

ACU-RITE



Installation Manual

AMI^{G2}

11/2017

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Symbol Introduction

AMI^{G2} Installation Manual Symbols

Message symbols



This symbol indicates that there is one or more of the following risks when using the described function

- Danger to work piece
- Danger to fixtures
- Danger to tool
- Danger to machine
- Danger to operators



Damage!

This symbol indicates that there is risk of damage, or electrical shock if instructions are not adhered to.



Different from machine to machine!

This symbol indicates that instructions may apply differently from one type of machine to another type of machine.



Refer to another Manual!

This symbol indicates that information required is located elsewhere (i.e. Machines Owner Manual).



Advice!

This symbol indicates that an Advice tip is being provided. Important, and/or additional information about the function described.

Changes (errors)

HEIDENHAIN Corporation is continuously striving to improve. Please help HEIDENHAIN Corporation by sending your request to the following e-mail address: sales@heidenhain.com

Visit www.acu-rite.com for latest version of this manual.

Symbols used on the system components

Where the following symbols appear on the AMI^{G2} system components, or in this document, they alert you to important safety considerations.

Symbol	Description
	This symbol is used to denote "Direct Current".
	This symbol is used to denote "Alternating Current".
	This symbol is used to denote "Earth (ground) terminal".
	This symbol is used to denote "Protective conductor terminal".
	This symbol is used to denote the power switch "On (supply)" position.
	This symbol is used to denote the power switch "Off (supply)" position.
	This symbol denotes "Caution, risk of electric shock".
	This symbol denotes "Caution, risk of danger". Refer to the accompanying information or documentation to protect against personal injury or damage to the unit.

1

Update Information
AMI^{G2}

1.1 Update Information

General information

Updates to hardware and installation are documented in this section.

New Release

Version -20

- New product release.

Version -21

- Pin out tables and schematics were updated.

Version -22

- Updated information regarding to alter settings, auto lube control, speed input, and spindle delay. See Chapter 4.
- Added Machine Functions Soft keys (MFSK). See Chapter 4.
- Software features available require MILLPWR^{G2} software 751005-04 or newer.

Version -23

- Updated the Console, motor cabling, & connection diagram. See Chapter 3.13.

Version -25

- Updated the Control Panel Wiring Diagram in Chapter 3.17.
Removed the Automatic Oiler option in Chapter 3.8.

Version -26

- Updated the E-Stop wiring diagram. See Chapter 3.1.

Version -27

- Added electrical specifications for switching inputs and switching outputs. See Chapter 3.8.

2

**Introduction &
Preparation**
AMI^{G2}

2.1 Introduction to AMI^{G2}

General information

The AMI^{G2} industrial control panel provides **Auxiliary Machine Interface (AMI)** and spindle control for MILLPWR^{G2}.

The AMI^{G2} should only be used with MILLPWR^{G2} consoles. There are two configurations of AMI^{G2} as described on page 19. The standard MILLPWR^{G2} console (ID 745604-01 Index >= B, 745604-03 Index >= B, 1113777-01, or 1113777-03) can be used with either AMI^{G2} configuration. The inverter control spindle requires the spindle control console (ID 745604-02 Index >= B, 745604-04 Index >= B, 1113777-02, or 1113777-04).

The software features described in this document require MILLPWR^{G2} Software 751005-04 or newer.

The AMI^{G2} should only be installed and operated as described in this manual. Commissioning, maintenance, inspection, and operation are only to be performed by trained personnel. For more information on MILLPWR^{G2} please refer to the MILLPWR^{G2} Installation Manual (ID 1034382-2x), and User's Manual (ID 1034384-2x).

Installation Requirements



Machine location must provide proper clearances for mounting and wiring the AMI^{G2}. Only install the AMI^{G2} in its intended orientation.

2.2 Installation Tools

Tools:

Tools required for installation:

Drills and Taps

- 1 1/4" center drill
- 2 3/8" variable speed drill (heavy duty)
- 3 #7 Drill (.201")
- 4 1/4-20 UNC Tap with handle

Drivers

- 1 Hex key 3/16" (Ball driver)
- 2 Hex key 2.5mm (Ball driver)

Hammers

- 1 Ball Peen (12 oz)

Measurement tools & levels

- 1 Measuring tape - 12 ft
- 2 Level - 8"

Screwdrivers

- 1 Small, non-conductive, flat tip
- 2 #2 Phillips Head

Miscellaneous

- 1 20 ft extension cord
- 2 Deburring tool

3

Mounting & Electrical Installation AMI^{G2}

3.1 E-Stop

Emergency Stop button



Emergency Stop buttons must be installed in the system. Ensure that the relay contacts have a sufficient rating for the application.

- The Emergency Stop button, and Overtravel limit switches are wired in series. When any of them open, power to the motor servos is removed. Correct installation is vital for safety.



Never alter these circuits to defeat their function. Serious injury, or machine damage could result. Observe all applicable codes as to the placement and labeling of Emergency Stop buttons.

External E-Stop and Limit switch

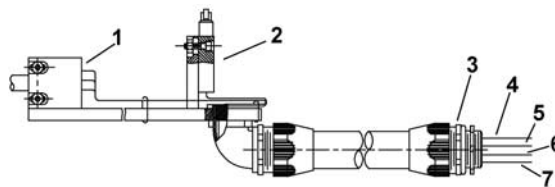
Refer to the drawing for the AMI^{G2} system. All external E-Stops are wired to TB3. Refer to the wiring table TB3 see "PCBA pin out" on page 38.



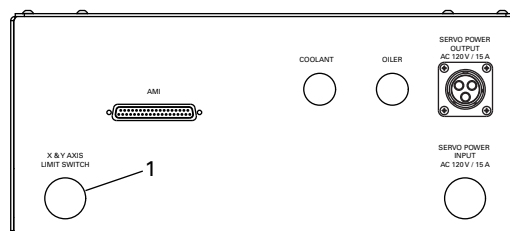
Parts required for this installation step are included with the Limit Switch Kit (ID 33000127).

- ▶ Locate the tie-wrap anchors and the 10-32 x 1/4" Phillips head screws.
- ▶ On the left side of the arm along the center, punch three locations 10" apart.
- ▶ Drill and tap 10-32 x 1/2" deep at the punched locations.
- ▶ Attach the tie-wrap anchors to the arm with the PHMS.

- 1** X axis limit switch
- 2** Y axis limit switch
- 3** 1/2" NPT nut
- 4** Wire: RED X1
- 5** Wire: BLACK X2
- 6** Wire: RED Y1
- 7** Wire: BLACK Y2
- 8** Coolant Harness



- ▶ Remove the metal 1/2" NPT nut from the X and Y axis limit switch cable.
- ▶ Insert the X and Y limit switch cable into the hole in the control cabinet [1]. Secure the connection.
- ▶ Connect the red and black X axis leads to screw terminals TB3-3 and TB3-4 of the AMI^{G2} interface board.
- ▶ Connect the red and black Y axis leads to screw terminals TB3-5 and TB3-6 of terminal block 14 of the AMI^{G2} interface board.



3.2 Mounting and Electrical Installation

Introduction

The following system drawings are available for reference:

Document ID	Description
745604-0x 1113777-0x	Console System Equipment, see page 44
1026815	Console, motor cabling, & connection, see page 45
1085469	Interconnect and single phase (Standard), see page 46
1117579	Interconnect, single and three phase (Deluxe), see page 48
1117582	DC system wiring, see page 51
1117581	E-Stop Ladder Wiring, see page 52
1111657	Control Panel Wiring, see page 53

3.3 Main Components

AMI^{G2} industrial control panel

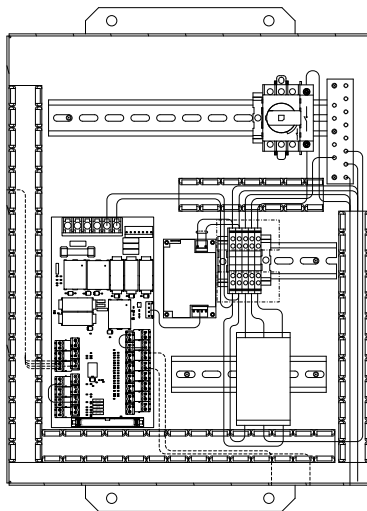
The AMI^{G2} is a compact electrical cabinet designed to be used with MILLPWR^{G2} consoles.

The AMI^{G2} provides commonly used machine interfaces and spindle control. There are two configurations of the AMI^{G2} available.

AMI^{G2} Standard ID 1109611-01

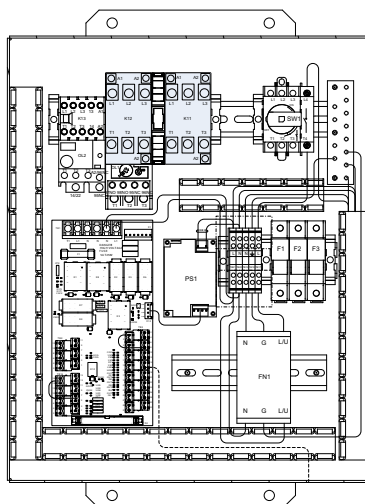
The AMI^{G2} Standard has I/O that can be used for various purposes. For example:

- Machine guards
- Limit switches
- Automatic oiler
- AMI Program Step. The AMI Program Step allows the programmer to specify the outputs to be turned ON or OFF, or PULSED for a certain duration. This can be used to control external devices such as an indexer.
- The AMI^{G2} Standard can also be used with an inverter controlled spindle. The spindle control console is required for inverter controlled spindle. The console provides the standard ± 10 Vdc and a spindle override knob.



