes commands with corresponding parameters that are separated by a null character (ASCII 0x00), space, dash, underscore, comma, or colon. Each command and response is completed by sending a carriage return (indicated with “\r” below). SwitchTest automatically adds the carriage return when sending commands and strips the carriage return out when showing received responses. Parameter values are indicated with underlines in the tables below.

Command	Format	Example Command	Response
Get	get\r	get\r	>MUX,K8X+,1.0,Off\r or >MUX,K8X+,1.0,On\r
Read Temperature	rt <u>CABLE-TC</u> \r <u>CABLE</u> 1 through 24 <u>TC</u> 1 through 21	rt 1-2\r read temperature of cable 1 thermocouple 2	>T,Cable- ,TC,Quality,FahrenheitF\r or >T,Cable- ,TC,Quality,CelsiusC\r Quality 1: Good thermocouple, Good K1 Quality -1: Bad thermocouple, Good K1 Quality -2: Bad K1 A quality of -1 will be accompanied by a temperature value to indicate the error. A quality of -2 may be accompanied by a temperature value to indicate an error: Fahrenheit / Celsius -2001: conversion timeout high Fahrenheit / Celsius -2002: conversion timeout low Fahrenheit / Celsius -2003: thermocouple resistance error
Turn K1 Boards Off	sm 0\r	sm 0\r	>0\r
Set Scale (Units)	ss <u>SCALE</u> <u>SCALE</u> F or C (F is default)	ss F\r or ss C\r	>TF\r or >TC\r

Table 4: K8X+ Frequently Used Commands and Responses

The following commands are infrequently used but are listed below for completeness.

Command	Format	Example Command	Response
Read Temperature Without Relay Check	rtm <u>CABLE</u> - <u>TC</u> \r <u>CABLE</u> 1 through 24 <u>TC</u> 1 through 21	rtm 1-2\r read temperature of cable 1 thermocouple 2 without checking the relays on the K1 boards	>T,Cable- ,TC,Quality,FahrenheitF\r or >T,Cable- ,TC,Quality,CelsiusC\r Quality 1: Good thermocouple Quality -1: Bad thermocouple A quality of -1 will be accompanied by a temperature value to indicate the error: Fahrenheit / Celsius -2001: conversion timeout high Fahrenheit / Celsius -2002: conversion timeout low Fahrenheit / Celsius -2003: thermocouple resistance error
Read Cold Junction Offset & Disable K1 Detection For 1 Hour	rb <u>TC</u> \r <u>TC</u> 1 through 21	rb 2\r	>V0-TC,1,Cold Junction Offset\r Cold junction offset is always set to -1, cannot change, and is not influenced by the TC selected
Read Cold Junction (K8X+ Board) Temperature	cj\r	cj\r	>CJ,FahrenheitF\r or >CJ, <u>Celsius</u> C\r

Read Thermocouple Voltage	rv <u>CABLE-TC</u> \r <u>CABLE</u> 1 through 24 <u>TC</u> 1 through 21	rv 1-2\r read voltage of cable 1 thermocouple 2	>V,Cable- ,TC,Quality,Millivolts\r Quality 1: Good thermocouple, Good K1 Quality -1: Bad thermocouple, Good K1 Quality -2: Bad K1 A quality of -1 will be accompanied by a millivolts value to indicate the error. A quality of -2 may be accompanied by a millivolts value to indicate an error. Millivolts -3000: conversion timeout high Millivolts -3001: conversion timeout low Millivolts -3002: conversion gain out of range Millivolts -3003: conversion microvolts too low Millivolts -3004: conversion microvolts too high
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Read Thermocouple Resistance	rr <u>CABLE-TC</u> \r <u>CABLE</u> 1 through 24 <u>TC</u> 1 through 21	rr 1-2\r read resistance of cable 1 thermocouple 2	>R,Cable-,TC,Quality,Ohms\r Quality 1: Good thermocouple, Good K1 Quality -1: Bad thermocouple, Good K1 Quality -2: Bad K1 A quality of -1 will be accompanied by a resistance value to indicate the error. A quality of -2 may be accompanied by a resistance value to indicate an error. Ohms -1000: conversion microvolts too low Ohms -1001: conversion microvolts too high Ohms -1002: conversion divide by zero Ohms -1003: conversion resistance too low Ohms -1004: conversion resistance too high Ohms -1005: conversion error microvolts Ohms -1006: conversion error cold junction
Jump to Bootloader	bt\r	bt\r	>ACK\r
Report Bootloader Version	btr\r	btr\r	>BOOTLOADER,K8X+,V1.0\r
Report Microcontroller Version	mcu\r	mcu\r	>AVR64DD32,64,8\r
Clear Temperature Faults	flt\r	flt\r	>CLEAR\r
Enable or Disable Logging to Micro-SD	log <u>EN</u> \r <u>EN</u> = 1, enabled <u>EN</u> = 0, disabled	log 1\r enable log or log 0\r disable log	>LOG,ENABLED\r or >LOG,DISABLED\r
List Contents of Micro-SD	ls\r	ls\r	>FILE,BYTES,[INDEX]\r

