

Technical Manual for ERI Model EC130 RF Dual Switch Controller



TM_EC130
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Technical Manual for ERI Model EC130 RF Switch Controller

Part Number: TM_EC130_RF_Switch_Controller

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Preface

Returns and Exchanges

Damaged or undamaged equipment should not be returned unless written approval and return authorization has been received from Electronics Research, Inc. Special shipping instructions and coding will be provided in said return authorization to assure proper handling. Complete details regarding circumstances and reasons for return should be included in the return request. Custom equipment or special order equipment is not returnable. In those instances where return or exchange of equipment is at the request of the customer, or of convenience to the customer, a restocking fee will be assessed. All returns will be sent freight prepaid and properly insured by the customer. When corresponding with Electronics Research, Inc., always specify the order number or invoice number to which the shipment applies.

Unpacking

Carefully unpack the equipment and perform a visual inspection to determine if any damage occurred during transit. Retain the shipping materials until it has been determined that all received equipment is undamaged. The carrier may inspect the packing material as part of the claim process. Retain and use the packing lists to help locate and identify any and all components and assemblies that are removed for shipping purposes and must be reinstalled upon receipt of the unit. Any shipping supports and/or packing materials should be removed.

Technical Assistance

Electronics Research, Inc. technical support can be reached during normal business hours (7:30 AM – 4:00 PM US Central Time) via telephone at +1 (812) 925-6000 or FAX at +1 (812) 925-4030. You may address correspondence to:

Technical Support
Electronics Research, Inc.
7777 Gardner Road
Chandler, Indiana 47610 USA

Purpose of this Manual

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions that should be observed by personnel in using this or other electronic equipment.

The information provided in this manual, technical or otherwise, is not intended as a design guide and should not be construed as such. This manual is not intended to provide complete or exhaustive information regarding the general theory behind or the operation of RF electronic equipment, electromagnetism, or any electronic component or system that requires specialized instruction or education in order to thoroughly

understand its operation. In short, this manual is intended as a basic guide to the operation of the components described herein for specifically trained and qualified personnel only.

Warning Regarding Personnel Risks

Warning

THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY WARNINGS, INSTRUCTIONS AND REGULATIONS.

The installation, operation, maintenance and service of this equipment involve risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. ERI, Inc. shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building and electrical codes and fire protection standards must be observed. The following National Fire Protection Association (NFPA) standards are recommended as reference:

1. Automatic Fire Detectors, No. 72E
2. Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
3. Halogenated Fire Extinguishing Agent Systems, No. 12A

Warning

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Warning

IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

Do not remove, short-circuit, or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances.

First-Aid

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures; it is a brief and is only to be used as a reference. It is the duty of all personnel using the equipment to

be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin
 - Cover area with cleanest available sheet or cloth.
 - Do not break blister, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
 - Treat victim for shock as required.
 - Arrange transportation to a hospital as quickly as possible.
 - If arms or legs are affected keep them elevated.

Note: If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes.

Discontinue fluid if vomiting occurs. Do not give alcohol.

2. Less severe burns - (1st & 2nd degree)
 - Apply cold (not ice cold) compresses using the cleanest available cloth article.
 - Do not break blisters, remove tissue, remove adhered particles of clothing, or apply slave or ointment.
 - Apply clean dry dressing if necessary.
 - Treat victim for shock as required.
 - Arrange transportation to a hospital as quickly as possible
 - If arms or legs are affected keep them elevated.

Reference: [American Red Cross Standard First Aid and Personal Safety Manual (Second Edition)]

General Information

This document provides technical information pertaining to the installation and operation of the Electronics Research Inc. motorized RF dual switch controller.

Switch Controller Description

The EC130 motorized RF switch controller is designed to operate a two industrial standard motorized waveguide or coaxial RF switch. The controller is contained in a 5.23-inch standard 19-inch rack mountable chassis. The front panel, shown in figure 1 below, has a key-lock selector switch and a red/green LED that indicates the RF switch's interlock status. The controller display shows both switch positions and provides buttons to initiate a state change. The controller rear panel, shown in figure 2, provides the status and control connection to the RF switch, a transmitter control interlock circuit and a remote status and control interface. The transmitter control interlock circuit is used to insure that RF power is removed from the RF switch before changing its position. It will also prevent RF power from being applied when the switch is not locked in an operating position.