AMI^{G2} Deluxe ID 1109611-05

The AMI^{G2} Deluxe includes everything in the Standard configuration plus the ability to control spindle and coolant pump using M-Functions for controlling direction (forward or reverse) and turning the spindle off.



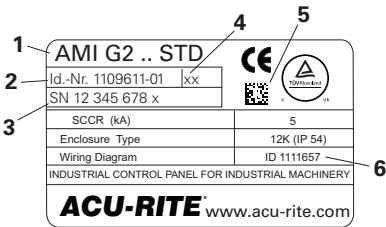
The standard MILLPWR^{G2} console (ID 745604-01 Index >= B, 745604-03 Index >= B, 1113777-01, 1113777-03) can be used with either AMI^{G2} configuration. The inverter control spindle requires the spindle control console (ID 745604-02 Index >= B, 745604-04 Index >= B, 1113777-02, 1113777-04). The possible combinations of consoles and AMI^{G2} are summarized in the table below:

Console ID's	1109611-01 AMI ^{G2} STD	1109611-05 AMI ^{G2} DLX
745604-01 Index >=B 745604-03 Index >=B 1113777-01 1113777-03	Basic I/O	Basic I/O, Spindle Direction Control, Coolant Pump
745604-02 Index >=B 745604-04 Index >=B 1113777-02 1113777-04	Basic I/O, Inverter Control	Basic I/O, Spindle Direction Control, Coolant Pump, Inverter Control

Enclosure labeling Standard

■ The enclosure label is located on the outside of the unit, to one side, and contains information and identification specific to that enclosure.

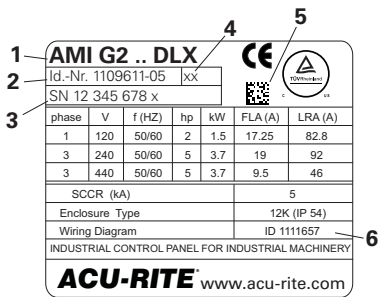
- 1 Product name
- 2 ID number
- 3 Serial number
- 4 Index
- 5 Bar Code
- 6 Wiring Diagram ID number



Enclosure labeling Deluxe

■ The 3 phase Deluxe enclosure label is located on the outside of the unit, to one side, and contains information and identification specific to that enclosure.

- 1 Product name
- 2 ID number
- 3 Serial number
- 4 Index
- 5 Bar Code
- 6 Wiring Diagram ID number



3.4 Grounding and Wiring Guidelines

Proper wiring of system grounds

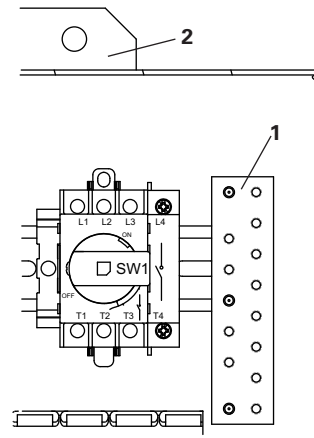
- Verify that building grounds conform to local codes at the time of installation. The CNC requires two ground paths from the building wiring: one via the AC 120 V line cord (factory installed), and one via the 3-Phase, AC 230 V wiring connected during installation (included with M-function control cabinets). Each enclosure has an assigned central ground point.



If in doubt that a proper building ground exists, consult a qualified electrician.

Central ground point - AMI^{G2} enclosure

- 1 Central Ground Buss Bar
- 2 AMI^{G2}



General wiring guidelines



Follow the electrical guidelines described here for any configuration that deviates from a standard CNC configuration. Failure to follow these guidelines can result in damage to the equipment, or bodily injury.



Warning!: Risk of electrical shock

A risk of electrical shock exists if this product is not properly grounded.

To avoid the hazard, always use a 3-conductor (grounded) power cord and ensure the ground is properly wired to the building installation.



Do not apply power until instructed to do so.

- Follow these general wiring guidelines:
 - Do not run signal wiring and power wiring in the same conduit. Where paths must cross, make their intersections perpendicular.
 - Segregate I/O wiring by signal type. Route wiring with different signal characteristics by separate paths whenever possible. To prevent crosstalk, do not run harnesses that contain different signal types parallel to one another.
 - Establish a low-impedance, single-point ground. All noise reduction techniques depend upon proper grounding.
 - Routing and grounding servo wiring is more important than wire length.
 - Make signal wiring as short and direct as possible.

Isolation transformer

AC 120 V line must be provided.

- An electrostatic-shielded isolation transformer with a rating of 2 KVA is recommended for the control system.
- If output devices are connected through the transformer, add their maximum VA requirements to determine the correct transformer size.

3.5 AMI^{G2} Installation

Procedure:



Caution when lifting the control cabinet. The weight of the two enclosures are approximately 12 lbs, and 14 lbs. Follow applicable safety regulations for lifting.



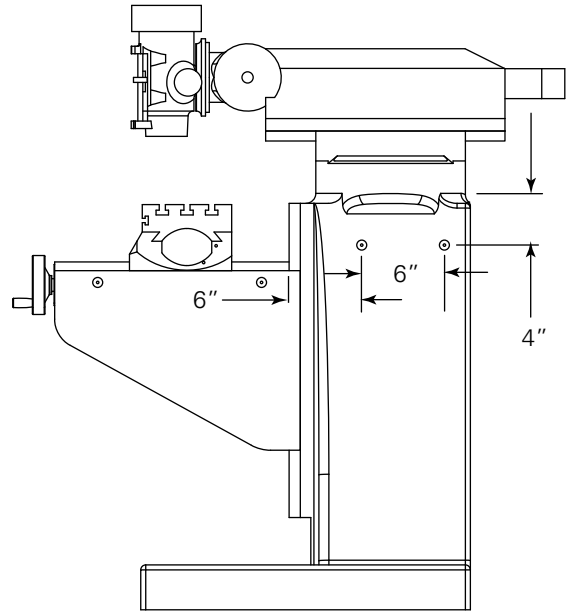
Machine location must provide proper clearances for mounting and wiring the control cabinet and console. Insure space around the machine allows for the control cabinet, and console cabling harnesses.



The hardware mounting kit includes an assortment of spacers to accommodate different machine surfaces for mounting to the side of the column.



If mounting the cabinet to the side of the column, then insure that the first top column mounting hole is 6 inches back from the knee's way. This will insure that the table will not collide with the cabinet or any of it's components.



AMI mounting fasteners

- 1 Spacer
- 2 AMI^{G2} Mounting Ear
- 3 Flat washer
- 4 Lock washer
- 5 Mounting bolt

■ The listed parts below are included in the installation kit for mounting the box.

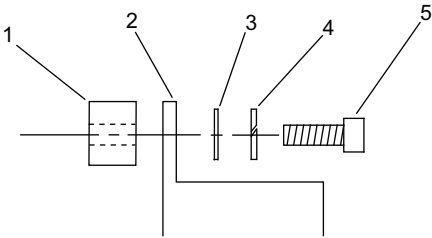
Part Number	Description
689418-23	Spacer
380108-185	1/4-20 x 1-1/2" SHCS
385039-121	1/4" lock washer
200593-35	1/4" flat washer

■ AMI^{G2} enclosure can be located on either side, or back of the column. First select the location of the enclosure. Insure that the front side of the AMI^{G2} enclosure is not protruding past the front of the knee ways of the column when mounting on the side of the column.



Only install the control cabinet in its intended orientation. Access holes and connectors are located to the underside of the cabinet when installed.

- ▶ Center the enclosure on the side of the column, locate the top two mounting holes approximately 4" down from the top of the column. Use a level to position the enclosure true with the machine.
- ▶ Center-punch the two locations on the column.
- ▶ Drill and tap hole locations for a 1/4-20 UNC thread.
- ▶ Attach the enclosure with a spacer, 1/4-20 x 1-1/2" SHCS, 1/4" flat washer and the 1/4" lock washer at each hole location.
- ▶ Locate the two lower mounting holes and repeat the above procedure.
- ▶ Torque the four fasteners to 60-75 lb-in.



3.6 Cable Connections

Rear panel

The ACU-RITE MILLPWR^{G2} console rear panel connection for the control cabinet.

- 1 Power switch
- 2 Power connector
- 3 Servo Power 120 V AMI connector
- 4 Earth (ground) terminal
- 5 Ethernet port
- 6 USB port
- 7 KT 130 Edge Finder
- 8 Pendant (Remote switch)
- 9 RS-232-C connector
- 10 Auxiliary Machine Interface (AMI) connector
- 11 Servo connector (X, Y, and Z)
- 12 Grounding Edger Finder
- 13 Encoder Inputs (W and Z axis)
- 14 Spindle connector (not shown)
- 15 VGA connector (not shown)

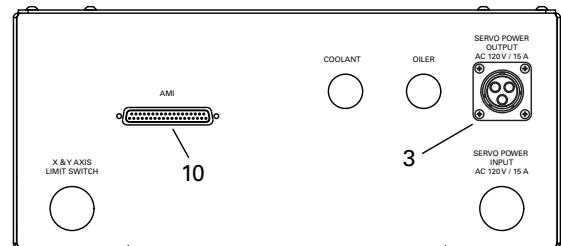


Cable routing



The AMI^{G2} should only be connected to MILLPWR^{G2} consoles.

- Connectors **3** Servo Power 120 V AMI connector, and **10** Auxiliary Machine Interface (AMI) connector, located on the underside of the control cabinet.



3.7 Electrical Wiring

Removing the cabinet cover



To ensure complete disconnect from the Mains, 3-Phase wiring must be wired to an external disconnect box, or terminated with a plug. Always disconnect from Mains power supply before opening the control cabinet.

