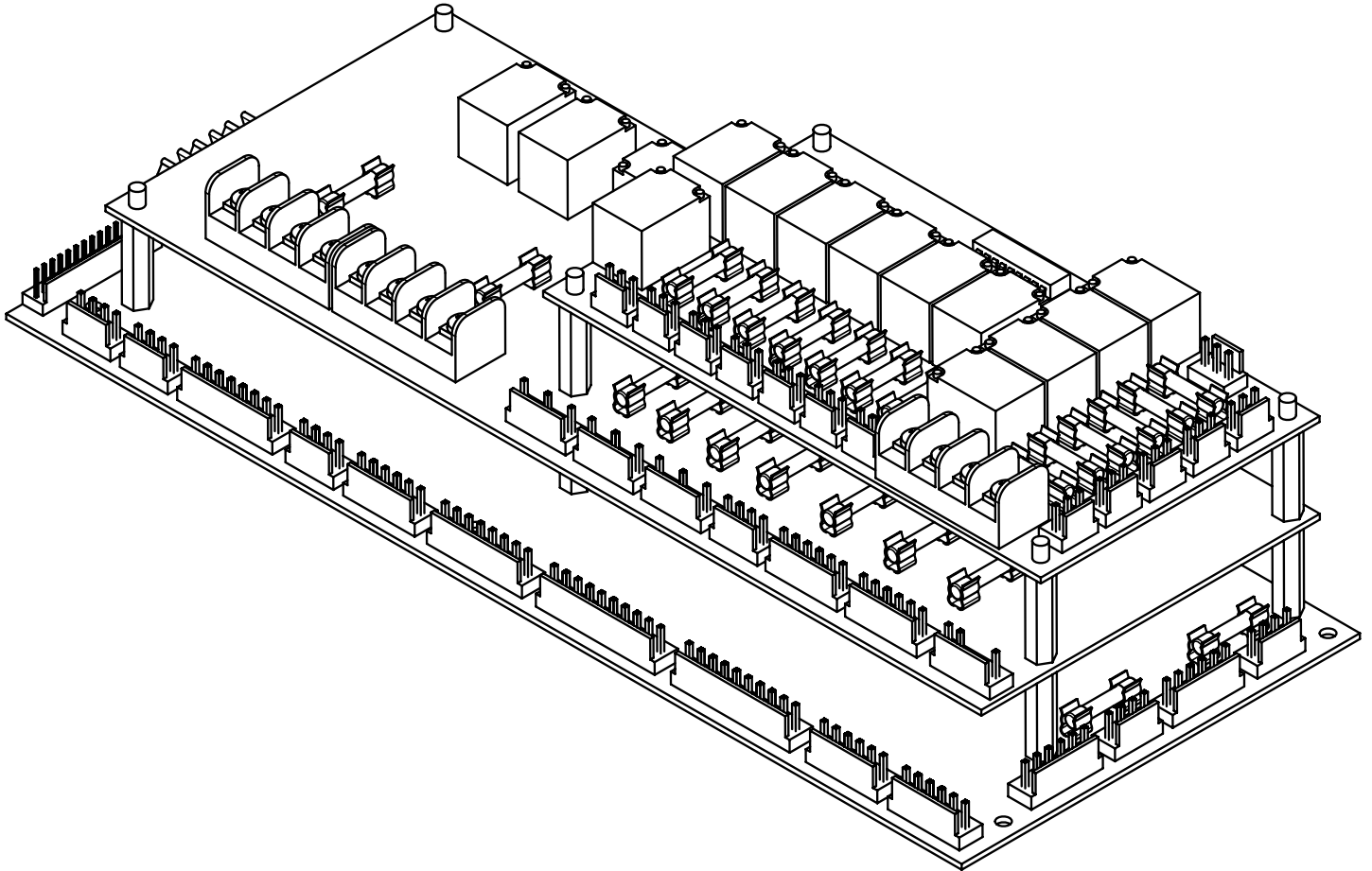


RTK3 Logic Controller User Manual

Revised 6-24-08



Overview

The RTK3 is intended to simplify and expedite control wiring. Centroid's PLCIO2 was the starting point for the RTK3, and modifications were aimed at increasing efficiency on standard system configurations. To reduce the number of connections in the control cabinet, input and most output voltages are standardized. Logic and input power supplies are built in to the RTK3 to further simplify installation. Positive locking connectors on pre-assembled cables eliminate the need to individually connect each wire to the RTK3.

Much remains common between the PLCIO2 and RTK3. The motion control card (CPU10 or compatible) connected to the RTK3 must be equipped with an IO2PIC chip (see TB133 for upgrade procedure). PLCCOMP or XPLCCOMP or both PLC compilers can be used with the RTK3, just like the PLCIO2. The RTK3 also retains the Fast I/O feature, which is now dedicated to a sourcing sensor input and relay output.

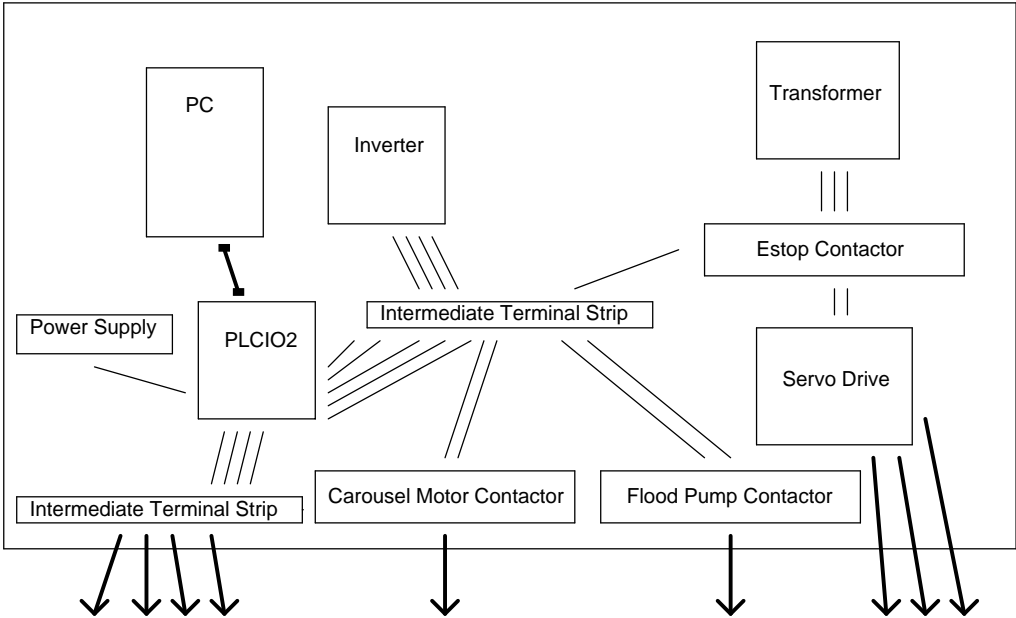
There are three layers in the RTK3 to minimize footprint and maximize cabinet efficiency. Only rarely used connectors are located on the backside of the unit to allow mounting against the cabinet wall if necessary. The bottom board has six mounting holes for direct attachment to standoffs. See the "RTK3 Mounting Dimensions" section for mounting standoff configuration. The bottom, or logic, board is home to the logic controller's processor, input isolators, analog output section, output drivers, and power supply section. This is where the fiber optic and almost all input connections are made. The middle board has 10 relays, one logic input, and two power inputs. Various voltage and load levels are controlled by relays on the middle board. The top board is equipped with 110VAC outputs and the 110VAC power input connector.