Read Contents of File	cat <u>INDEX</u> \r where <u>INDEX</u> is found using the "ls" command	cat 0\r	>START\r >LOG0000.LOG,[0]\r >END\r
Reset XBee (UNUSED)	xbeerst\r	xbeerst\r	>ACK,XBEERST\r
Read Real-Time-Clock (RTC)	rtc\r	rtc\r	>RTC,YYYY,MM,DD,HH,MM,SS\r
Set Real-Time-Clock (RTC)	rtc YYYY-MM-DD HH:MM:SS\r	rtc 2026-07-16 13:35:15\r Set UTC time to July 16, 2026, 1:35:15 PM	>ACK\r
Write Serial Number (FOR FACTORY USE ONLY)	sn <u>KEY</u> <u>SN</u> \r <u>KEY</u> is a unique code required to unlock the serial number writing <u>SN</u> 10 digits	sn <u>KEY</u> 0123456789	>SN,K8X+ <u>SN</u> \r
Set Resistance Read Offset (FOR FACTORY USE ONLY)	sr <u>OFFSET</u> \r To set a negative Ohms offset (-128 to -1): <u>OFFSET</u> = Ohms + 256 To set a positive Ohms offset (0 to 127): <u>OFFSET</u> = Ohms	sr 255\r Set offset to -1 (-1 Ohms + 256) = 255 sr 251\r Set offset to -5 (-5 Ohms + 256) = 251 sr 1\r Set offset to 1 sr 5\r Set offset to 5	>ACK\r >ACK\r >ACK\r >ACK\r
Force Watchdog Timer Reset	wdt\r	wdt\r	>Waiting for WDT\r If the hardware watchdog fails, the firmware watchdog will attempt to be forced: >HW WDT failed\r >Waiting for FW WDT\r If the firmware watchdog fails: >FW WDT failed\r

Table 5: K8X+ Infrequently Used Commands and Responses

7.8 K8X / K8X+ RS-485 Communication

The K8X / K8X+ boards communicate over RS-485 at 9600 baud with 8 data bits, no parity and 1 stop bit.

The K8X+ has an internal 120 Ohm termination resistor and does not require external termination. The K8X+ RS-485 is isolated and requires the RS-485 isolated ground to be connected as described in section 4.3 RS-485 Communication Connections.

7.9 K8X+ Board Troubleshooting

The K8X+ eight LEDs where five provide useable visual feedback. The additional three LEDs can be ignored.

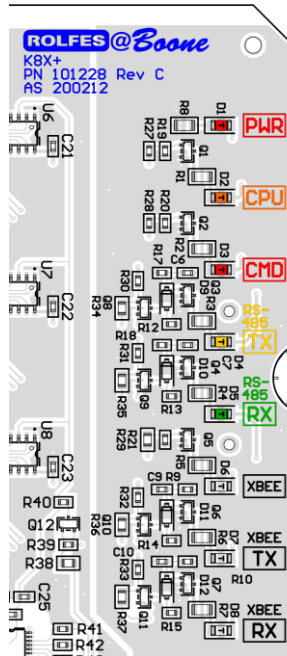


Figure 20: K8X+ LEDs

The K8X+ has 5 states indicated through the five LEDs as shown below.

LED Name	LED Color	Booting (30 sec.)	Idle	Command Receiving	Command Processing		Command Responding	
[PWR]	Red	ON	ON	ON	ON		ON	
[CPU]	Amber	Rapid Blink	Slow Blink	OFF	SD Good ON	SD Bad OFF	SD Good ON	SD Bad OFF
[CMD]	Red	OFF	OFF	OFF	ON		ON	
RS-485 [TX]	Yellow	OFF	OFF	OFF	OFF		Briefly ON	
RS-485 [RX]	Green	N/A	OFF	Briefly ON	OFF		OFF	

Table 6: K8X+ LED States

The [PWR] LED will be illuminated when power is applied. The K8X+ has a hardware power watchdog which when a fault is detected will power down for approximately 30 seconds before powering up. If the [PWR] LED is blinking rapidly, ensure that +12 V is available to the KTSW.