- ▶ Shut the power off to the cabinet by turning the power switch to the OFF position which is located on the front panel cover. The cover can not be removed with the switch in the ON position.
- ▶ Four fasteners attach the front panel cover to the cabinet. Unscrew the two lower screws using a Phillips screwdriver.

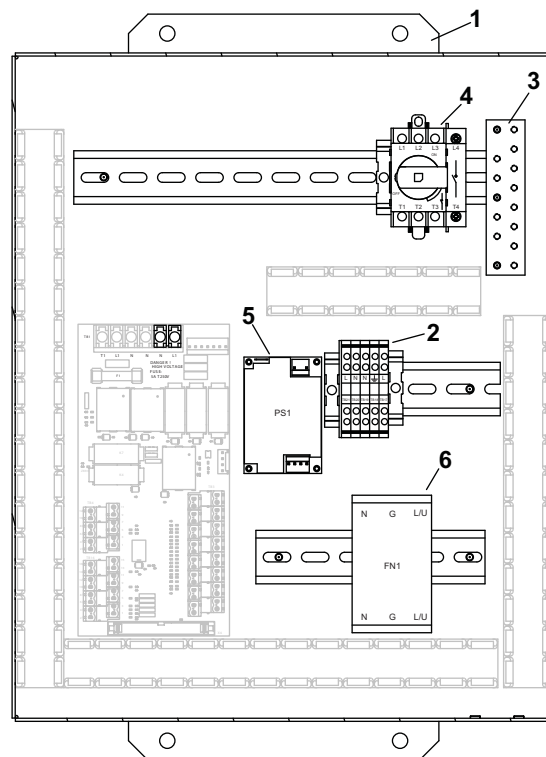
These are non-removable fasteners attached to the cover, and are retained to the cover when it is removed.

- ▶ Unscrew the two upper screws, and pull the cover horizontal away from the front of the cabinet.
- ▶ Restore cover once all internal connections are done. Torque these fasteners to 5.1 lb-in.

Spindle motor wiring, standard model

For systems without the M-Functions for the spindle motor.

- 1 AMI^{G2} cabinet
- 2 Incoming single phase power (terminal block)
- 3 Central ground bus bar
- 4 Disconnect switch
- 5 Power supply



Spindle inverter



Follow the inverter's instructions for installation and configuration. The wiring guidelines for connecting an inverter to AMI^{G2} are based on common inverter applications.

Wiring spindle inverter

AMI^{G2} can interface to an external inverter drive. DAC output from AMI^{G2} is -10 Vdc to +10 Vdc (BiPolar) or 0 to 10 Vdc (UniPolar).

Wire S+ to TB4-1

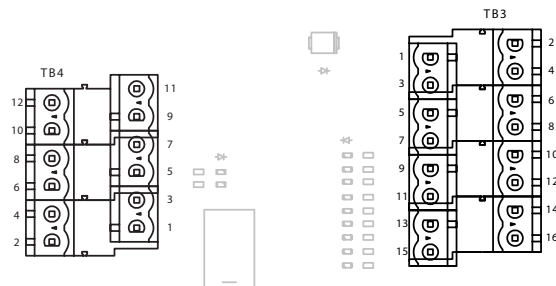
Wire S- to TB4-2

Wire Spindle EN to TB4-3

Wire (FWD) to TB3-12

Wire (REV) to TB3-14

Wire the fault output from the spindle inverter to TB4-5 (spindle inverter input).



Spindle motor wiring, deluxe model



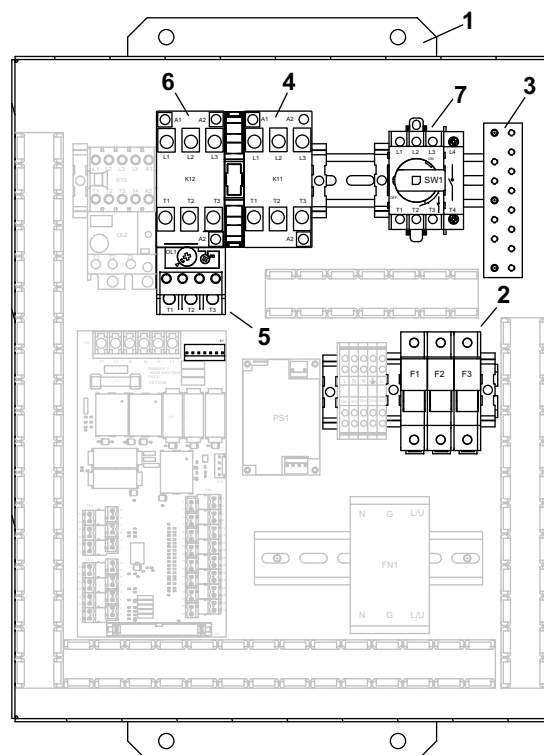
To ensure complete disconnect from the Mains, 3-Phase wiring must be wired to an external disconnect box, or terminated with a plug. Always disconnect from Mains power supply before opening the control cabinet.

For systems using the M-Functions for the spindle motor, refer to drawing 1117579-00 page 1 of 3 on page 48.

■ There are knock outs provided in the cabinet for connecting the incoming 3-Phase power.

- 1 AMI^{G2} cabinet
- 2 Incoming 3-Phase power
- 3 Central ground bus bar
- 4 Reversing contactors
- 5 Thermal overload
- 6 Spindle motor
- 7 Disconnect switch

- ▶ Attach the incoming 3-Phase power leads to the disconnect switch 7.
- ▶ Install the non-terminated end of the harness into one of the lower access holes of the AMI^{G2}. Secure the harness with the connector.
- ▶ Connect spindle motor wires to the reversing contact 5.



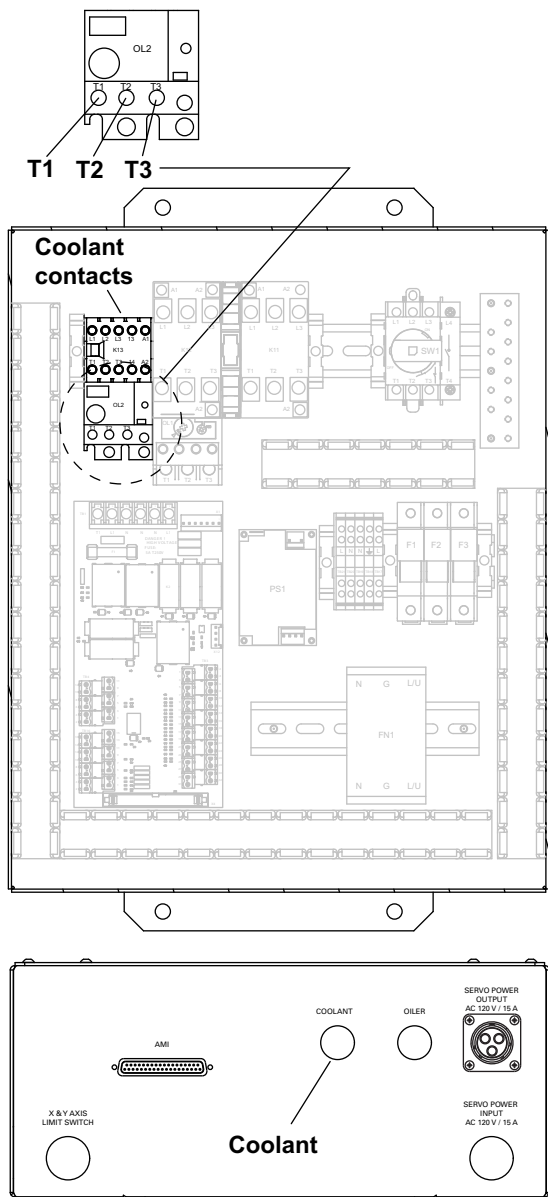
Coolant pump



To ensure complete disconnect from the Mains, 3-Phase wiring must be wired to an external disconnect box, or terminated with a plug. Always disconnect from Mains power supply before opening the control cabinet.

For machines that have a coolant pump installed, refer to drawing 1117579-00 page 3 of 3 on page 50.

- Connect the coolant flood pump harness as specified by the manufacturer to T1, T2, and T3.
- Insert the harness into the lower hole on the under side of the AMI^{G2} that is labeled COOLANT.



Guards

A jumper wire is factory installed between TB16-14 and TB16-16. This is required when no guards are present.

Guards must be connected to TB16 of the AMI^{G2} interface board with a DPST switch, or equivalent. Multiple guards are allowed, but must be wired in series.

Connecting a guard:

- Wire Pin 16 (24 V) to one pole of the guard switch in the closed state.
- Wire Pin 15 (GND) to one pole of the guard switch in the open state.

When the guards are closed, the guard circuit is energized, and enables the spindle, coolant and servo drives.

This is indicated by the red LED on the AMI^{G2} interface board marked GOP1 (D27).

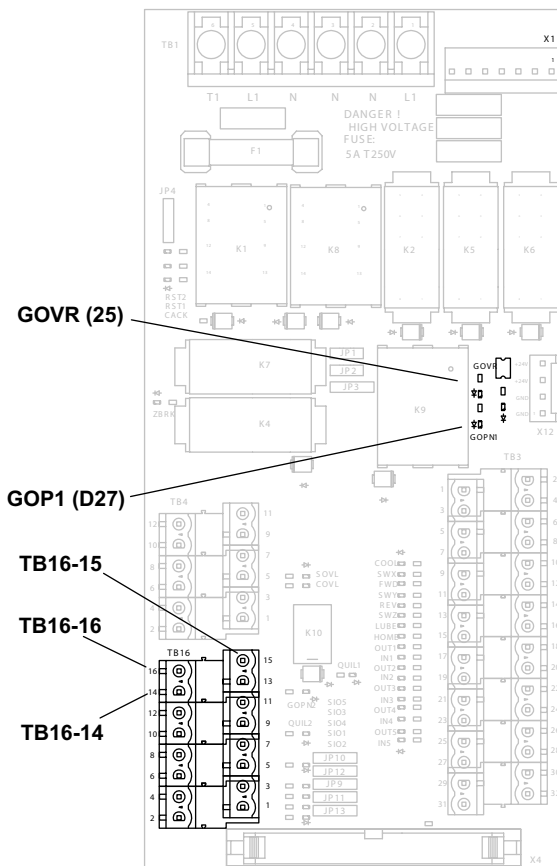
ON = normal operation

OFF = guards opened, system halted.