RTK3 System Constraints

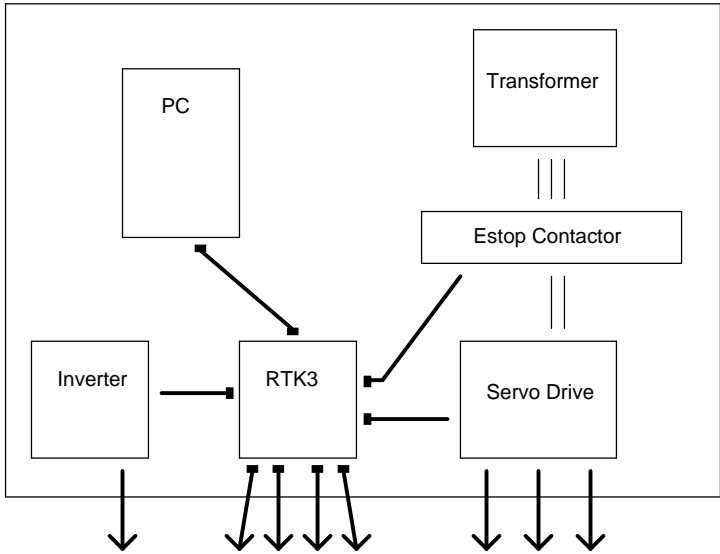
The lube pump output must be either 220VAC or 110VAC single phase. In addition, the E-stop power loop must be 24VAC, solenoids and lights must be 110VAC, and sensors must be compatible with 24VDC inputs when using an RTK3.

Wiring Concept Visual Comparison

Previous ATC Wiring Sample



RTK3 Wiring Sample



Note the simplified layout and wiring enabled by the RTK3. Fewer individual wires (thin lines) are used and intermediate terminal block connections are reduced. Cables (thick lines) with quick connect ends replace many individual wires. Integrated components and specialized connection points on the RTK3 reduce the quantity of external hardware required. These advantages allow for quicker, more organized, more compact and more reliable panel wiring.

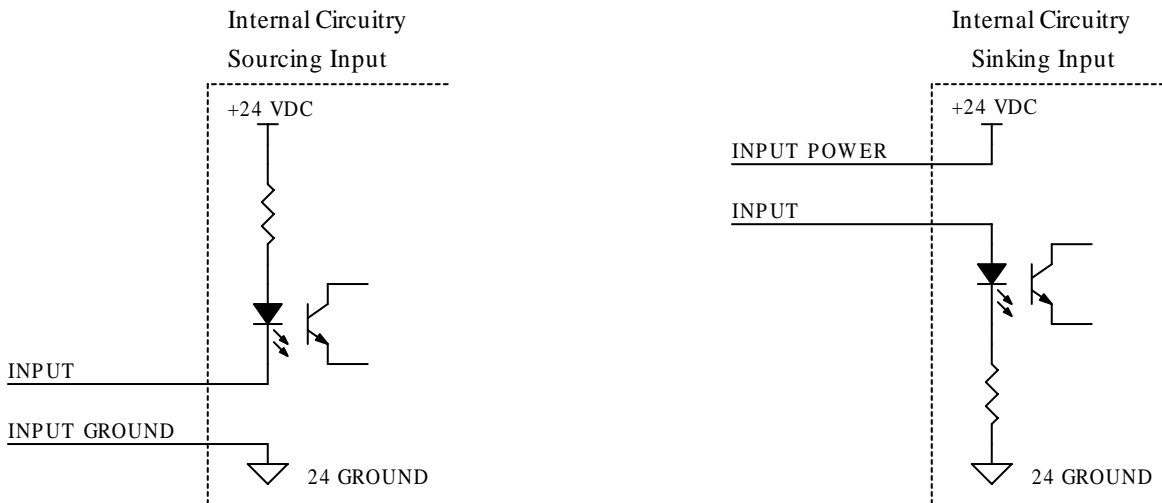
Power Connection

Three power connections are necessary on a full RTK3 installation. Five position plugs are used for the 220VAC and 24VAC power inputs. Three wires are positioned uniquely in the housing to prevent operation with incorrect voltage connections. Screw terminals on the top board are used for 100VAC connection.

The 220VAC input supplies the 220VAC lube and spindle cooling fan outputs. The 110VAC input powers the on board power supply as well as 110VAC outputs. The E-stop output and configurable outputs may use the 24VAC input.

Input Wiring

All inputs on the RTK3 are optically isolated and 24VDC powered. Some inputs are sourcing and others are sinking, see the “Input Map” section for details. The two basic input configurations are shown below.