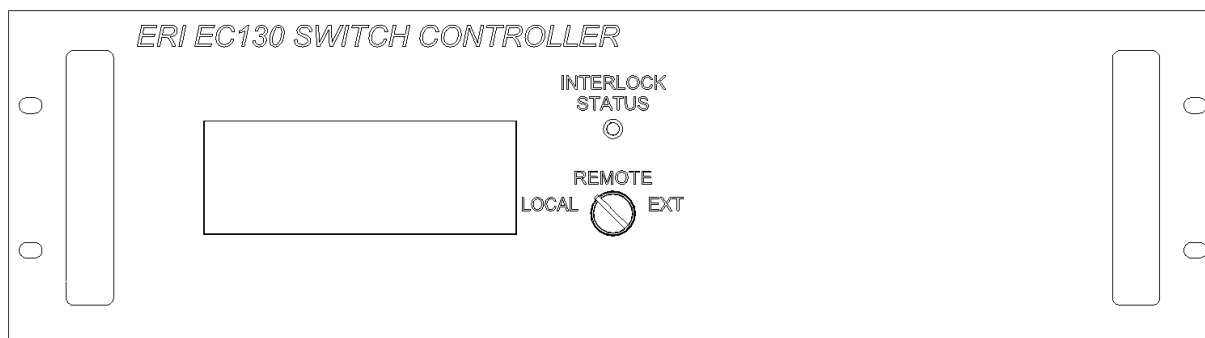


Figure 1 Switch Controller Front Panel

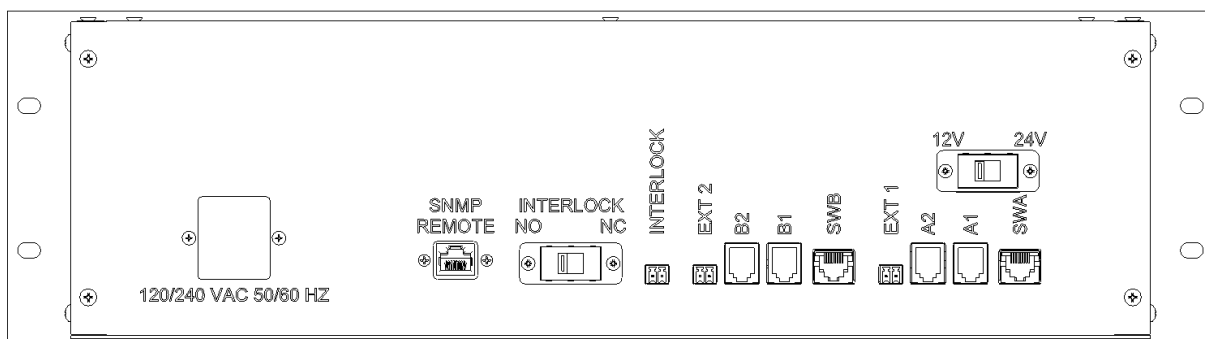


Figure 2 Switch Controller Rear Panel

RF Switch Requirements

The controller requires that the motorized RF switch DC voltage matches the controller DC voltage (either 12V or 24V available) The switch must have two form A (Normally Open Contact) limit switches in each of its two positions. It is expected that the RF switch control system will have a three terminal interface such that the switch is driven by briefly applying the control voltage to two of the three pins. One pair will drive the switch to position 1 and the other to position 2. The common pin is shared between the remaining two pins and is connected to the negative terminal of the switch controller's power supply. See the controller circuit diagram in the **Parts and Drawings** section of this manual for more details.

Specifications

AC Input

Voltage	84 to 264 VAC
Frequency	47 to 63 Hz
Current	1.2 A (120 VAC) 0.8 A (240 VAC)

DC Control Power

Voltage	12 or 24 VDC
Max Current	1.0 A (12 VDC) 0.5 A (24 VDC)

Environmental

Operating Temperature	0 to 50 C
Storage Temperature	-20 to 70 C
Humidity	30% to 85% (non-condensing)

Installation

Installation consists of mounting the controller box in a rack panel, supplying AC power, connecting the controller to the RF switch, wiring the transmitter interlock circuit and optionally wiring the remote control interface. This section describes how to do this.

READ BEFORE APPLYING POWER

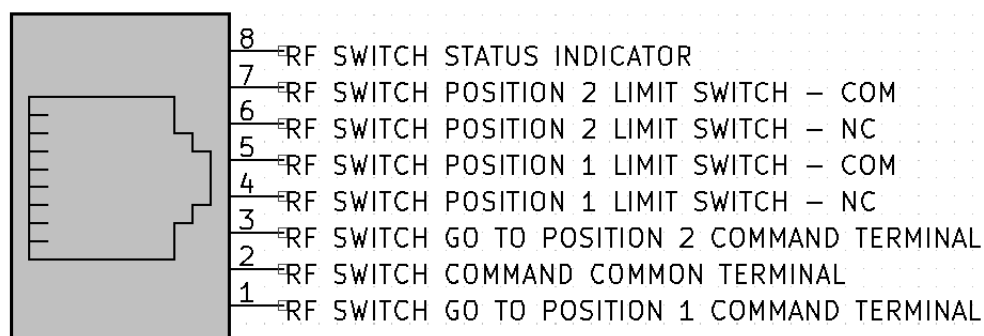
The EC130 is capable of 12Vdc or 24Vdc operation of two switches. It is not capable of controlling both a 12Vdc and a 24Vdc switch simultaneously. **VERIFY** the control voltage required by the switch intended to control and toggle the slide switch on the back panel to the appropriate voltage before powering the switch controller. Failure to do this first step may **DAMAGE** the switch circuitry.

AC Power

AC power is supplied to the controller by means of a standard computer power cord. A six foot cord is supplied with the controller.

Switch Control Cable (SWA or SWB)

The RF switch control cable is a standard Cat-5 or Cat-6 ethernet cable.



RJ45 SWITCH CONNECTION

Figure 3 RF Switch Control Cable Wiring

Preparing a switch to be used with the EC130

The EC130 is designed to work with ERI “C” model switches. The EC130 and a “C” series switch is plug-n-play after verifying the control voltage.

If a switch is being used that is not an ERI “C” model, use the diagram above to connect the appropriate wires to the RF switch’s limit contactors. The EC130 will provide +24 Vdc to the common pin 7. In order for the RF Switch Status Indicator to provide feedback and allow switching, the COM pin of the limit switch (pin 7) must be connected directly to pin 8 by means of a jumper wire **at the switch**. This allows a +24Vdc signal

to be read at the EC130 which indicates the switch is connected. This is already in place if the EC200 Wiring harness is used with a “B” series ERI switch or an ERI “C” series switch is used.

Wiring the Transmitter Interlock Circuit

The transmitter interlock circuit is used to turn the transmitter off before the RF switch is driven and to keep the transmitter off until the switch is locked in a safe operating position. This circuit is controlled by the PLC unit. See figure 15 &16 on pages 20 and 21 in the Operation section of this manual for a drawing of the actual circuit. This circuit is terminated at terminals 1 and 2 connector labeled INTERLOCK on the rear panel of the controller. This circuit should be connected to the appropriate control interface of the transmitter that supplies the RF power that passes through the switch. The purpose of this circuit is to insure that the transmitter is off or muted whenever the circuit is open. The relays and switches in this passive circuit can handle 6 amps of either AC (up to 240 VAC) or DC (up to 28 VDC). A one second delay is programmed into the switching logic to ensure the interlock is triggered prior to exercising the switch. A delay is also programmed to close the interlock circuit one second after the switch has entered the final position. To ensure the switch is in position, the switch position limit switches may be wired in series with the switch controller Interlock connections. The limit switch connections must be made at the switch. Refer to the switch manual to find the appropriate connections.

Wiring the SNMP Remote Control Interface

The switch controller remote control interface is brought out through the rear panel via an RJ45 Ethernet connector and can be connected to a switch or router to provide remote access to the EC130 switch controller.

Wiring the RF Power Detection Interface

The RF power detection interface can be used with an ERI VDM303 Power Detector. These power detectors are powered by a 24Vdc power supply, provided by the EC130 switch controller and provide a 4-20 mA signal. RF connections A1 and A2 should only be place on ports 1 and 4, or 2 and 3 if both used. If a shorting cap is used on port 4, a single power detector on port 1 is all that is needed. RF connections A1 and A2 will only affect the operation of Switch A. Likewise, RF connections B1 and B2 will only affect the operation of Switch B.