When overridden, it is indicated by the red LED on the servo interface board marked GOVR (D25).

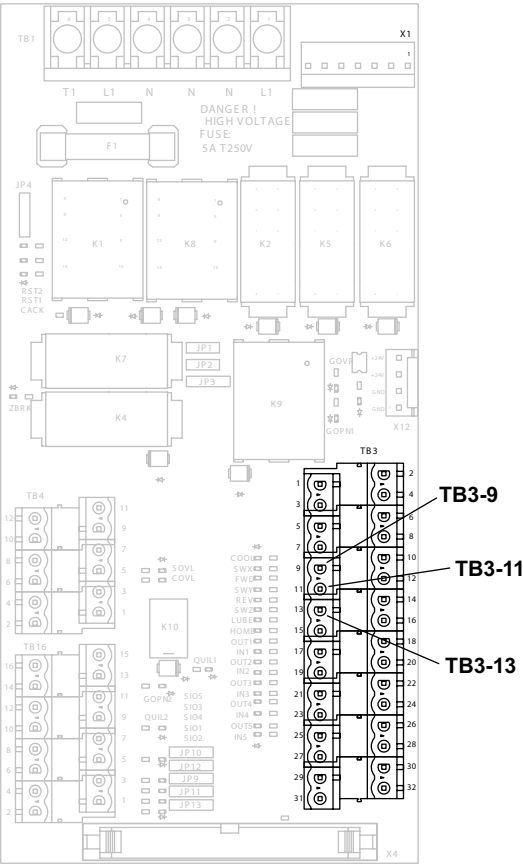
ON = Guards overridden.

OFF = Normal operation.



Vector/Home switch connection

Vector switches are done using TB3 input pins 9 (X), 11 (Y), 13 (Z) on AMI^{G2} interface.



3.8 Electrical Information

AMI^{G2} Specification



To ensure complete disconnect from the Mains, the 3-Phase wiring must have an external disconnect box, or terminated using a plug. Always disconnect the AMI^{G2} from the Mains power supply before opening the control cabinet.

Specification	AMI ^{G2} Standard	AMI ^{G2} Deluxe
Main Power Input from console	AC 100 ... 120 V (±10 %) 50 Hz ... 60 Hz (±2 %)	AC 100 ... 120 V (±10 %) 50 Hz ... 60 Hz (±2 %)
Replaceable Fuses:	See "Fuse ratings" on page 33	See "Fuse ratings" on page 33
Motor Power Input: Single Phase		AC 100 ... 120 V (±10 %) 50 Hz ... 60 Hz (±2 %) (max. 1.47 kW)
Motor Power Input: 3-Phase		AC 220 ... 485 V (±10 %) 50 Hz ... 60 Hz (±2 %) (max. 3.7 kW)
Operating Temperature	0 ° ... 45 °C (32 ° ... 113 °F)	0 ° ... 45 °C (32 ° ... 113 °F)
Storage Temperature	-20 ° ... 70 °C (-4 ° ... 158 °F)	-20 ° ... 70 °C (-4 ° ... 158 °F)
Relative humidity	< 80 % RH	< 80 % RH
Protection (IEC 60529)	Type 12 K (IP 54)	Type 12 K (IP 54)
SCCR	5 kA	5kA
Weight	12 lbs (5.4 kg)	14 lbs (6.3 kg)
Enclosure	Sheet metal	Sheet metal

Switching Inputs 24 Vdc (PLC)

Input signals of the switching inputs for the AMI^{G2} PCB:

Voltage range	
"1" Signal: Vi	13 V to 30.2 V
"0" Signal: Vi	-20 V to 3.2 V

Current ranges	
"1" Signal: Vi	3.8 mA to 8.9 mA
"0" Signal: Vi when Vi = 3.2 V	1.0 mA

Switching Outputs 24 Vdc (PLC)



PLC outputs must not be connected to a 24 V supply or to other PLC outputs with a difference in potential. This could cause the voltage present at the PLC outputs to transmit to the power supply. The PLC outputs that can be switched off may be supplied with this voltage.

The switching outputs are transistor outputs with current limitation. Please note:

- Permissible load: Resistive load (ohmic load)---inductive load (e.g. relay, contactor) only with quenching diode parallel to inductance.
- Short circuiting of one output is permissible. No more than one output may be short-circuited at one time.

Output signals:

Voltage range	
"1" Signal: Vi	13 V to 30.2 V

Current ranges	
Single 24 Vdc output	<=100 mA
All 24 Vdc outputs	<=500 mA



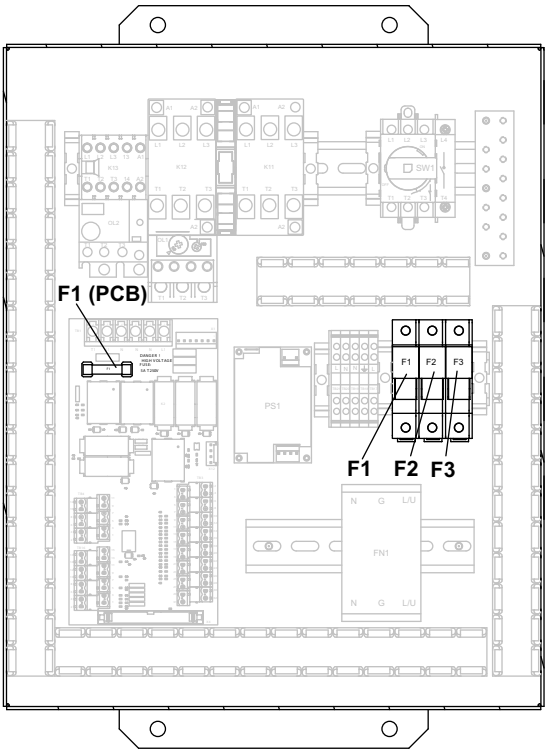
The switching outputs need a minimum load of 5 mA to operate correctly. Outputs conform to EN 61131-2.

Fuse ratings

Fuse #	Dimensions	Size
F1	10 x 38 mm	T 30A/600 VAC UL T 32A/690 VAC IEC
F2	10 x 38 mm	T 30A/600 VAC UL T 32A/690 VAC IEC
F3	10 x 38 mm	T 30A/600 VAC UL T 32A/690 VAC IEC
F1(PCB)	6.3 x 32 mm	T 5A/250 VAC

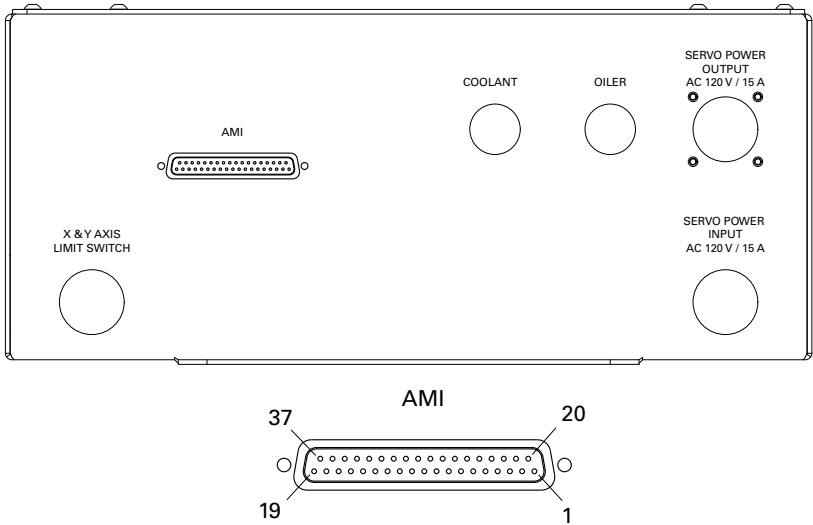


Use only replacements fuses meeting the rated specifications.