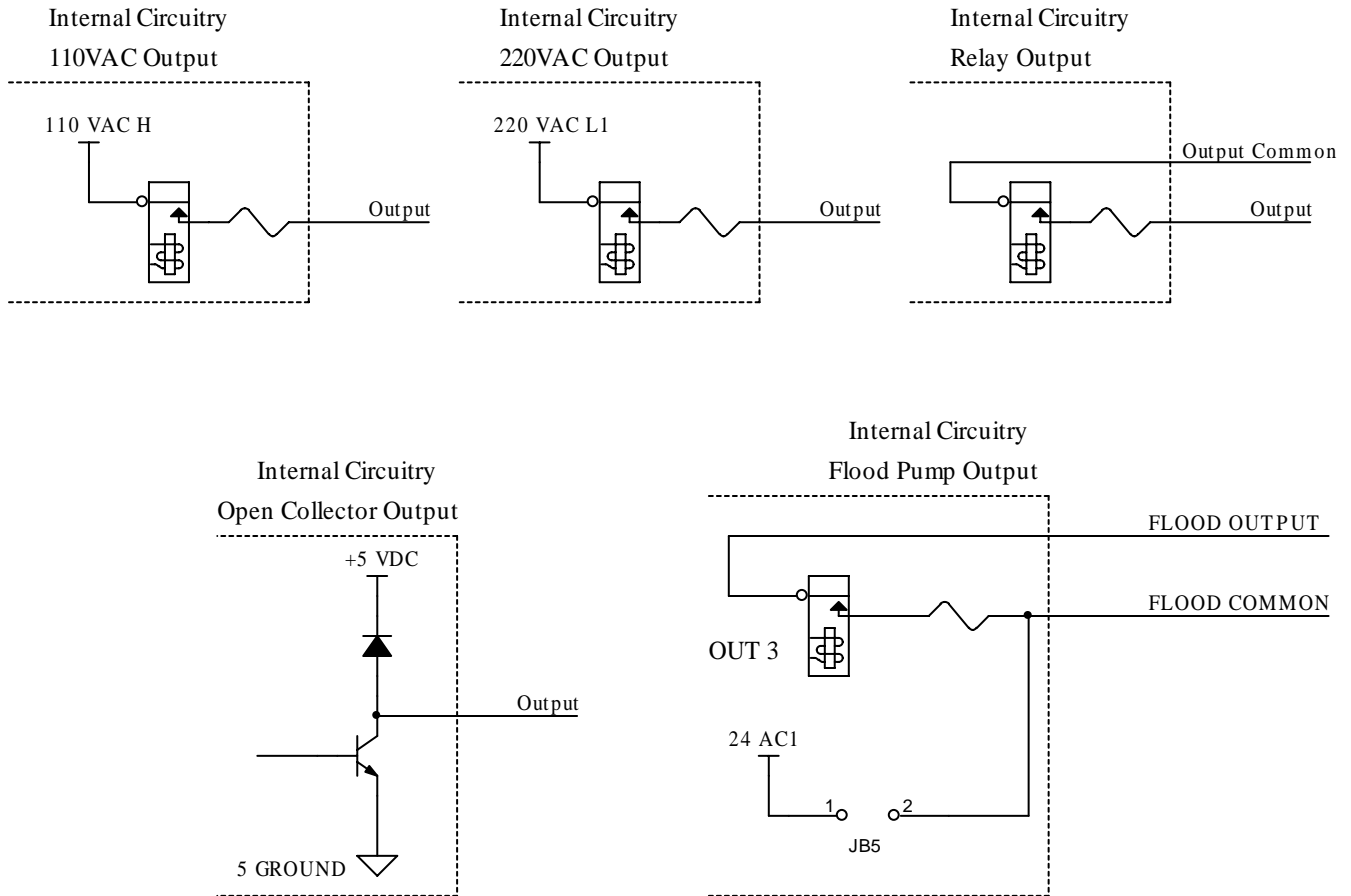
Either type of input may be used with a switch. Sourcing inputs may be used with sinking sensors that are capable of sinking 15mA at 24VDC. Sinking inputs may be used with sourcing sensors that provide 15mA at 24VDC. Compare sensor and RTK3 input specifications using the “RTK3 Specifications” table to ensure compatibility. Two wire sensors should not be used with the RTK3, since they normally do not meet the “Input On Voltage” and “Input Off Voltage” specifications. Care must be taken to wire each input correctly, as the cable for each input has signals that are not used in all cases. These include 24VDC and Input Ground for powering sensors and a shield connection that should normally be connected only to the RTK3. The 24VDC supply fuse is located on the bottom (logic) board. The “DIGITIZE PROBE” connector has an additional fuse on its 24VDC supply pin, which can also be found on the logic board. These fuses are in series such that the digitizer fuse could fail without affecting other inputs. However, a short in any other 24VDC circuit will blow the main 24VDC fuse, causing a loss of all input voltages.

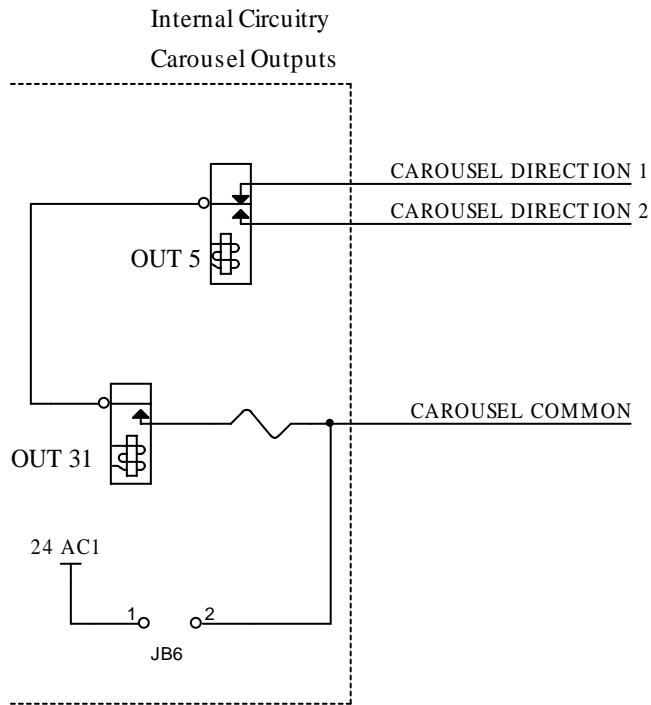
Connectors are available on the RTK3 to plug in limit and fault inputs from a Centroid DC brushed servo drive. The “DRV FAULT” and “LIMITS TO DRIVE” headers are intended only for allowing straight through cable connections to a drive. Limit switch wiring should be done from the “X- / X+ / Y- / Y+ LIMITS” and “W+ / W- / 5+ / 5- LIMITS” headers. When using a Centroid DC brushed servo drive with an RTK3, the “G” and “5” power DIP switches on the drive should be turned on.

Output Wiring

Several output types are present on the RTK3 to reduce wiring time when interfacing with specific components. These include 110VAC, 220VAC, and 3 phase outputs as well as a 24VAC and an analog output. Open collector and relay contact outputs are also available for more general application. See the “Output Map” section for more information.

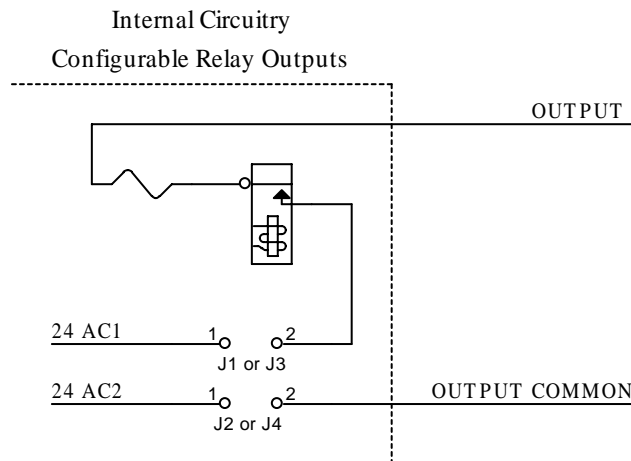
Each power relay output is protected by a fuse. The “DOOR FAN” and “CONSOLE” unswitched 110VAC outputs are also fuse protected. Fuses are 5x20mm and should be rated equal to or less than the ratings printed on the RTK3 for safety. Signal relays, such as those on the inverter outputs, are not fuse protected.