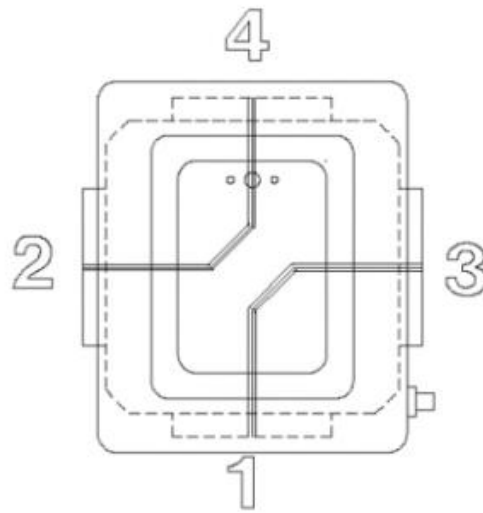
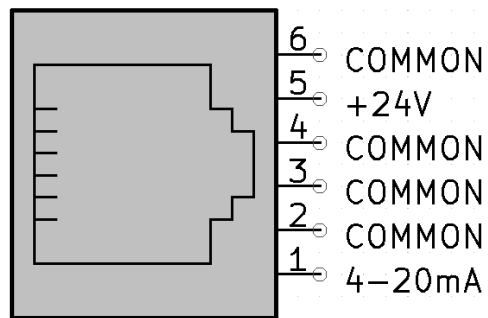


Figure 4: Switch Port Diagram (Shown in position 2)



RJ11 RF POWER DETECTOR

Figure 5: Power Meter Pinout Connection

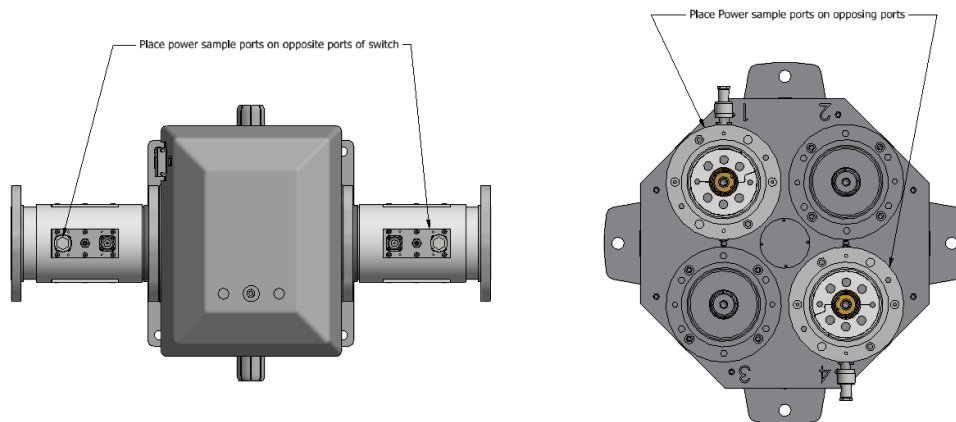


Figure 6: Power Sample Placement Best Practice

Operation

The operation of the EC130 switch controller is explained in this section.

Front Panel Operation

The front panel of the controller Menu Driven User Interface, a red/green LED and a 3-position switch-lock.

The red/green LED shows the current status of the interlock. Green means the interlock is active and the switches are in proper position and red shows that the interlock has been interrupted because the switches are out of position.

The 3-position selector switch-lock sets the operating mode of the controller. When the switch-lock is in the Local position both Remote and EXT control of the RF switch is disabled although the red/green LED and User Interface will continue to show the RF switch's current position and interlock status. When in the LOCAL position the RF switch may only be controlled by means of the front panel control interface. When in the REMOTE position the switch may only be controlled by means of the controller's remote control interface. The control interface can still be navigated while in the REMOTE or EXT positions.

Menu Navigation

The "A" and "B" buttons are action buttons when needed on each screen. The "-" and "+" buttons are used to increment or decrement through menus. The "Cancel" and "OK" buttons denoted by a circular backwards arrow and checkmark, respectively, are used to cancel or accept new settings to the switch controller.

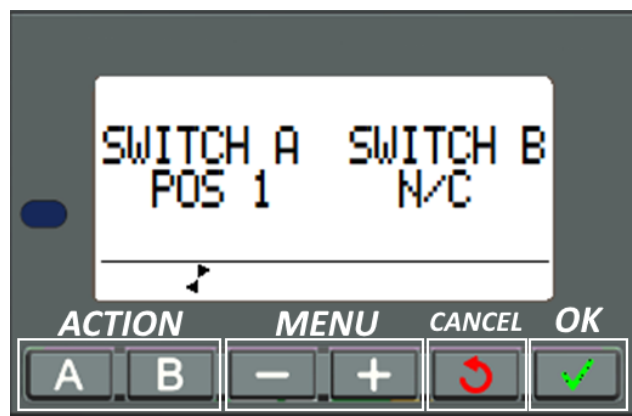


Figure 7: Main Menu

The main screen shows the status for each switch. If a switch is not detected, and N/C (not connected) status will show in lieu of a switch position.

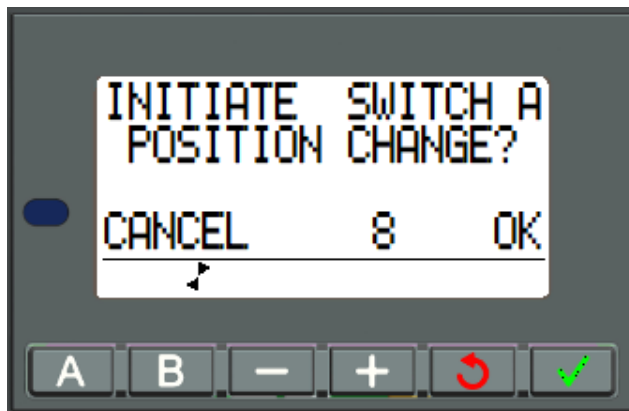


Figure 8: Confirm Menu

Pressing the “A” action button while on the main screen when Switch A is connected will initiate a switch change. The “OK” button needs to be selected within 10 seconds to confirm the position change. If the switch is not connected, the action button will have no effect. The “B” action button presents a similar dialog for a switch connected to the switch B port.