Symptom	Remedy
[PWR] LED blinks rapidly or fades	Ensure +12 V is stable and available to the KTSW. Attempt power cycling for 10 seconds using the circuit breaker.
[PWR] LED regularly turns off for 15 to 30 seconds at a time	Hardware watchdog timer is engaging, likely board failure, attempt power cycling for 10 seconds using the circuit breaker.
Boot sequence occurs repeatedly	Software watchdog timer is engaging, likely board failure, attempt power cycling for 10 seconds using the circuit breaker.
Boot sequence lasts for significantly longer than 30 seconds	Firmware not loaded, or board failure, attempt loading Micro-SD card with "K8X.bin" using your PC deleting "K8X.CUR" if it exists, reinstall Micro-SD card in K8X+ and click the reset button, if issue persists ensure the file was named "K8X.bin". If upon reading the Micro-SD card with your PC, "K8X.bin" is gone and now "K8X.CUR" exists, firmware is now flashed.
[CPU] LED not blinking once per second during idle	Likely board failure, attempt power cycling for 10 seconds using the circuit breaker.
[CPU] LED not ON when [CMD] LED is ON	Micro-SD card is not installed or is not functioning. Check Micro-SD card using your PC. File contents should include a file name "LOGSTAT.DAT" which contains a log name such as "LOG0123.LOG" and many log files. Ensure that no corrupted file names are present on the card. Ensure card is installed properly and attempt power cycling for 10 seconds using the circuit breaker.

The first LED is the red power LED which will illuminate when power is applied. The second LED is the amber CPU LED which toggles ON and OFF once per second. During a read, the CPU LED will be ON if the Micro-SD card is functioning and OFF if the Micro-SD card is not functioning. The third LED is the red CMD LED which is ON when a command is received and being processed, and OFF otherwise. The fourth LED is the yellow RS-485 TX LED which is ON when the K8X+ sends RS-485 data out. The fifth LED is the green RS-485 RX LED which is ON when the K8X+ receives RS-485 data in. The remaining three LEDs can be ignored.

When the K8X+ is first powered up after a period of being powered down, the red PWR LED will be solid ON and the amber CPU LED will blink rapidly for approximately 30 seconds. During this 30 second period, the K8X+ will not respond to commands.

7.10 K8X Board Troubleshooting

The K8X has two red LEDs that provide visual indication of the KTX System's status. The first LED is the power LED which will illuminate when power is applied. The second LED is the command LED which blinks when a read is in progress.

If both LEDs are illuminated for long periods of time, and the LEDs of the K1 boards do not change state, attempt power cycling of the K8X by switching the breaker that provides power to the OFF position, wait 10 seconds, then return the breaker to the ON position. If this does not resolve the issue, or the issue returns shortly, please contact Rolfes@Boone.

8 Software Requirements

8.1 Network Requirements

The KTX System requires communication between local and internet connected devices. Either the Digi ConnectPort X2 or X4 gateway link the BRX radios of the KTX System to the network through the ethernet connection on the gateway. The local PC hosts BCSGrain software for viewing temperature data locally, and the KTX App Hardware relays data to the cloud service for remote viewing.

Port	Purpose
80: TCP	For Digi ConnectPort X2 or X4 setup
7650 or 7670: UDP	For link between gateway, PC, and KTX App Hardware

Table 7: Network Port Requirements

The Digi ConnectPort X2 or X4 gateway requires a static IP address. The PC and KTX App Hardware can be assigned a static IP or assigned via DHCP.

The KTX App Hardware requires the following web addresses to be accessible through an internet connection:

- <https://rolfes-online.rolfesatboone.com/>
- <https://RMT-IoTHub-Staging.azure-devices.net>
- <https://rmt0storage0staging.blob.core.windows.net/configuration/>

8.2 PC Installation

The following programs must be installed on the local PC. Software and instructions are available at: <https://rolfesatboone.com/support/#manuals>.

- BCSGrain
 - Requiring the “Full Control” allowed in the “Security” tab when right clicking and selecting “Properties”

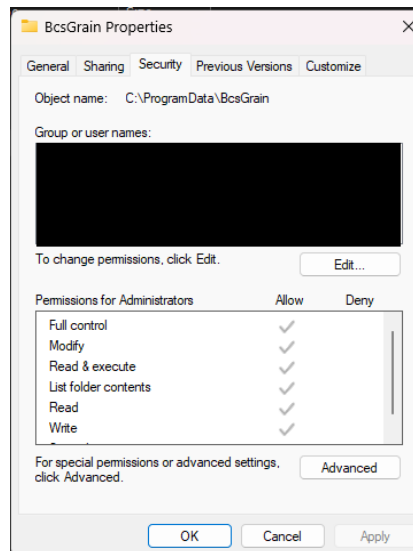


Figure 21: BCSGrain Properties

- SwitchTest
- Digi Device Discovery

8.3 Digi ConnectPort X2 or X4 Network Settings

Navigate to the Digi ConnectPort X2 or X4 gateway's IP address. This can be found by opening Digi Discovery on the local PC or a third-party IP scanner.