Connections:

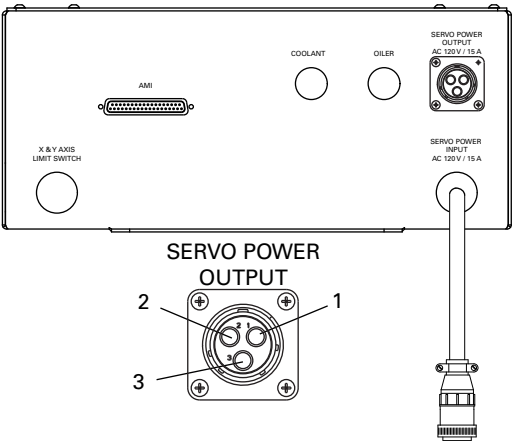
AMI Signal - 37 pin out



1	2	3	4	5	6	7	8	9	10
GND	O17 XY IN-POS	N/A	ESTOP 2	N/A	O3 COOL ON	O4 SPDL FWD	O5 SPDL REV	O8 LUBE ON	O18 MIST ON
11	12	13	14	15	16	17	18	19	20
O19 AUX 1	I0 HOME SW X	I1 HOME SW Y	I2 HOME SW Z	I7 SPDL OVL	I8 COOL OVL	I19 SHARED I1	I20 SHARED I2	I21 SHARED I3	I22 GUARD
21	22	23	24	25	26	27	28	29	30
O27 AUX 2	+24 V	+24 V	CTRL RDY	I31 DRIVE EN	I11 HOME SW U	O28 AUX 3	O30 PLC RDY	O29 AUX 4	I3 CTRL ACK
31	32	33	34	35	36	37	-	-	-
I23 SPDL AT-SPEED	I24 SPDL AT-REST	I25 REMOTE GO	I26 LOW OIL	I27 SPDL GEAR	SPINDLE DAC+	SPINDLE DAC-	/	/	/

Servo Power output - pin out

Pin	SIGNAL
1	Line
2	Neutral
3	Ground

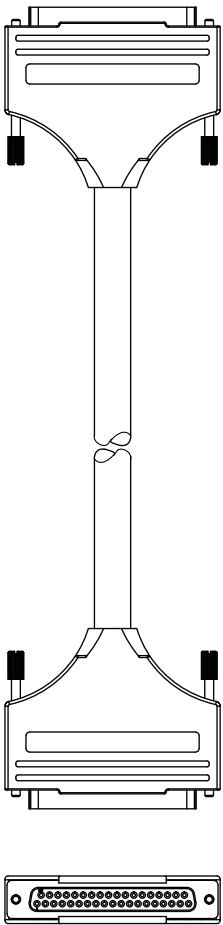


3.9 Interconnect Cable

AMIG²

Connecting cable

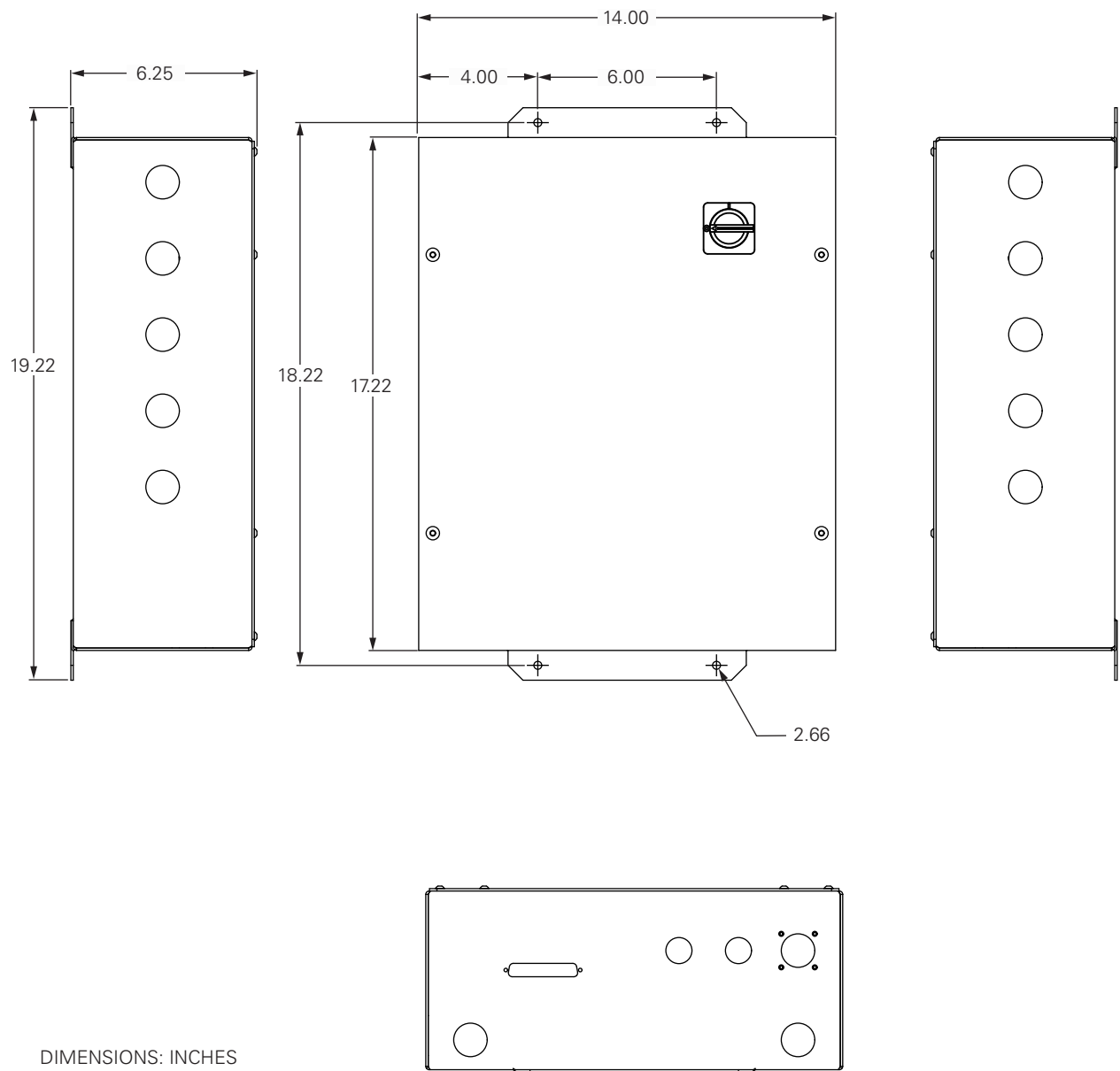
ID	Cable, Console to control cabinet
1117505-05	16.4 ft (5 m)



3.10 Product Overview and Dimensions

Dimensions:

AMI^{G2} dimensions



DIMENSIONS: INCHES

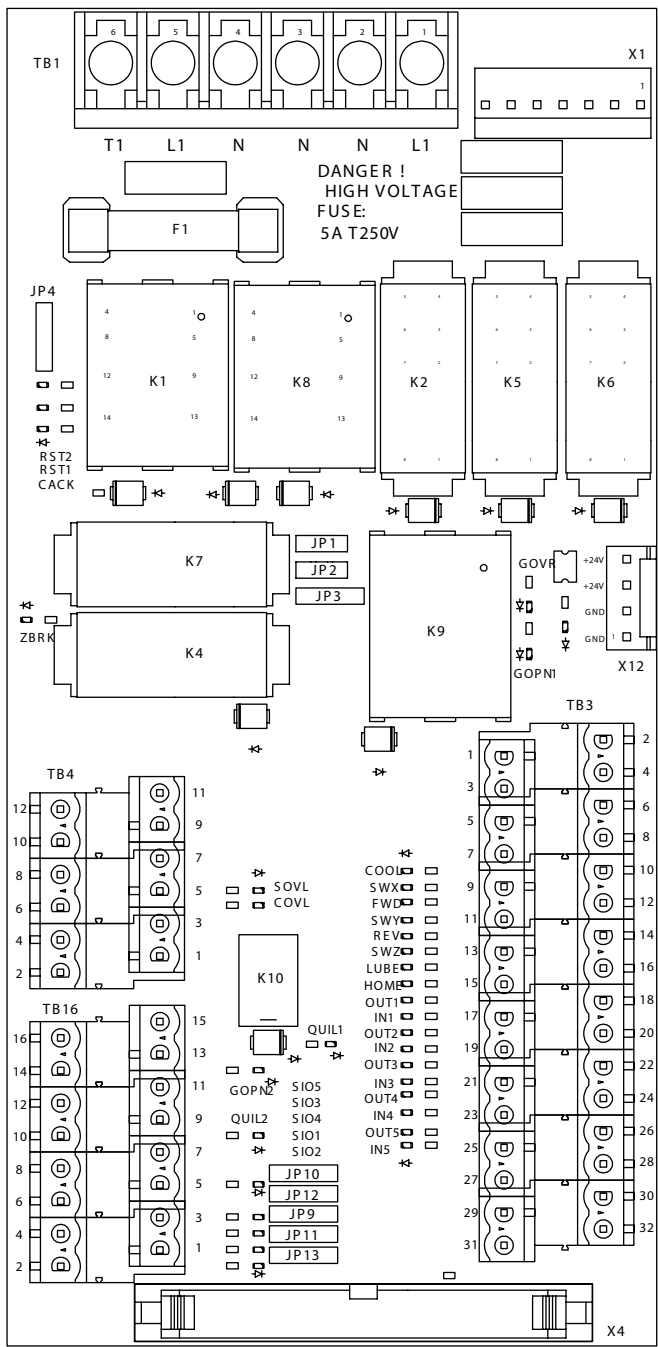
AMIG² Interface

ID 1071952-xx

PCBA pin out

General Notes:

- ▶ If dead-stop limits, or additional E-Stop buttons are not being used, jumpers must be placed at their corresponding location on TB3: (1-2), (3-4), (5-6), (7-8).
- ▶ Remove factory installed jumper from TB16 when using machine guards.
- To access the shared I/O at TB16, (Guards Safety and Quill will be disabled).
 - ▶ Remove harness from TB4.
 - ▶ Move jumpers JP9 thru JP13 from pins 1-2 to pins 2-3.
 - ▶ Add jumper from TB16-14 to TB16-16.