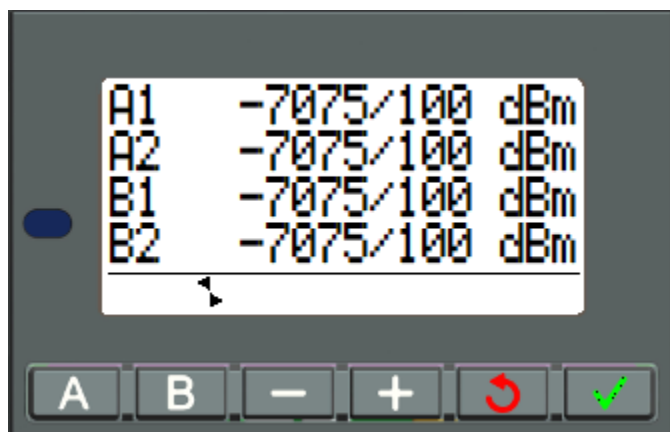


Figure 9: Power Meter Menu

Pressing the “+” menu button will advance to the Power Meter screen. Power meters A1 and A2 should be connected to opposing ports of switch A while power meters B1 and B2 should be connected to opposing ports of switch B. The power meters watch for any power present on the switch and prohibit switching if the power is greater than 5 dB from the noise floor. The power meters should be placed on voltage probes or forward ports of directional couplers.



Figure 10: Power Meter Offset Menu

Pressing the “+” menu advance button again brings you to the offset menus for the power meters. If desired, the coupling value of the directional coupler or voltage probe can be added here to display a more accurate reading of power on the previous screen. Each sensor has it’s own offset value. Pressing the “A” action button will increase the offset value while pressing the “B” action button will decrease the offset value. These values are read in dBm. The values are divided by 100 in order to get the actual dBm readings.



Figure 11: Power Meter Offset Menu Example

The offset value shown in this image is equal to 20 dBm.

Changing these values has no bearing on whether power is present for switch control.

Pressing the “-” menu button will return to the previous menu.

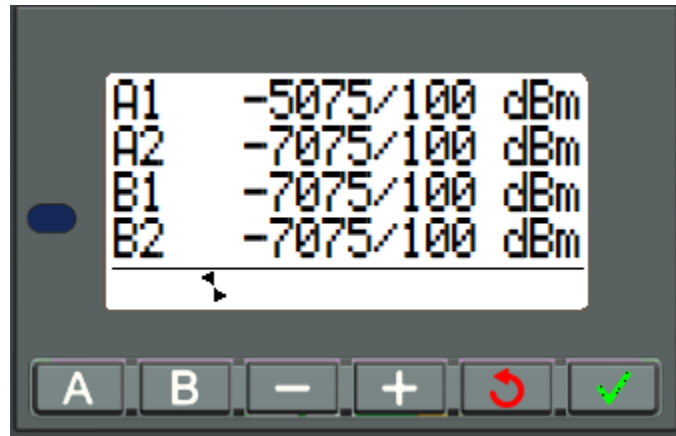


Figure 12: Power Meter Menu Example

By changing the offset value, sensor A1 now has a 20 dBm higher noise floor. To convert dBm to Watts, use the equation:

$$Watts = 10^{\frac{dBm}{10}} \cdot 1mW$$



Figure 13: Power Meter Trip Menu

AFTER the OFFSET is adjusted, the TRIP level must also be adjusted. Notice the output reading of the sensor on Menu 2 and adjust the trip level to be 5 dB (500) greater than the expected OFF level. The EC130 will use this value to determine if the system is safe for switching. If the level is set too low, the controller will not activate the switches, but if it is set too high the controller could switch under power. The EC130 will only activate a switch if the Interlock output is disengaged AND the power is below the selected threshold. There is a 1 second delay to allow the sensor reading to settle. Each power sensor has a menu for OFFSET and TRIP level.

If no sensors are being used, leave both OFFSET and TRIP set to 0. In this mode of operation, only the Interlock status will be verified before switching. The “cancel” button will reset each of these menus to 0.

SNMP Network Configuration Setup

The EC130 Dual switch controller has SNMP monitoring and control capabilities. An ADFWeb HD67164-232-485-B2 Modbus to SNMP converter is used to accomplish the control capabilities. To configure the SNMP connection, download the Windows based configuration software, SW67164, from ADFWeb at:

<https://www.adfweb.com/home/download/download.asp#HD67164>

Download the ERI EC130 Configuration file at:

<https://eriinc.com/product/ec-series-motorized-switch-controllers/>

Unzip the EC130 configuration file to the installation path. The default path is:

C:\Program Files (x86)\ADFweb\Compositor_SW67164\Projects

After running the configuration software, load the ERI Configuration file (*Step 1*).

Set the communication parameters (*Step2*) for the SNMP network for which the switch controller is to be connected. The IP address, Subnet Mask, and Gateway should be configured for the network it is attached. This menu also has the SNMP parameters. By default, SNMP Protocol 2 is activated. SNMP Protocol 3 is also available and has additional security options that need to be configured here if it is to be used.

The “Set Access” menu (*Step 3*) are preconfigured to communicate with the PLC through the Modbus 485 Protocol. This menu should be left alone.

The “Set SNMP Access” menu (*Step 4*) is preconfigured with the addresses that will be accessible to the SNMP master. If it is desired to change the descriptions of the information on the network, it should be done here. **Do not change the Bit assignments.** The **Read Community are set to public** by default in step 4 and the **Write Community is set to private** and can be changed to increase security. These community names will be needed when addressing the EC130 with the SNMP manager. The community names function as a password to the data stream. Assign an appropriate IP address to where the SNMP traps should be sent.

Save the SNMP MIB (*Step 5*) for use in the SNMP Manager and use a computer that is connected to the SNMP controller to update the firmware (*Step 6*). Flash the firmware in a short time after applying power to the EC130. If the power has been applied for some time, you may need to unplug the unit and plug it back in before being able to flash the new firmware.