Once on the web page, select Network. Select "Use the following IP address" and entered the desired networking information. Once input, hit apply. This will require a reboot of the device. This can be accomplished by selecting "Reboot" on the left-hand navigation.

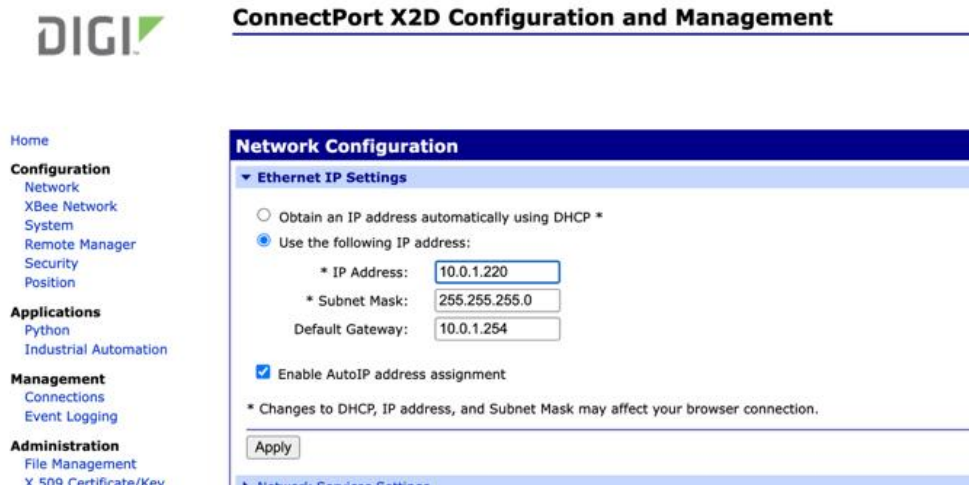


Figure 22: Digi ConnectPort X2 Network Configuration

8.4 KTX App Hardware Network Settings

IP settings for the KTX app hardware can be accomplished by navigating to the App Hardware IP address (found by a third-party IP scanner) or by navigating in a web browser to <https://revpi{serial#}.local:41443> and entering the username (pi) and the password printed on the side of the RevolutionPi device internal to the App Hardware box. Detailed instructions can be found at <https://revolutionpi.com/en/knowledge/static-ip-address>

8.4.1 OS Bookworm

Select Administrative access → Networking → eth0 and enter the static IP information.

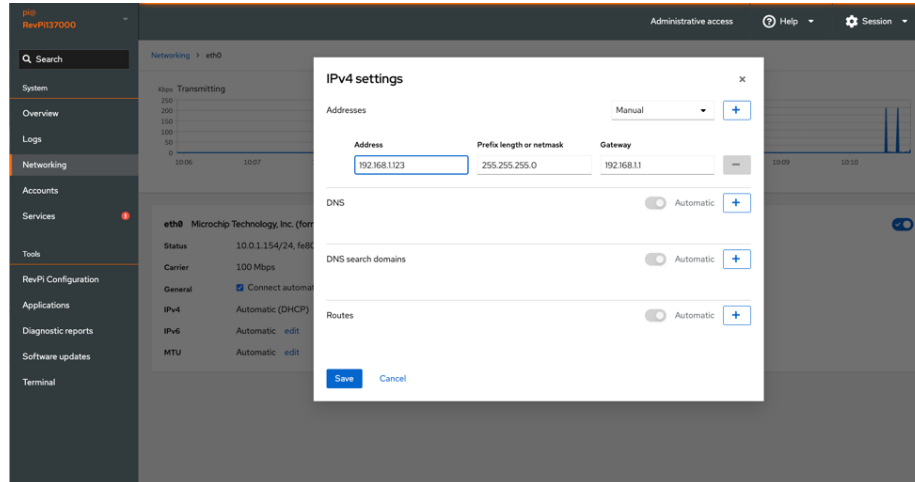


Figure 23: OS Bookworm Network Settings

8.4.2 OS Bullseye

Requires a terminal connection and set using network manager. From the terminal run the following command, you may be prompted to login to the superuser account:

```
sudo nmtui
```

Set as manual and define static IP address.