Pin outs for TB1

PIN	COLOR	DESCRIPTION
1	BLACK	L1 AC IN
2	WHITE	N NEUTRAL
3		N NEUTRAL
4		N NEUTRAL
5		L1 AC IN
6		T1 AC OUT

Pin outs for TB3

1	2	3	4	5	6	7	8	9
EXTERNAL ESTOP	EXTERNAL ESTOP	X-LIMIT	X-LIMIT	Y-LIMIT	Y-LIMIT	Z-LIMIT	Z-LIMIT	I0 HOME SW X
10	11	12	13	14	15	16	17	18
O3 COOL ON	I1 HOME SW Y	O4 SPDL FWD	I2 HOME SW Z	O5 SPDL REV	I11	O8 LUBE PUMP ON	I23 SPDL AT SPEED	O18 COOL MIST
19	20	21	22	23	24	25	26	27
I24 SPDL AT REST	O19 AUX 1	I25 REMOTE GO	O27 AUX 2	I26 LOW OIL	O28 AUX 3	I27 SPDL GEAR HIGH	O29 AUX 4	COM
28	29	30	31	32	-	-	-	-
+24 V	COM	+24 V	COM	+24 V	/	/	/	/

Pin outs for TB4

PIN	COLOR	DESCRIPTION
1		SPDL DAC+
2		SPDL DAC-
3		SPDL ENABLE
4	BLUE	+24 V
5	BLACK	SPDL OVL
6	BLACK	COOL OVL
7		COM
8		ESTOP OUT
9		
10		
11	YELLOW	COM
12	BLUE	+24 V

Pin outs for TB16

1	2	3	4	5	6	7	8
I19 SHARED_I1	I20 SHARED_I2	I21 SHARED_I3	I22 SHARED_I4	O17 IN_POSITION	/	COM	+24 V
9	10	11	12	13	14	15	16
NA	NA	COM	+24 V	/	I22 GUARD SW INPUT	COM	+24 V

JUMPERS

Other jumpers have no user functionality and are not to be moved.

JP	DEFAULT	DESCRIPTION
JP3	1-2	2-3: ENABLED E-STOP OUT
JP9	1-2	2-3: ENABLED SHARED_I4 (I22 AT TB16-4)
JP10	1-2	2-3: ENABLED SHARED_O1 (O17 AT TB16-5)
JP11	1-2	2-3: ENABLED SHARED_I1 (I19 AT TB16-1)
JP12	1-2	2-3: ENABLED SHARED_I3 (I21 AT TB16-3)
JP13	1-2	2-3: ENABLED SHARED_I2 (I20 AT TB16-2)

Pin outs for X1

PIN	COLOR	DESCRIPTION
1	BLACK	OVL95
2	BLACK	OVL96
3	BLACK	SPDL FWD
4	BLACK	SPDL REV
5	BLACK	COOL
6	/	/
7	WHITE	NEUTRAL

Pin outs for X4

1	2	3	4	5	6	7	8	9	10
GND	I22 GUARD	O17 XY IN-POS	O27 AUX 2	N/A	+24 V	ESTOP 2	+24 V	N/A	CTRL RDY
11	12	13	14	15	16	17	18	19	20
O3 COOL ON	I31 DRIVE EN	O4 SPDL FWD	I11 HOME SW U	O5 SPDL REV	O28 AUX 3	O8 LUBE ON	O30 PLC RDY	O18 MIST ON	O29 AUX 4
21	22	23	24	25	26	27	28	29	30
O19 AUX 1	I3 CTRL ACK	I0 HOME SW X	I23 SPDL AT-SPEED	I1 HOME SW Y	I24 SPDL AT-REST	I2 HOME SW Z	I25 REMOTE GO	I7 SPDL OVL	I26 LOW OIL
31	32	33	34	35	36	37	-	-	-
I8 COOL OVL	I27 SPDL GEAR	I19 SHARED I1	SPINDLE DAC+	I20 SHARED I2	SPINDLE DAC-	I21 SHARED I3	/	/	/

Pin outs for X12

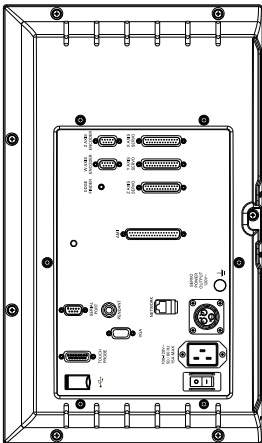
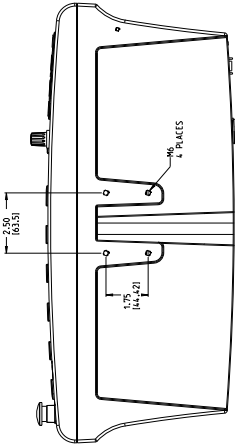
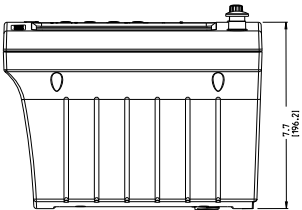
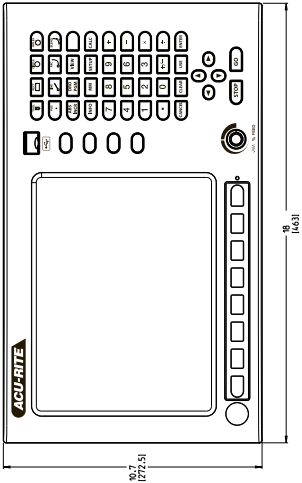
PIN	COLOR	DESCRIPTION
1	BLACK	GND
2	BLACK	GND
3	BLUE	+24 V
6	BLUE	+24 V

Diagnostic Leds

DIAGNOSTIC LEDS					
LED	COLOR	DEFAULT	SILKSCREEN	DESCRIPTION	
D2	GREEN	OFF	SWX	I0	ON: I0/HOME_SW_X ENABLED
D3	GREEN	OFF	ZBRK	E-STOP	ON: E-STOP ENABLED
D4	GREEN	OFF	RST2	RESET2	ON: RESET2 ENABLED
D5	GREEN	OFF	RST1	RESET1	ON: RESET1 ENABLED
D6	GREEN	ON	CACK	CNC ACK	OFF: CNC SYSTEM FAULT
D7	GREEN	OFF	COOL	COOL ON	ON: O3/COOLANT_ON ENABLED
D8	GREEN	OFF	LUBE	LUBE ON	ON: O8/LUBE_PUMP ENABLED
D9	GREEN	OFF	FWD	SPDL FWD	ON: O4/SPDL_FWD ENABLED
D10	GREEN	OFF	REV	SPDL REV	ON: O5/SPDL_REV ENABLED
D11	GREEN	OFF	OUT3	AUX2	ON: O27/AUX2 ENABLED
D12	GREEN	OFF	OUT4	AUX3	ON: O28/AUX3 ENABLED
D15	GREEN	OFF	SWY	I1	ON: I1/HOME_SW_Y ENABLED
D22	RED	ON	COVL	COOL OVL	OFF: THERMAL OVL ON COOLANT CONTACTOR
D23	RED	OFF	SOVL	SPDL OVL	ON: THERMAL OVL ON SPDL CONTACTOR
D24	GREEN	ON	+24 V	+24 V DC	OFF: NO 24 V DC PRESENT FROM POWER SUPPLY
D27	RED	OFF	GOPN1	GRD I CLOSED	ON: GUARDS ARE OPEN
D30	GREEN	OFF	SWZ	I2	ON: I2/HOME_SW_Z ENABLED
D32	GREEN	OFF	IN1	I23	ON: I23/SPDL_AT_SPEED ENABLED
D33	GREEN	OFF	OUT1	O18	ON: O18/COOL_MIST ENABLED
D34	GREEN	OFF	IN2	I24	ON: I24/SPDL_AT_REST ENABLED
D35	GREEN	OFF	OUT2	AUX1	ON: O19/AUX1 ENABLED
D36	GREEN	OFF	IN3	I25	ON: I25/REMOTE_GO ENABLED
D37	GREEN	OFF	IN4	I26	ON: I26/LOW_OIL ENABLED
D38	GREEN	OFF	IN5	I27	ON: I27/SPDL_GEAR_HIGH ENABLED
D39	GREEN	OFF	OUT5	AUX4	ON: O29/AUX4 ENABLED
D42	GREEN	OFF	GOPN2	GRD II CLOSED	ON: GUARDS ARE CLOSED
D50	GREEN	OFF	SIO1	I19	ON: I19 ENABLED
D51	GREEN	OFF	SIO2	I20	ON: I20 ENABLED
D52	GREEN	OFF	SIO3	I21	ON: I21 ENABLED
D53	GREEN	OFF	SIO4	I22	ON: I22 ENABLED
D54	GREEN	OFF	SIO5	O17	ON: O17/IN_POSITION ENABLED