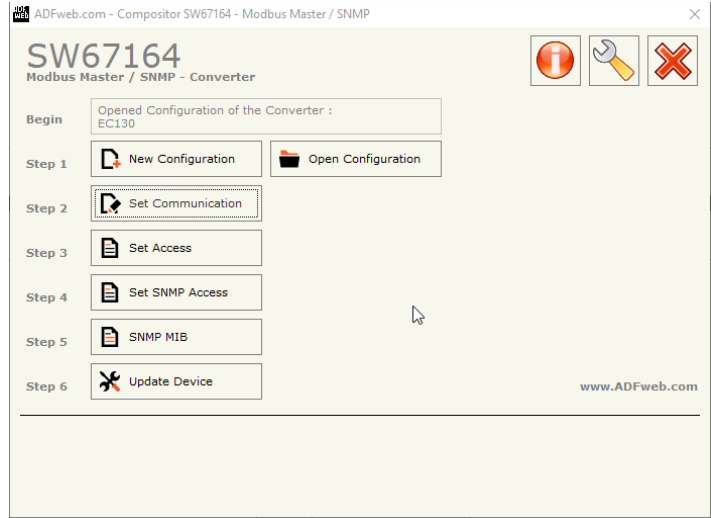


Figure 14: SNMP Configuration Utility Main Interface

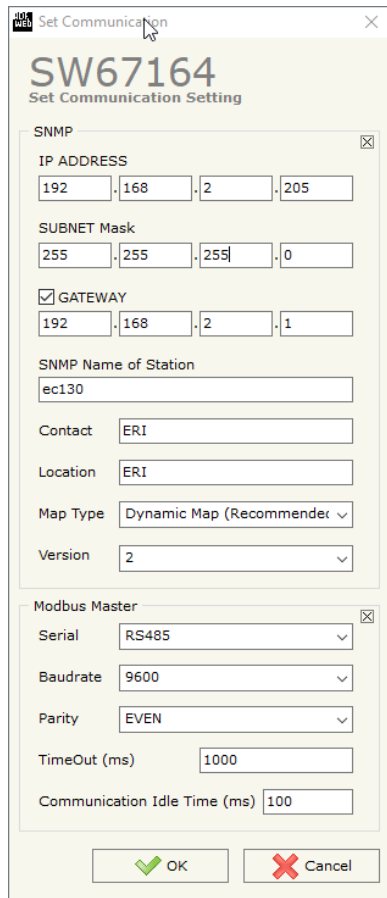


Figure 15: Set Communication Default Network Parameters

More detailed information on configuring the SNMP controller can be found at:
http://www.adfweb.com/download/filefold/MN67164_ENG.pdf

SNMP Default settings

IP Adress: 192.168.2.205
 Subnet Mask: 255.255.255.0
 Gateway: 192.168.2.1

Version 2
 READ Community public
 WRITE Community private

Modbus (*Do not modify*)

Serial: RS485
 Baudrate: 9600
 Parity: Even
 Timeout: 1000 ms
 Communication idle time: 100 ms

Table 1: SNMP Read Table

Variable	Description	Output Value	Trap
interlockStatus	Interlock	0 = Off Air 1 = Normal	Yes, on Event
swApos1	Switch A in Position 1	0 = No 1 = Yes	Yes, on Event
swApos2	Switch A in Position 2	0 = No 1 = Yes	Yes, on Event
swBpos1	Switch B in Position 1	0 = No 1 = Yes	Yes, on Event
swBpos2	Switch B in Position 2	0 = No 1 = Yes	Yes, on Event
swAconnect	Switch A is connected	0 = No 1 = Yes	Yes, on Event
swBconnect	Switch B is connected	0 = No 1 = Yes	Yes, on Event
rfA1	A1 Power Sensor Reading	Signed Integer, dBm/100	Yes, 500 ms Interval
rfA2	A2 Power Sensor Reading	Signed Integer, dBm/100	Yes, 500 ms Interval
rfB1	B1 Power Sensor Reading	Signed Integer, dBm/100	Yes, 500 ms Interval
rfB2	B2 Power Sensor Reading	Signed Integer, dBm/100	Yes, 500 ms Interval
local	Local control	0 = No 1 = Yes	Yes, on Event
snmpRemote	SNMP Remote Control	0 = No 1 = Yes	Yes, on Event
extRemote	EXT triggered control	0 = No 1 = Yes	Yes, on Event

Table 2: SNMP Write Table

Variable	Description	Write Value
togSwitch	Toggle Switch A or B	Momentary, <= 1s* 0x01 = Request Switch A to change positions 0x02 = Request Switch A to change positions 0x03 = Request BOTH Switch A and Switch B to change positions ** 0x04 = RESET Request bits

***Application note:** Set up the SNMP command from the manager as follows.

Toggle Switch A

```
SET      togSwitch  0x01      //Request State change on Switch A
DELAY    1s
SET      togSwitch  0x04      //RESET Request bits
```

****Expected behavior of a dual switch command**

If a 0x03 command is SET to initiate a state change on both Switch A and Switch B, the controller will still restrict movement if power is present on A1 or A2 for Switch A, or B1 or B2 for Switch B. Therefore it is possible for Switch A to switch while Switch B does not or for Switch B to switch while Switch A does not.

Sequential switching may be accomplished by triggering Switch A (0x01 followed by 0x04), checking for a position change on Switch A, and then initiating Switch B (0x02 followed by 0x04).

Troubleshooting

The SNMP controller responds to a PING, but cannot be programmed.

- 1) Remove power from the EC130 Switch Controller
- 2) Try reapplying power and programming. If this fails, move on to step 3.
- 3) Remove the top cover of the EC130 Switch Controller
- 4) The ADFWeb Modbus to SNMP converter is the white box located near the center of the enclosure.
- 5) Release the rail securing the converter to the enclosure for easier access.
- 6) There are two DIP switches facing towards the front of the EC130 Switch Controller, located on the same side as the Modbus 485 connections
 - a. Flip the 1st DIP switch into the OFF (UP) Position.
 - b. Reapply power
 - c. Use the default IP address to find the controller: 192.168.2.205
 - d. Reprogram and wait for "OK" signal
 - e. Remove power from the EC130 Switch Controller
 - f. When programming is complete, Flip the 1st DIP switch into the ON (DOWN) position.
- 7) Replace mounting hardware for the SNMP converter
- 8) Replace enclosure lid

9) Apply power to the EC130 Switch Controller

*Page 28 of the ADFWeb manual

Transmitter Interlock and Switch Motor Drive Control

To ensure that RF power is turned off before the motorized RF switch is operated and to further ensure that RF power is not applied to the switch before it has reached its commanded position the interlock circuit shown in *Figure 16* is used.

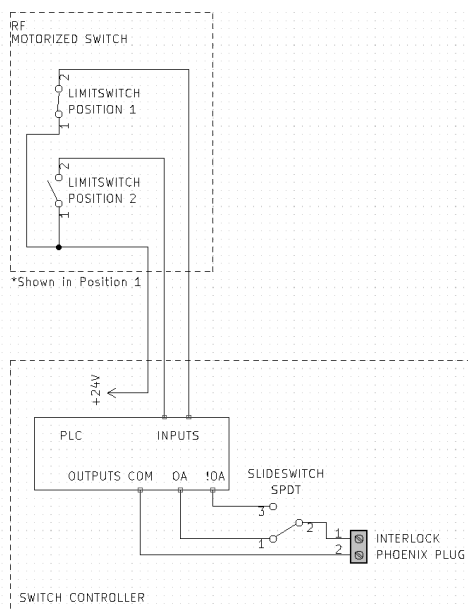


Figure 16: Switch Controller Interlock Circuit

For the purpose of the following discussion assumes that the RF switch is in position 1. The PLC provides a set of dry contacts and will open the contacts when instructed to change positions. The slide switch on the rear of the switch controller provides a quick way to choose normally open or normally closed connections. When the switch controller is set to a normally closed position (as shown), the contacts will open, initiate a switch position change, and will not close the contacts until the switch provides a closed set of contacts that indicate the switch is in position 2.