8.4.3 OS Buster and Earlier Versions

Edit “dhcpcd.conf” to assign a static IP address by issuing the following command in the terminal, you may be prompted to login to the superuser account:

```
sudo nano /etc/dhcpcd.conf
```

Edit the file by adding or adjusting the lines below, using the arrow keys to scroll through the file:

```
interface eth0
noipv6rs
static ip_address=192.168.0.10/24
static broadcast_address=192.168.0.63
static ip6_address=fd51:42f8:caae:d92e::ff/64
static routers=192.168.0.1
static domain_name_servers=192.168.0.1 fd51:42f8:caae:d92e::1
```

Save the file by pressing “CTRL + X” on the keyboard, then when prompted to save the modified buffer, press “Y” on the keyboard followed by “Enter”.

Restart the networking service by issuing the following command in the terminal:

```
sudo systemctl restart dhcpcd
```

Verify the new IP address by issuing the following command in the terminal:

```
ip addr show eth0
```

9 Troubleshooting the KTX System

9.1.1 Rediscovering Radio(s)

1. From the local PC, close all programs
2. Open Digi Device Discovery Software
3. Make sure it shows the IP address for the ConnectPort X2
4. Double-click the IP address
 - a. This will open the web browser
5. In the top left corner, click on "XBee Network"
6. In the middle right of the page, underneath the "Discover XBee Devices" button, checkmark "Clear list before discovery"
7. Click on the "Discover XBee Devices" button
8. In the list above, make sure all the radios show up, KTX01 through [number of radios] + Office or Repeater(s)
9. When done with discovering, at the bottom left of the page, select "Reboot"
10. Click the "Reboot" button at the top
11. When it's done, it will go back to the home screen
12. Close out the programs and open the "Switch Test" program
13. On the Interface window, select the "Gateway", and click on the "Select" button below
14. On the Switch Test window, at the bottom left, put the device on number 1 with the up arrow
15. In the window above the response should look like:
 - a. TIMESTAMP IP ADDR 1get
 - b. TIMESTAMP IP ADDR >1ack
 - c. TIMESTAMP IP ADDR 1:MUX,K8X,Version,Off
 - i. or [TIMESTAMP] [IP ADDR] >1:MUX,K8X+,Version,Off
16. Repeat step 14 for all the other devices and make sure you get the same response for each device
17. Close SwitchTest and restart BCSGrain
18. When BCSGrain shows "Ready (next read [TIME])" go up to "Read" and "Begin Read"

9.1.2 Check Power and Connections

- Check the BRX to see if the lights are on
 - A solid light and a blinking light indicating normal operation
- Cycle power to the Gateway and disconnect / reconnect the ethernet cable
- Ensure all K8X / K8X+ and K1 boards are fully installed into the KTSW

9.1.3 Check Software and Network

- Make sure multiple programs are not running in the background
 - Open Task Manager look for a "BCSGrain Temperature System" or "SwitchTest" being listed under the "Running Apps" section
 - Close the programs
- In BCSGrain check under Tools / Options / Network if the IP address has changed for the "GW".
 - If so, contact your IT department

10 Acronyms and Abbreviations

Acronym / Abbreviation	Definition
AC	Alternating Current, typically high voltage electricity
ASCII	American Standard Code for Information Interchange
AWG	American Wire Gauge
BRX	Wireless radio for KTX System
DC	Direct Current, typically low voltage electricity
ESD	Electrostatic Discharge, static discharge that can harm electronics
FULL MUX	Synonym of KTX Switch accepting 1 to 24 temperature cables
FW	Firmware
Gateway	Physical link between KTX System hardware and software
GB	Gigabyte, a measure of storage capacity
HALF MUX	Synonym of KTX Switch accepting 1 to 12 temperature cables
HW	Hardware
K1	Cable select board, is installed into KTSW
K8X	Control board (discontinued), is installed into KTSW
K8X+	Control board, is installed into KTSW
K8X / K8X+	Control board, referencing both the K8X or K8X+ interchangeably
KTSW	KTX Switch
Leadwire	Extension wire that connects temperature cables to the KTSW
LED	Light Emitting Diode, illumination indication device
Micro-SD	Storage device for diagnostic log files
MUX	Synonym of KTX Switch, abbreviated from Multiplexer
PC	Personal Computer
RPX	Power supply for KTX System
RS-485	3 wire industrial communication standard
RTC	Real-Time Clock, a timekeeping device using a backup battery
RX	Receive
TC	Thermocouple, temperature sensing junction
TX	Transmit
UTC	Coordinated Universal Time, standard time zone used
VAC	Volts Alternating Current
VDC	Volts Direct Current

Table 8: Acronyms and Abbreviations