3.11 System Equipment

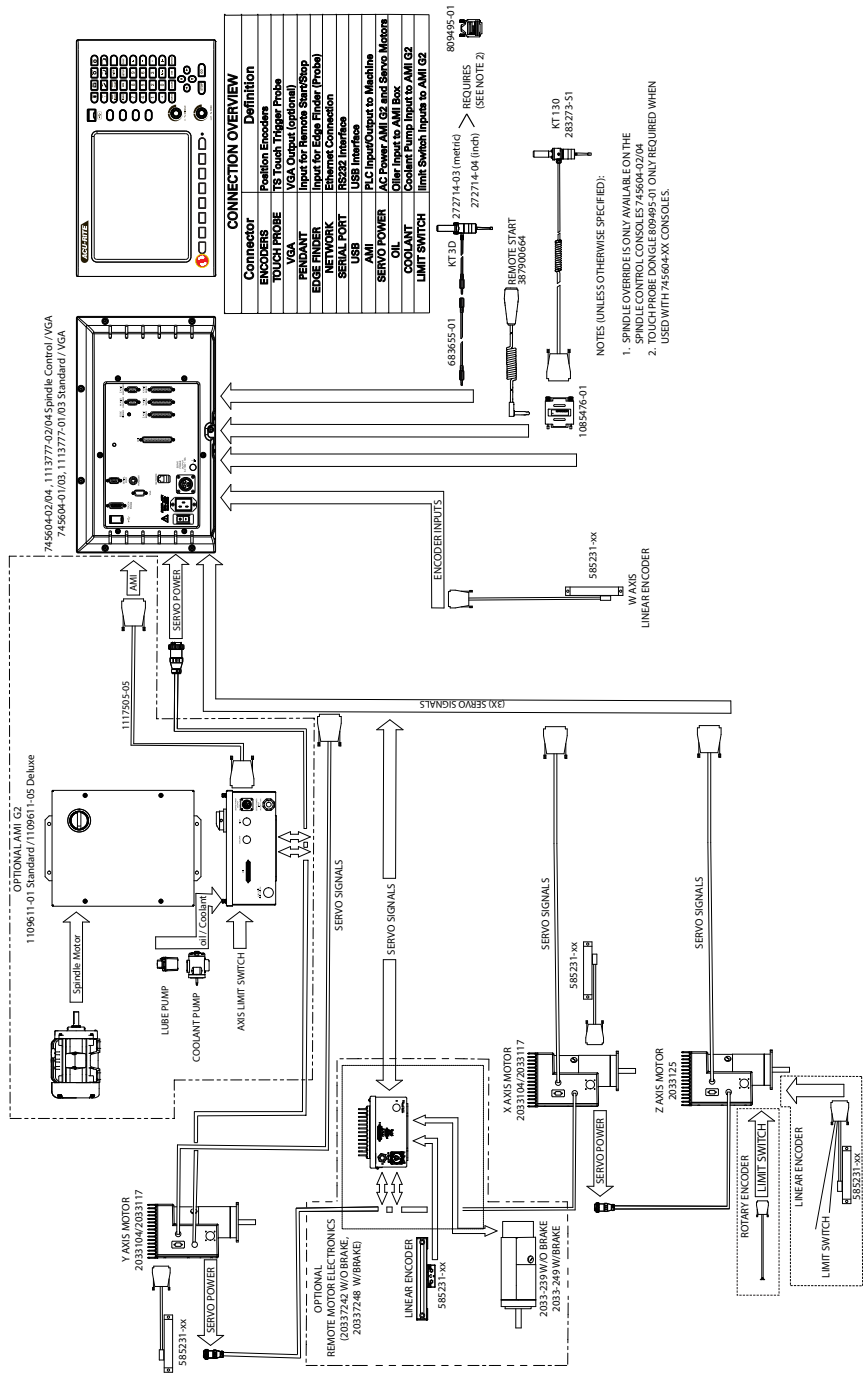
Console ID 745604-0x, 1113777-0x



3.12 System Interconnect

Console, motor cabling, & connection

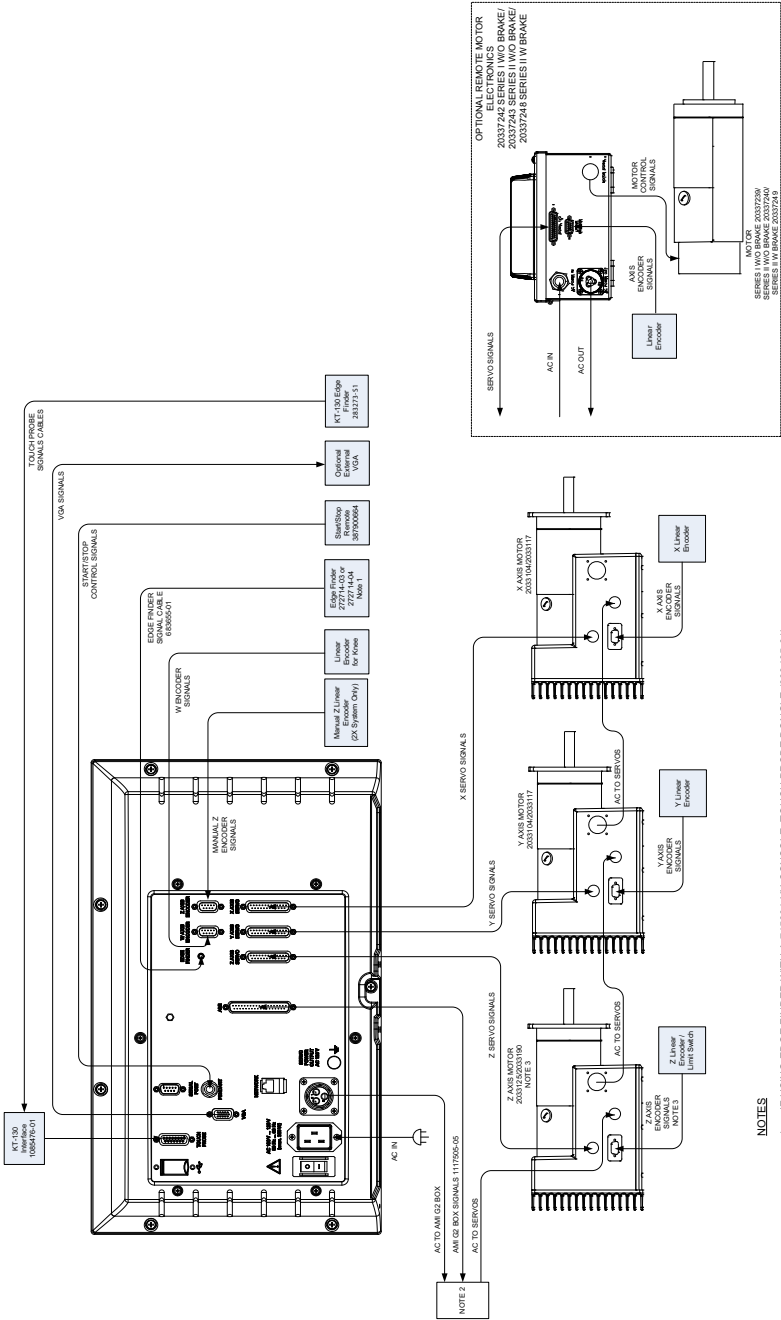
Document ID 1026815



3.13 Interconnect and Wiring Diagram (Standard)

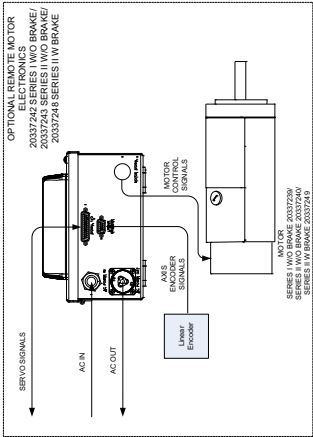
Console interconnect

Document ID 1085469 Page 1 of 2



NOTES

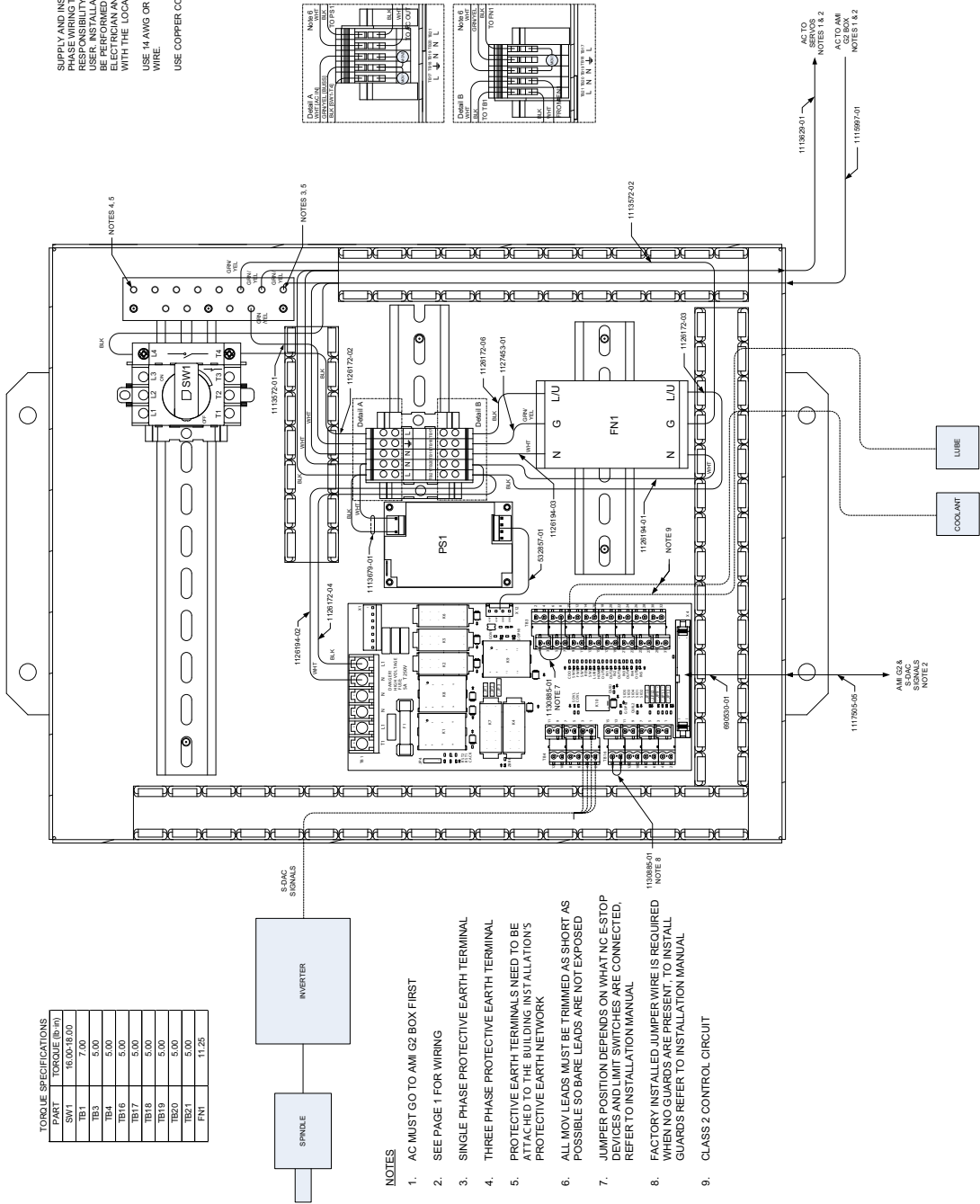
1. IF USING EDGE FINDER WITH A 745604-XX CONSOLE TOUCH PROBE DONGLE (809495-01) NEEDS TO BE PLUGGED INTO TOUCH PROBE PORT
2. AMI G2 BOX CONNECTIONS ON PAGE 2
3. Z AXIS ROTARY MOTOR (2033190) DOES NOT NEED EXTERNAL ENCODER