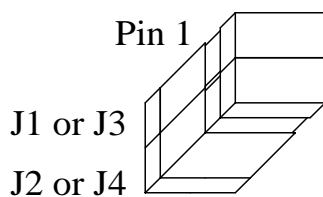


Configurable Outputs

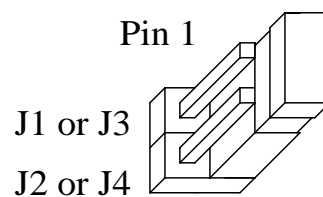
Outputs 11 and 37 may be configured as 24VAC or relay contact outputs. These outputs are routed to the “AUX 2 / CHILLER” connector. The configurable output jumper settings must be verified before connecting these outputs to prevent damage to the RTK3 or associated hardware.



24VAC Output Setting

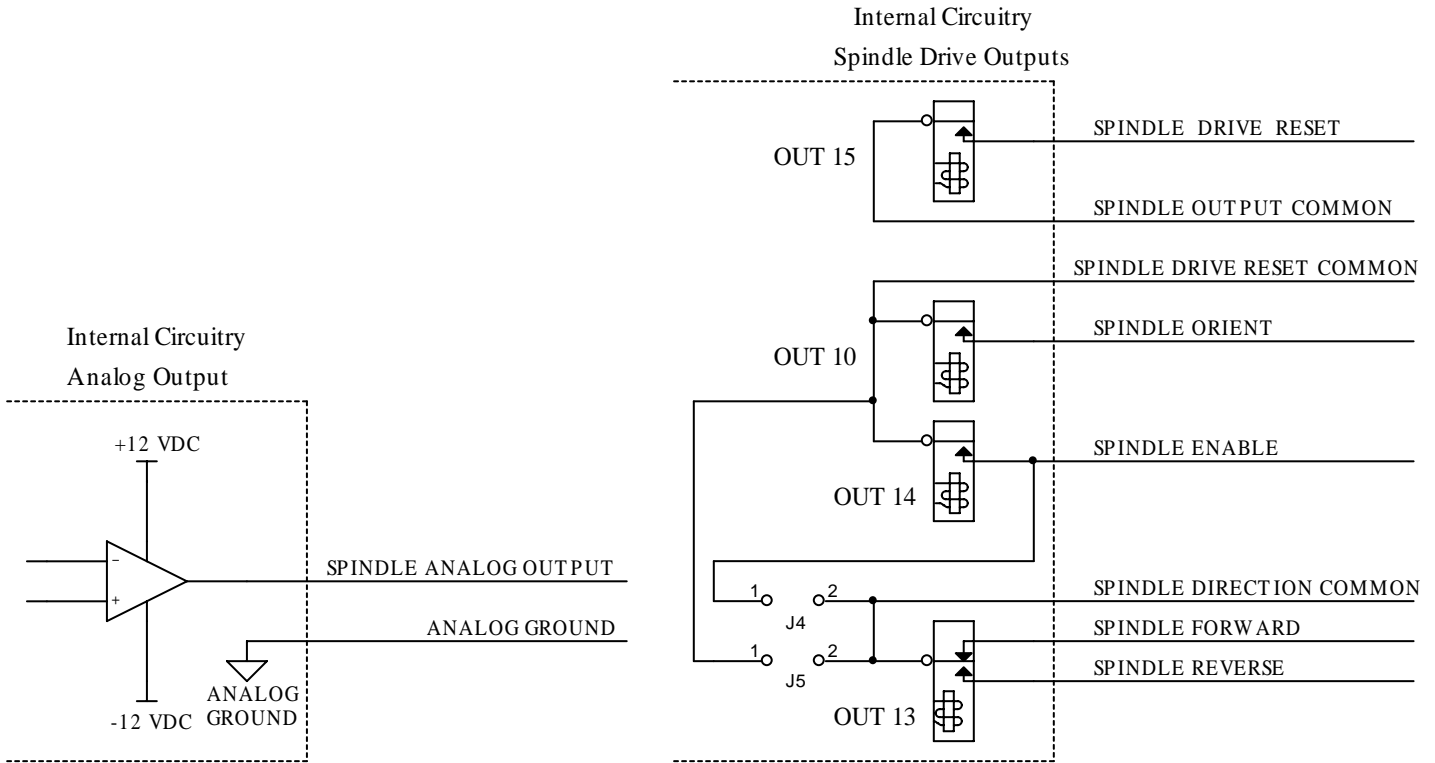


Relay Contact Output Setting

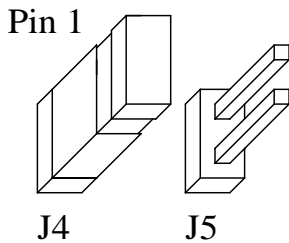


Spindle Outputs

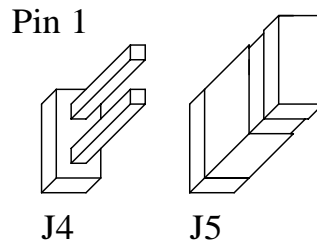
The RTK3 is equipped with an analog output and specialized relay outputs to simplify spindle drive wiring. The analog output has a 12-bit resolution and can be configured for 0 to +5VDC or 0 to +10VDC output. The analog ground should not be connected to other grounds on the RTK3. All input and output functions required for a standard inverter connection are located on the 15 pin “INVERTER” connector.



Jumper Setting for Direction Run Through Enable



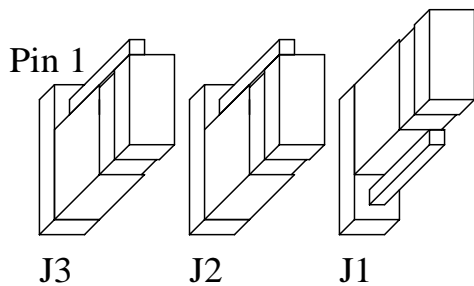
Jumper Setting for Direction Pulled to Common



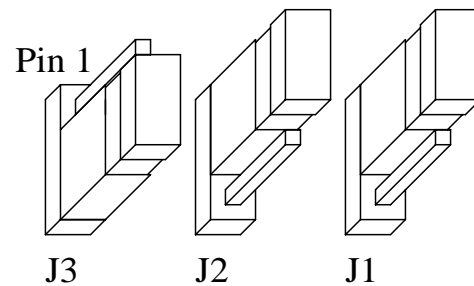
Analog Output Adjustment

Output voltage range can be set to 0 to +5VDC or 0 to +10VDC by setting jumpers J1, J2, and J3 according to the diagrams below. Trimming the output can be accomplished with VR1 and VR2 potentiometers. See the “RTK3L (Bottom) Board Connections” diagram for the location of adjustment hardware. The analog levels are adjusted at the factory for the 0 to +10VDC range, so only slight adjustments should be needed for each installation. Only adjust the “OFFSET” potentiometer (pot) (VR2) at the minimum possible spindle speed. This adjustment is intended only to null the voltage level when 0 RPM is commanded. The “GAIN” pot (VR1) should be used at maximum speed to match actual RPM with commanded RPM. Adjustments to the analog output should be very minor and cannot be used to compensate for incorrect inverter or control settings.