An alternative wiring diagram (*Figure 17*) is provided to add an additional safety into the circuit. The above approach relies on the PLC logic to provide interlock logic. The below diagram adds two additional limit switches to the interlock circuit that must be activated for the interlock circuit to be closed. This alternative wiring diagram requires four limit switches to be activated for the interlock circuit to close. Two limit switches are used for logic inputs to the PLC and two limit switches are hardwired into the limit switch circuit path. The benefit of this approach over the prior approach becomes apparent when the switch controller is being bypassed and a switch is operating manually. A manual operation of the switch will open the interlock circuit at the switch

regardless of the logic being supplied by the EC130 switch controller, thus preventing any accidental switching under RF power.

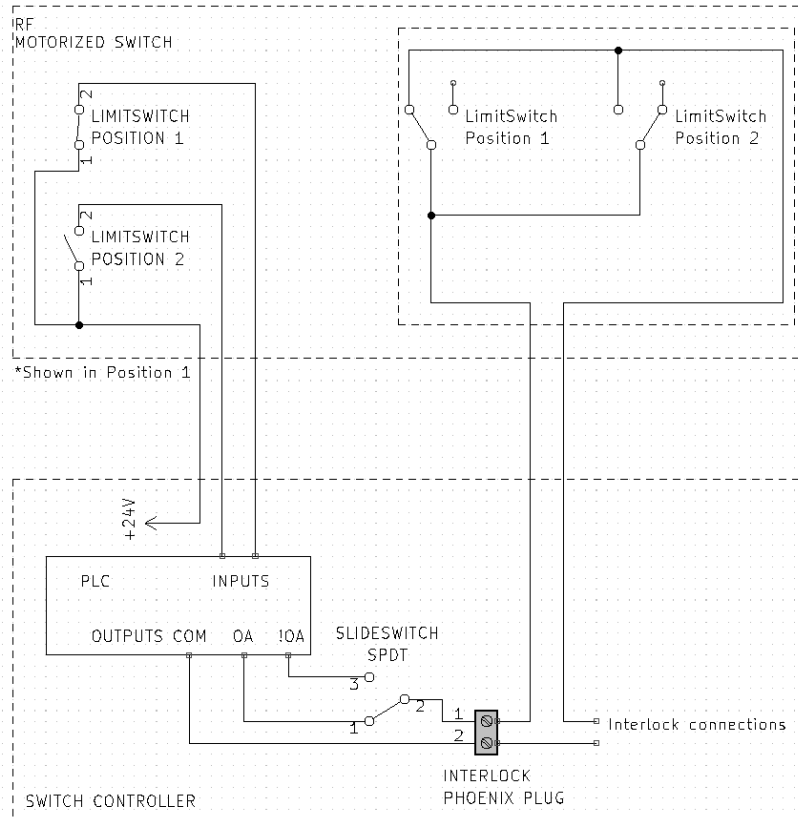


Figure 17: Alternative Wiring Diagram Interlock Circuit

Remote Control

The RF switch can be externally triggered by with EXT1 and EXT2 on the controller rear panel. The status of the switch should be taken from the switch connection.

When the key-lock switch is in the EXT position, the switch can be triggered by use of a momentary dry contact closure between pins 1 and 2 of the EXT Phoenix plug, for example a push button switch, or an NPN transistor can be used as a remote control device. The device need only supply continuity to the circuit for 50-100 ms in order to initiate RF switch control. The remote control circuit is driven by the controller 24 VDC power supply and is connected to a PLC input connection.

Note that the switch lock key position determines whether control is done from the front panel, the remote interface, or networked SNMP control. The three sources are not enabled at the same time. However, the remote position indicator circuit is powered regardless of the position of the switch lock.

Bypass Switch Controller

The EC130 will provide Interlock logic only if a switch is detected. If no switch is detected, the Interlock will stay in an OFF logic condition as seen by the RED LED on the front panel. If the EC130 needs to be bypassed, removing power and toggling the Interlock selection switch to the opposing mode of operation on the back panel will force an ON logic condition.

Table 3: Interlock Bypass Logic Table

Normal Operation - Powered	Bypass - Unpowered
NC – Provides closed set of contacts for logic ON AIR	NO – Provides closed set of contacts
NO – Provides open set of contacts for logic ON AIR	NC – Provides open set of contacts

EC130 Accessories

VDM303	Conic Power Detector, +20 dBm maximum input, 4-20 mA signal output, 24VDC power
CS250C	1-5/8" EIA Coaxial Switch, 0 - 250 MHz
CS252C	1-5/8" EIA Coaxial Switch, 470 - 860 MHz
CS300C	3-1/8" EIA Coaxial Switch, 0 - 860 MHz
CS350C	3-1/8" EIA Coaxial Switch, 0 - 250 MHz
CS352C	3-1/8" EIA Coaxial Switch, 470 - 806 MHz
CS400C	4-1/16" EIA Coaxial Switch, 0 - 860 MHz
CS450C	4-1/16" EIA Coaxial Switch, 0 - 250 MHz
CS452C	4-1/16" EIA Coaxial Switch, 470 - 860 MHz
CS650C	6-1/8" EIA Coaxial Switch, 0 - 250 MHz