0 to 10 VDC Jumper Settings

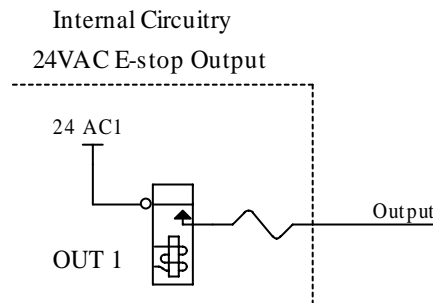


0 to 5 VDC Jumper Settings



Emergency Stop Connector

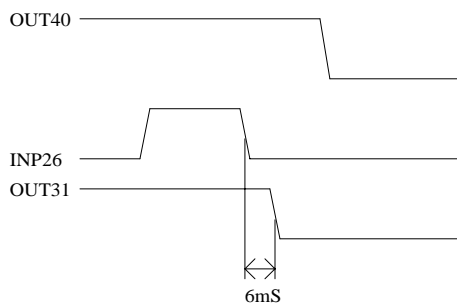
The E-stop connector has an input and output, unlike most RTK3 connectors. The input notifies the control of an external E-stop press. The output allows an E-stop to be triggered by the PLC program. Because the E-stop connector sources 24VAC, a 24VAC contactor coil must be used. This reduces the number of connections at the cost of some versatility.



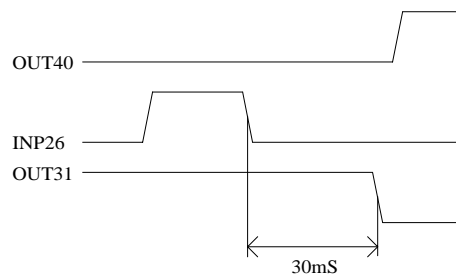
Fast I/O Operation

The Fast I/O is a hard-coded function that is enabled when output 40 is turned on in the PLC program. The Fast I/O immediately turns off output 31 when a falling edge is detected on input 26. This is done immediately before sending any data back to the control. The function is self-resetting - after output 31 is turned off, output 40 must be turned on again in order to reactivate the Fast I/O. Using the Fast I/O prevents the carousel from moving too far due to communication delays. When output 40 is off, output 31 and input 26 work normally. In the RTK3 implementation of the Fast I/O, input 26 is dedicated to a sourcing tool counter sensor and output 31 controls the carousel enable relay. Output 40 is not a physical output, since using this output for purposes other than Fast I/O enable could cause confusion.

Timing Diagram - Fast I/O Enabled



Timing Diagram - Normal PLC Operation



Status Indicator LEDs

Six green indicator LEDs (lights) located on the bottom board display RTK3 status. All six LEDs will be lit under normal operating conditions. Five of the LEDs indicate the presence of required operating voltages. The 110VAC input feeds the power supply to generate these voltages. The “PLC OK” LED lights when the RTK3 and motion control card (CPU10) have a working communication link. This LED will not be lit as soon as power is applied. After the control software (CNC10) has initialized the motion control card, communication can be established with the RTK3, which lights the “PLC OK” LED.

Input Map

Input Specification			Connection Location		
Number	Function	Type	Board	Connector	Pin
1	X- Limit	Sourcing	Bottom	X- / X+ / Y- / Y+ LIMITS	1
2	X+ Limit	Sourcing	Bottom	X- / X+ / Y- / Y+ LIMITS	3
3	Y- Limit	Sourcing	Bottom	X- / X+ / Y- / Y+ LIMITS	5
4	Y+ Limit	Sourcing	Bottom	X- / X+ / Y- / Y+ LIMITS	7
5	Z- Limit	Sourcing	Bottom	Z+ / Z- LIMITS	1
6	Z+ Limit	Sourcing	Bottom	Z+ / Z- LIMITS	3
7	W- Limit	Sourcing	Bottom	W+ / W- / 5+ / 5- LIMITS	1
8	W+ Limit	Sourcing	Bottom	W+ / W- / 5+ / 5- LIMITS	3
9	5th- Limit	Sourcing	Bottom	W+ / W- / 5+ / 5- LIMITS	5
10	5th+ Limit	Sourcing	Bottom	W+ / W- / 5+ / 5- LIMITS	7
11	Emergency Stop	Sourcing	Bottom	ESTOP	1
12	Servo Drive Fault	Sourcing	Bottom	DRV FAULT	2
13	TT1	Sourcing	Bottom	TT1 / AUX	1
14	Probe	Sourcing	Bottom	DIGITIZE PROBE	1
15	Probe Detect	Sourcing	Bottom	DIGITIZE PROBE	3
16	Error Check	Internal	N/A	N/A	N/A
17	Door Interlock	Sourcing	Bottom	DOOR SWITCH	1
18	Low Lube	Sourcing	Middle	LOWLUBE	1
19	Spindle Zero Speed	Sourcing	Bottom	INVERTER	10
20	Spindle At Speed	Sourcing	Bottom	INVERTER	13
21	Spindle Orient Complete	Sourcing	Bottom	INVERTER	11
22	Tool Clamped	Sourcing	Bottom	TOOL CLAMP/UNCLAMP	3
23	Tool Unclamped	Sourcing	Bottom	TOOL CLAMP/UNCLAMP	1
24	Tool Release Switch	Sourcing	Bottom	TOOL REL SW	1
25	Spindle Drive Fault	Sourcing	Bottom	INVERTER	12
26	Tool Counter *	Sinking	Bottom	CAROUSEL INPUTS	4
27	Carousel Out / TP Up	Sinking	Bottom	CAROUSEL INPUTS	2
28	Carousel In / TP Dwn	Sinking	Bottom	CAROUSEL INPUTS	1
29	Auxiliary 1	Sinking	Bottom	CAROUSEL INPUTS	3
30	Rotary Home	Sourcing	Bottom	ROTARY INPUTS	1
31	Rotary Clamped	Sourcing	Bottom	ROTARY INPUTS	3
32	Air Pressure Low	Sourcing	Bottom	AIR LOW	1
33	NOT USED	N/A	N/A	N/A	N/A
34	NOT USED	N/A	N/A	N/A	N/A
35	NOT USED	N/A	N/A	N/A	N/A
36	NOT USED	N/A	N/A	N/A	N/A
37	NOT USED	N/A	N/A	N/A	N/A
38	NOT USED	N/A	N/A	N/A	N/A
39	NOT USED	N/A	N/A	N/A	N/A
40	NOT USED	N/A	N/A	N/A	N/A
41	NOT USED	N/A	N/A	N/A	N/A
42	NOT USED	N/A	N/A	N/A	N/A
43	NOT USED	N/A	N/A	N/A	N/A
44	NOT USED	N/A	N/A	N/A	N/A
45	NOT USED	N/A	N/A	N/A	N/A
46	NOT USED	N/A	N/A	N/A	N/A
47	NOT USED	N/A	N/A	N/A	N/A
48	NOT USED	N/A	N/A	N/A	N/A
49	NOT USED	N/A	N/A	N/A	N/A
50	NOT USED	N/A	N/A	N/A	N/A
51	NOT USED	N/A	N/A	N/A	N/A
52	NOT USED	N/A	N/A	N/A	N/A
53	NOT USED	N/A	N/A	N/A	N/A
54	NOT USED	N/A	N/A	N/A	N/A
55	NOT USED	N/A	N/A	N/A	N/A
56	NOT USED	N/A	N/A	N/A	N/A
57	NOT USED	N/A	N/A	N/A	N/A
58	NOT USED	N/A	N/A	N/A	N/A
59	Range 3 / Arm Clamp	Sinking	Bottom	AUX SPINDLE INPUTS	1
60	Range 2 / Arm Stop	Sinking	Bottom	AUX SPINDLE INPUTS	2
61	Range 1 / Arm Home	Sinking	Bottom	AUX SPINDLE INPUTS	3
62	Spindle Chiller OK	Sinking	Bottom	AUX SPINDLE INPUTS	4

* Fast I/O Related

Output Map

Output Specification			Connection Location		
Number	Function	Type	Board	Connector	Pin
1	Emergency Stop	24VAC	Bottom	ESTOP	4
2	Lube Pump	220VAC	Middle	220 LUBE	1
2	Lube Pump	110VAC	Top	110 LUBE	1
3	Flood Pump	3 PHASE	Middle	FLOOD MOTOR	1,2,3
4	Mist Solenoid	110VAC	Top	MISTER	1
5	Carousel Direction	Internal	Middle	N/A	N/A
6	Carousel Out Solenoid	110VAC	Top	CAR OUT	1
7	Tool Clamp Solenoid	110VAC	Top	TOOL CLAMP	1
8	Air Blow Through	110VAC	Top	AIR BLOW	1
9	Carousel In Solenoid	110VAC	Top	CAR IN	1
10	Orient	Relay Contact	Bottom	INVERTER	3
11	Spindle Chiller	Configurable	Middle	AUX 2 / CHILLER	1,2
12	Spindle Cooling Fan	220VAC	Middle	SPIN FAN	1
13	Spindle Direction	Relay Contact	Bottom	INVERTER	5,6,7
14	Spindle Enable	Relay Contact	Bottom	INVERTER	4
15	Inverter Reset	Relay Contact	Bottom	INVERTER	1
16	Error Check	Internal	N/A	N/A	N/A
17	Spin. Speed Bit 0	Internal	N/A	N/A	N/A
18	Spin. Speed Bit 1	Internal	N/A	N/A	N/A
19	Spin. Speed Bit 2	Internal	N/A	N/A	N/A
20	Spin. Speed Bit 3	Internal	N/A	N/A	N/A
21	Spin. Speed Bit 4	Internal	N/A	N/A	N/A
22	Spin. Speed Bit 5	Internal	N/A	N/A	N/A
23	Spin. Speed Bit 6	Internal	N/A	N/A	N/A
24	Spin. Speed Bit 7	Internal	N/A	N/A	N/A
25	Spin. Speed Bit 8	Internal	N/A	N/A	N/A
26	Spin. Speed Bit 9	Internal	N/A	N/A	N/A
27	Spin. Speed Bit 10	Internal	N/A	N/A	N/A
28	Spin. Speed Bit 11	Internal	N/A	N/A	N/A
29	Gear Change	Relay Contact	Middle	AUX1 / RANGE	1,2
30	Rotary Clamp Solenoid	110VAC	Top	ROT CLAMP	1
31	Carousel Enable *	3 PHASE	Middle	CAROUSEL MOTOR	1,2,3
32	Red Light	110VAC	Top	RED LIGHT	1
33	Green Light	110VAC	Top	GRN LIGHT	1
34	Yellow Light	110VAC	Top	YEL LIGHT	1
35	Worklight	110VAC	Top	WORKLIGHT	1
36	Auxiliary 1	Relay Contact	Middle	AUX 1 / RANGE	3,4
37	Auxiliary 2	Configurable	Middle	AUX 2 / CHILLER	3,4
38	Auxiliary 3	Open Collector	Bottom	AUX DRIVERS 1	10
39	Auxiliary 4	Open Collector	Bottom	AUX DRIVERS 1	9
40	Fast I/O Enable *	N/A	N/A	N/A	N/A
41	Auxiliary 5^	Open Collector	Bottom	AUX DRIVERS 1	7
42	Auxiliary 6^	Open Collector	Bottom	AUX DRIVERS 1	6
43	Auxiliary 7^	Open Collector	Bottom	AUX DRIVERS 1	5
44	Auxiliary 8^	Open Collector	Bottom	AUX DRIVERS 1	4
45	Auxiliary 9^	Open Collector	Bottom	AUX DRIVERS 1	3
46	Auxiliary 10^	Open Collector	Bottom	AUX DRIVERS 2	10
47	Auxiliary 11^	Open Collector	Bottom	AUX DRIVERS 2	9
48	Auxiliary 12^	Open Collector	Bottom	AUX DRIVERS 2	8
49	NOT USED	N/A	N/A	N/A	N/A
50	NOT USED	N/A	N/A	N/A	N/A
51	NOT USED	N/A	N/A	N/A	N/A
52	NOT USED	N/A	N/A	N/A	N/A
53	NOT USED	N/A	N/A	N/A	N/A
54	NOT USED	N/A	N/A	N/A	N/A
55	NOT USED	N/A	N/A	N/A	N/A
56	NOT USED	N/A	N/A	N/A	N/A
57	NOT USED	N/A	N/A	N/A	N/A
58	NOT USED	N/A	N/A	N/A	N/A
59	Auxiliary 13	Open Collector	Bottom	AUX DRIVERS 2	6
60	Auxiliary 14	Open Collector	Bottom	AUX DRIVERS 2	5
61	Auxiliary 15	Open Collector	Bottom	AUX DRIVERS 2	4
62	Auxiliary 16	Open Collector	Bottom	AUX DRIVERS 2	3