Parts List and Drawings

40	1	PURCHASE	FUSE - 3A 250VAC, SLOW BLOW, 5x20mm (Digikey: 507-1297-ND)
39	2	PURCHASE	FUSE - 1A 250VAC, FAST BLOW, 5x20mm (Digikey: 486-1783-ND)
38	2	RIBBON CABLE	RIBBON CABLE (DIGI-KEY P/N 1528-5294-ND)
37	2.0 in	EW18PVCWH	#18 WHITE PVC COATED HOOK-UP WIRE
36	6.0 in	EW18PVCWH/GN	#18 WHITE/GREEN PVC COATED HOOK-UP WIRE
35	6.0 in	EW18PVCWH/VI	#18 WHITE/VIOLET PVC COATED HOOKUP WIRE
34	6.0 in	EW18PVCOR	#18 ORANGE PVC COATED HOOK-UP WIRE
33	1	EC130-WH8	GROUND WIRE w/ (1) RING TERMINAL& (1) 90° CRIMP CONN., 6" LONG
32	1	EC130-WH7	4 WIRE POWER HARNESS w/ (2) 3-PIN & (2) 90° CRIMP CONN., 6" LONG
31	1	EC130-WH6	6 WIRE HARNESS w/ (1) 6-PIN & (6) FEMALE QUICK CONNECTORS, 12" LONG
30	2	EC130-WH5	3 WIRE HARNESS w/ (1) 3-PIN & (3) FEMALE QUICK CONNECTORS, 6" LONG
29	1	EC130-WH4	3 WIRE HARNESS w/ (1) 3-PIN TO LED, 12" LONG
28	1	EC130-WH2	2 WIRE HARNESS w/ (1) 2-PIN CONNECTOR, 6" LONG
27	2	EC130-WH1	2 WIRE HARNESS w/ (2) 2-PIN CONNECTORS, 12" LONG
26	13	PURCHASE	#6-32 FEMALE HEX STANDOFF, 3/4" LONG (MMC P/N91780A131)
25	2	PURCHASE	#6-32 100° COUNTERSINK FHMS, 3/8" LONG (MMC P/N 91771A978)
24	13	PURCHASE	#6-32 100° COUNTERSINK FHMS, 1/4" LONG (MMC P/N 91771A977)
23	6	NU/632	#6-32 HEX JAM NUT, STAINLESS STEEL
22	2	WL/6SS	#6 SS LOCK WASHER
21	2	WF/6SS	#6 in, SS FLAT WASHER
20	4	SC/632J0037	#6-32 X 3/8 PHILLIPS PAN HEAD SCREW, SS
19	13	SC/632J0025	#6-32 X 1/4 PHILLIPS PAN HEAD SCREW, SS
18	2	NU/440	4-40 SS HEX NUT, WAX COATED
17	2	SC/440J0038	4-40 X 3/8" LG. SST PPHS
16	4	SC/440J0025	#4-40 X 1/4 PHILLIPS PAN HEAD SCREW
15	2	PURCHASE	SLIDE SWITCH w/ MOUNTING EARS (DIGI-KEY P/N V70213SS05Q)
14	1	PURCHASE	24V POWER SUPPLY (DIGI-KEY P/N EPS-25-24)
13	1	PURCHASE	12V POWER SUPPLY (DIGI-KEY P/N EPS-25-12)
12	1	PURCHASE	RJ45 ETHERNET CABLE, MALE/FEMALE (MOUSER P/N P909)
11	1	PURCHASE	SNMP/MODBUS CONVERTER (ADF WEB P/N HD67164-232-485-B2)
10	1	PURCHASE	MODBUS 485 INTERFACE CARD (CROUZET P/N 88980122)
9	1	PURCHASE	EM4 NANO PLC LOCAL (CROUZET P/N 88981103)
8	1	ML362-4.00	DIN RAIL, ZINC PLATED STEEL - 4.00 LONG
7	1	ES017	3-POSITION KEY SWITCH
6	1	EJ032	AC INLET- RFI FILTER & FUSE HOLDER
5	1	EA005-2	LED MOUNTING CLIP
4A	1	EC130-PC3	PRINTED CIRCUIT BOARD ASSEMBLY, PLC-B
4	1	EC130-PC2	PRINTED CIRCUIT BOARD ASSEMBLY, PLC-A
3	1	EC130-PC1	PRINTED CIRCUIT BOARD ASSEMBLY
2	1	EC130-DW1	DIN RAIL WELDMENT
1	1	EC130-EB1	ELECTRICAL BOX, EC130 SWITCH CONTROLLER
ITEM	QTY	PART NUMBER	DESCRIPTION

Table 4: Parts List

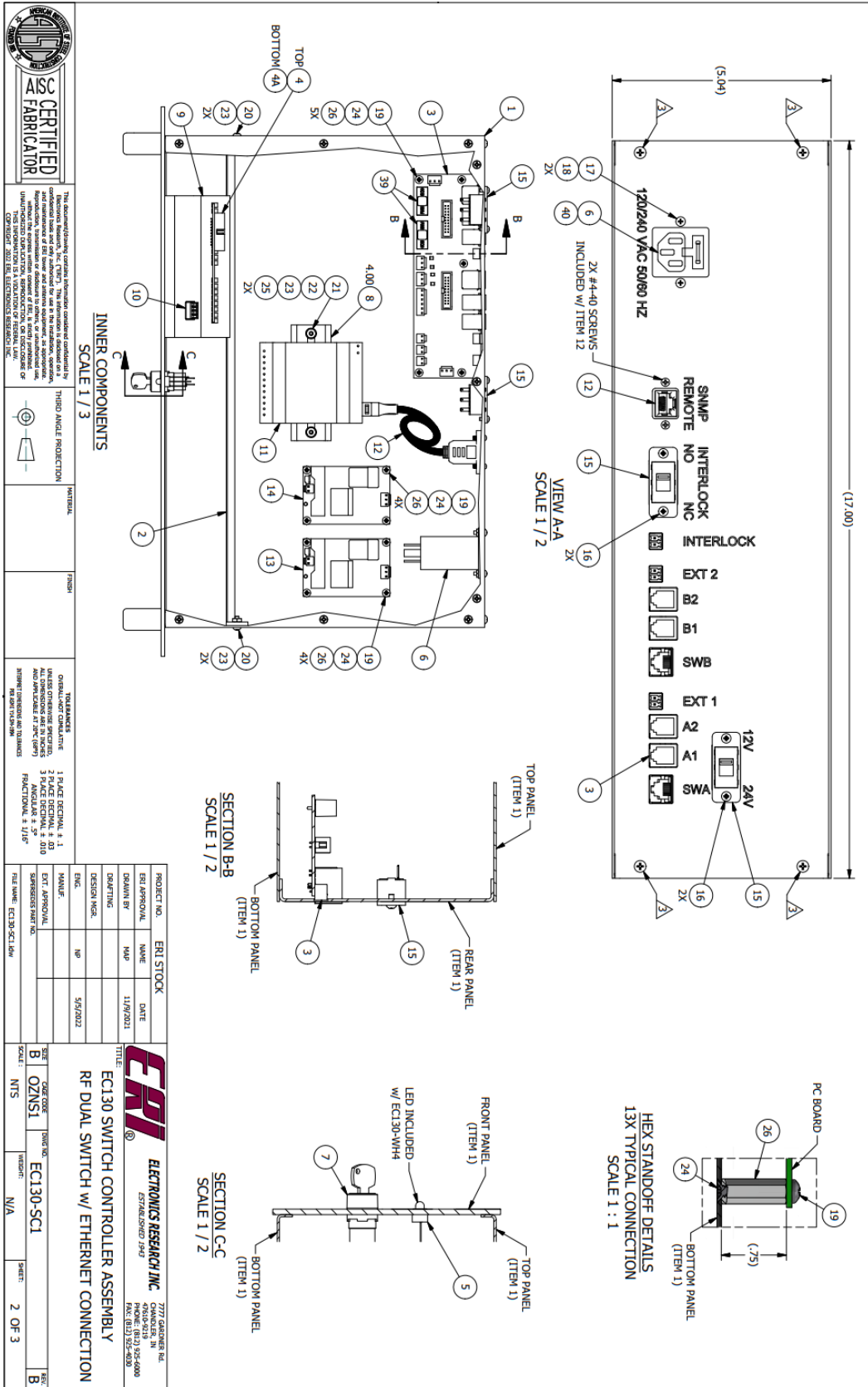


Figure 18: Drawing

ASIS CERTIFIED FABRICATOR

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VERTICAL	FINISH	TOLERANCES	UNLESS OTHERWISE SPECIFIED, 3 PLACE DECIMAL, ±.010 ANGULAR ± .5° FRACTIONAL, ±.115°
THIRD ANGLE PROJECTION		UNLESS OTHERWISE SPECIFIED, 3 PLACE DECIMAL, ±.010 ANGULAR ± .5° FRACTIONAL, ±.115°	
		UNLESS OTHERWISE SPECIFIED, 3 PLACE DECIMAL, ±.010 ANGULAR ± .5° FRACTIONAL, ±.115°	
		UNLESS OTHERWISE SPECIFIED, 3 PLACE DECIMAL, ±.010 ANGULAR ± .5° FRACTIONAL, ±.115°	

PROJECT NO.	ERI STOCK	DATE	DATE
ERL APPROVAL	NAME	11/9/2021	
DRAWING BY	MAP		
DESIGN NBR.	NP	5/5/2022	
ENG.			
MANUF.			
EXT. APPROVAL			
SUBMITTED BY			
FILE NAME	EC130-SCI.dwg		

ERI ELECTRONICS RESEARCH INC. 1775 GARDNER BL. CHANDLER, AZ 85226-4000 FAX: (813) 252-4800

TITLE: EC130 SWITCH CONTROLLER ASSEMBLY

RF DUAL SWITCH w/ ETHERNET CONNECTION

SCALE: B

DATE CODE: 1908/20

REV: 02/NS1

EC130-SCI

DATE: N/A

SHEET: 2 OF 3

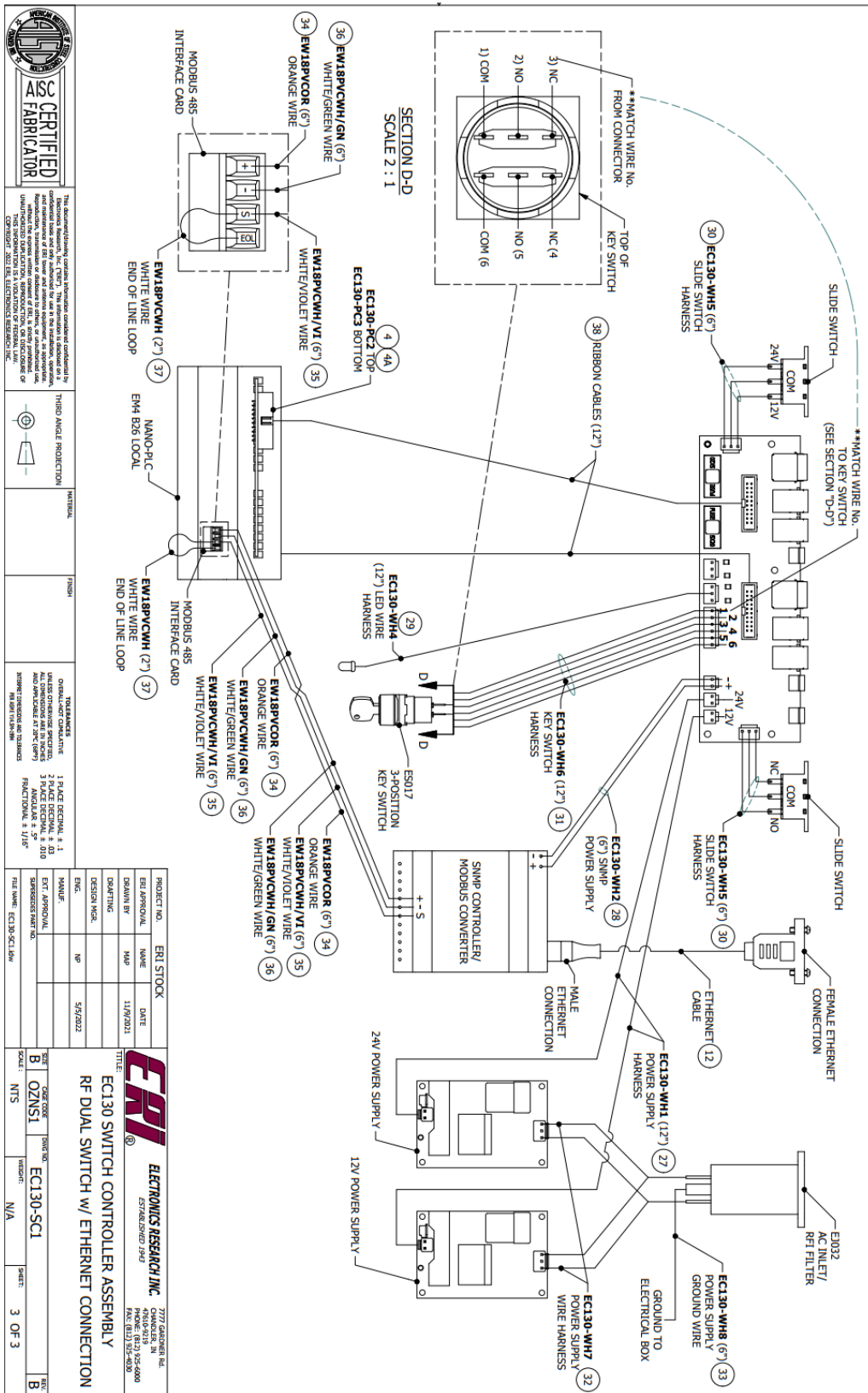


Figure 19: EC130 Schematic