* Fast I/O Related

^ Often used to store the tool number

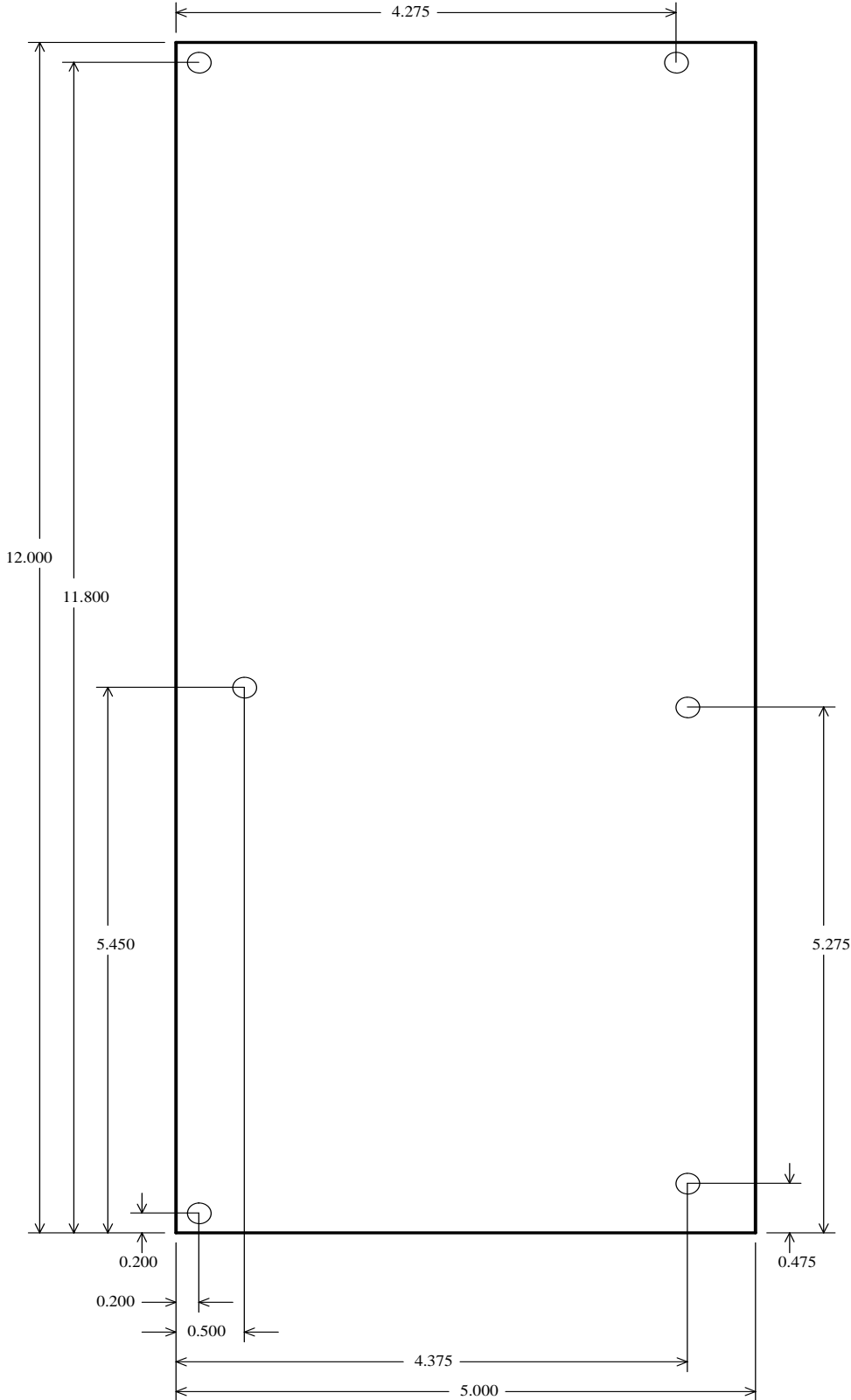
RTK3 Specifications

Characteristic	Min.	Typ.	Max.	Unit
5 Volt Supply Current	-	1.6	-	A
24 Volt Supply Current	-	0.6	-	A
Input Pullup Voltage	-	24	-	V
Input On Voltage	22	-	-	V
Input Off Voltage	-	-	1.25	V
Power Relay Output Current	0.01	-	10	A @ 250VAC
Power Relay Output Current	0.01	-	5	A @ 30VDC
Power Relay Output Current	10	-	400	mA @ 100VDC
Signal Relay Output Current	0.001	-	0.5	A @ 125VAC
Signal Relay Output Current	0.001	-	1	A @ 24VDC
Open Collector Output Current	-	-	500	mA
Open Collector Output Voltage	-	5	-	V
3 Phase Output Load	-	-	0.50	HP @ 250VAC
110 VAC Input Current	-	9	28	A
3 Phase Input Current	-	-		
Input Operating current	9	11	15	mA
Analog Output Resolution	-	12	-	bits
Analog Output Voltage	0	-	10	V
Analog Output Current	0	1	20	mA
Size: 12*5*4 (W*D*H)				

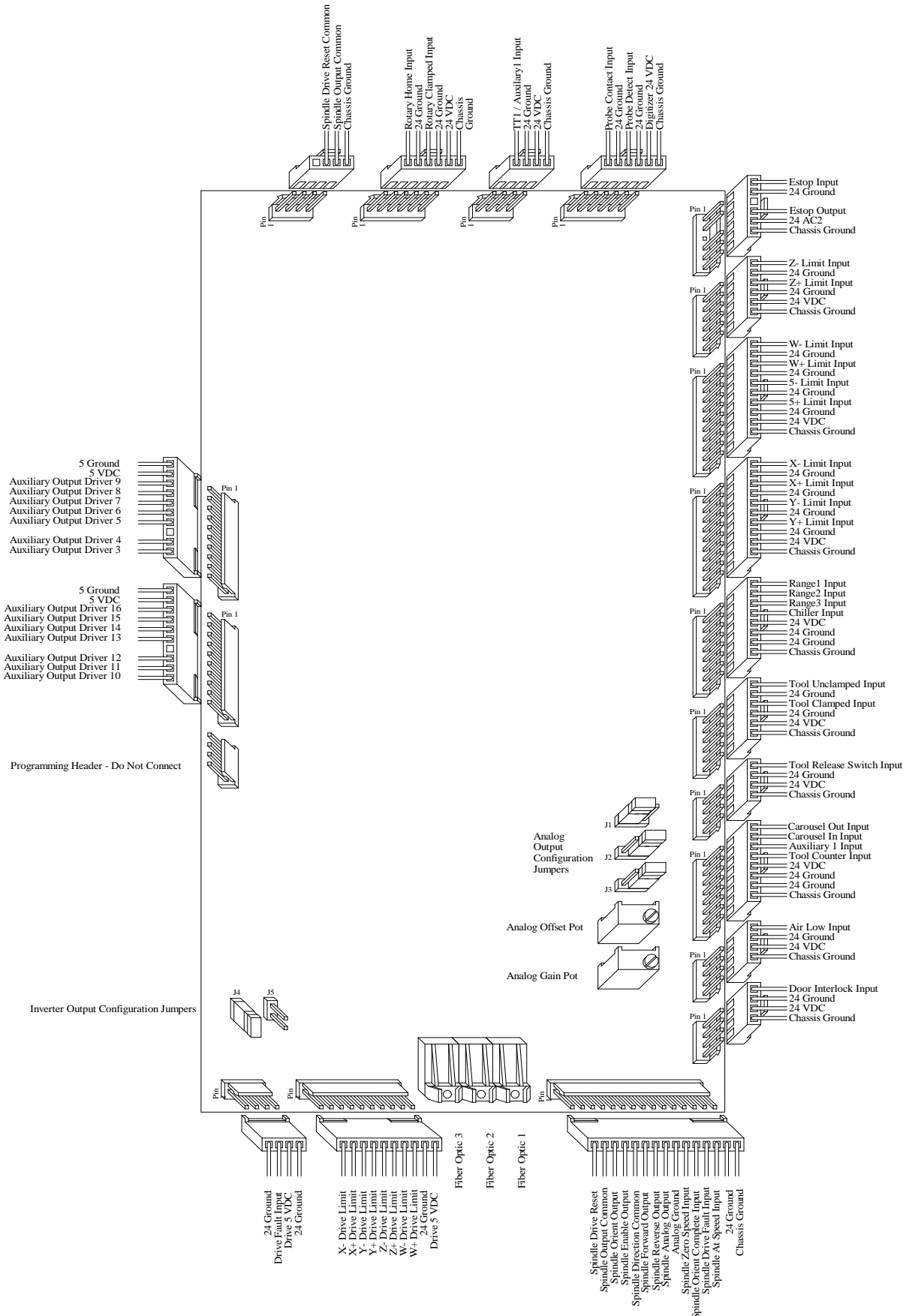
RTK3 Troubleshooting

Symptom	Possible Cause	Corrective Action
All status LEDs out	110VAC not connected	connect 110VAC supply to H7 on top board, check voltage between 110ACN and 110ACH terminals
	F1 Fuse on logic board blown	Return for repair
PLC OK LED out	Motion control card not initialized	Start CNC10 or CNC7 software
	Incorrect PIC on motion control card	Install IO2PIC
	Fibers faulty or incorrectly connected	Check connections, inspect or swap fibers
+24 LED out	Fuse blown or poor connection	Check +24VDC fuse and fuseclips on bottom board
No digitizer +24VDC	If +24VDC LED is lit, digitizer fuse blown or poor connection	Check digitizer fuse and fuseclips on bottom board
No analog output or non-linear output	Incorrect Parameter 31 setting	Set P31 to -1
Estop contactor or other 24VAC outputs not working	24VAC not connected	plug 24VAC cable into 24VAC input on middle board, check connections and voltage
AUX2 or CHILLER outputs not working	Jumpers J1-J4 on Output (middle) board not set correctly	Refer to page 6 in the manual

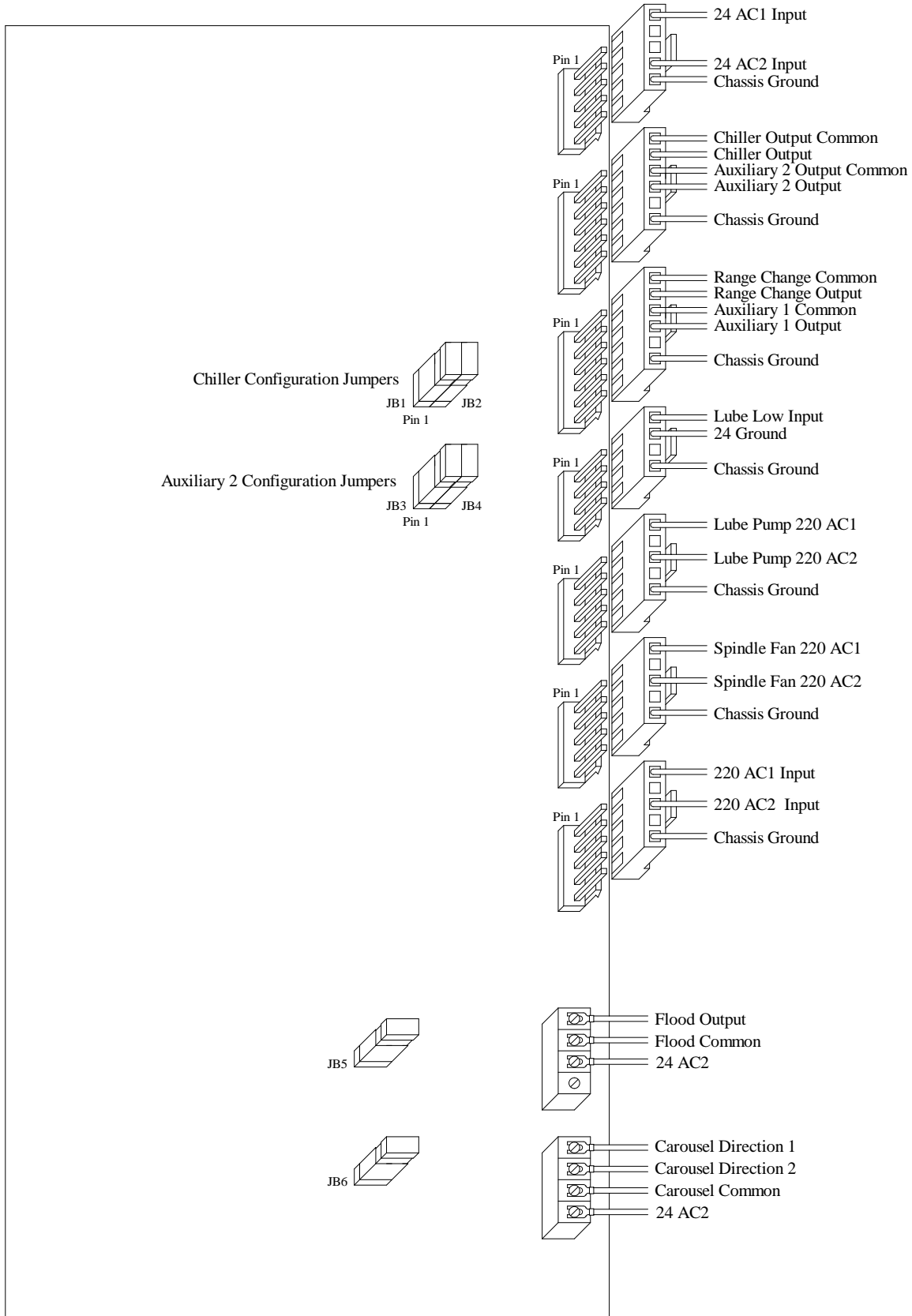
RTK3 Mounting Dimensions



RTK3L (Bottom) Board Connections



RTK30 (Middle) Board Connections



RTK3T (Top) Board Connections