Standard single phase wiring diagram

Document ID 1085469 Page 2 of 2

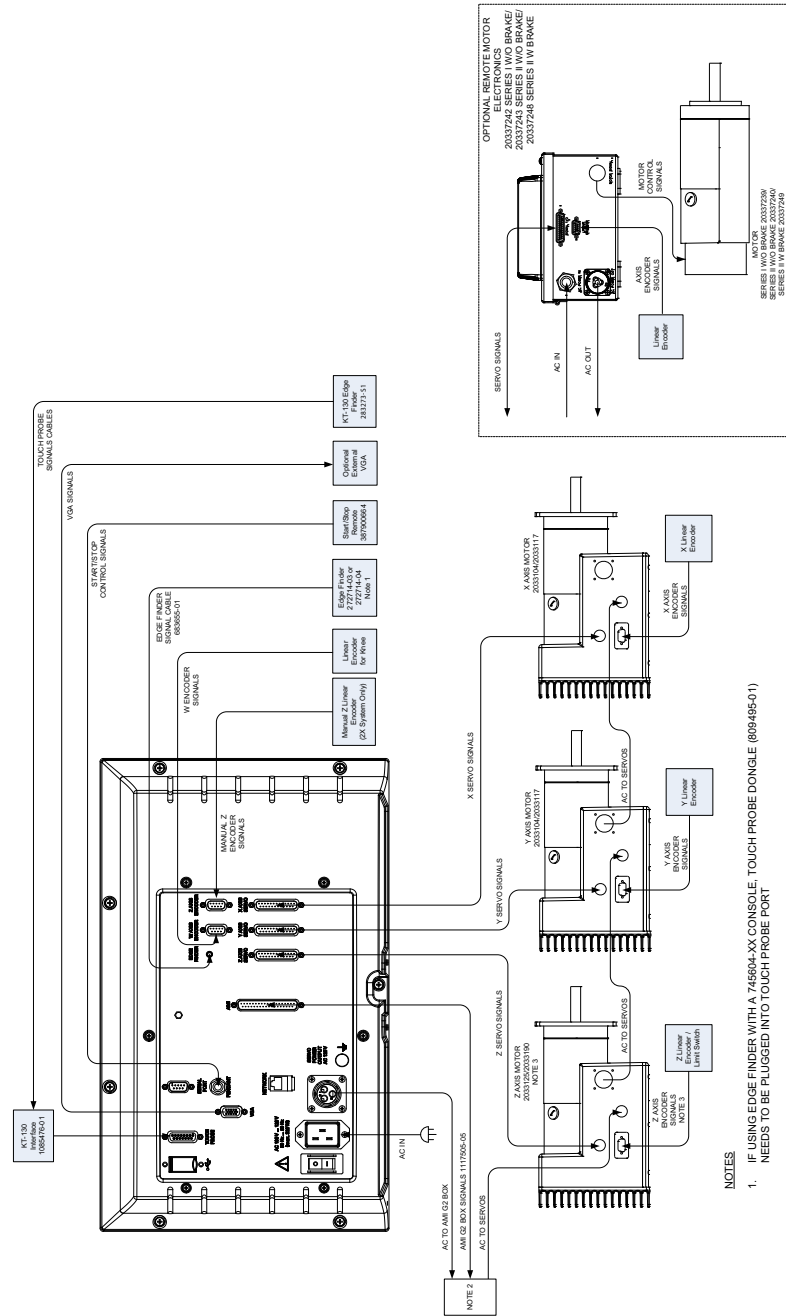
SUPPLY AND INSTALLATION OF 3 PHASE SUPPLY TO THE UNIT IS THE RESPONSIBILITY OF THE OEM OR END USER. INSTALLATION SHOULD ONLY BE PERFORMED BY A QUALIFIED ELECTRICIAN AND MUST COMPLY WITH THE LOCAL ELECTRICAL CODE. USE 14 AWG OR LARGER 60°C (140°F) WIRE. USE COPPER CONDUCTORS ONLY.



3.14 Interconnect and Wiring Diagram (Deluxe)

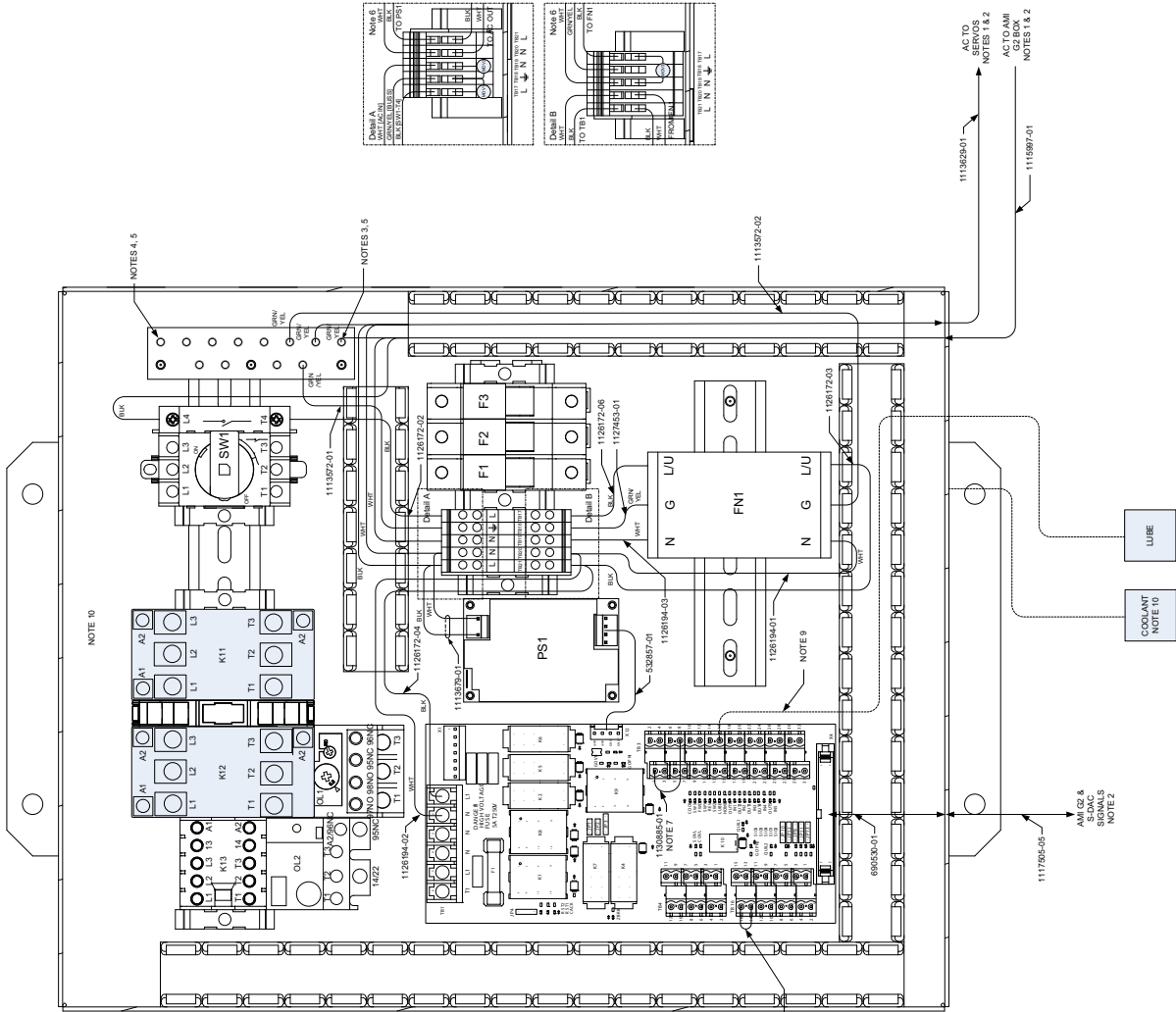
Console interconnect

Document ID 1117579 Page 1 of 3



- NOTES
1. IF USING EDGE FINDER WITH A 745604-XX CONSOLE, TOUCH PROBE DONGLE (609485-01) NEEDS TO BE PLUGGED INTO TOUCH PROBE PORT
 2. AMI G2 BOX CONNECTIONS ON PAGE 2
 3. Z AXIS ROTARY MOTOR (20331190) DOES NOT NEED EXTERNAL ENCODER

Deluxe single phase wiring diagram



TORQUE SPECIFICATIONS	
PART	TORQUE (lb-in)
SW1	16.00-18.00
TB1	7.00
TB3	5.00
TB4	5.00
TB16	5.00
TB17	5.00
TB18	5.00
TB19	5.00
TB20	5.00
TB21	5.00
FN1	11.25
F1	14.75
F2	14.75
F3	14.75
K11	19.50
K12	19.50
K13	9.00
OLI-MAN	17.00
OLI-AUX	9.00
OLI2	7.00

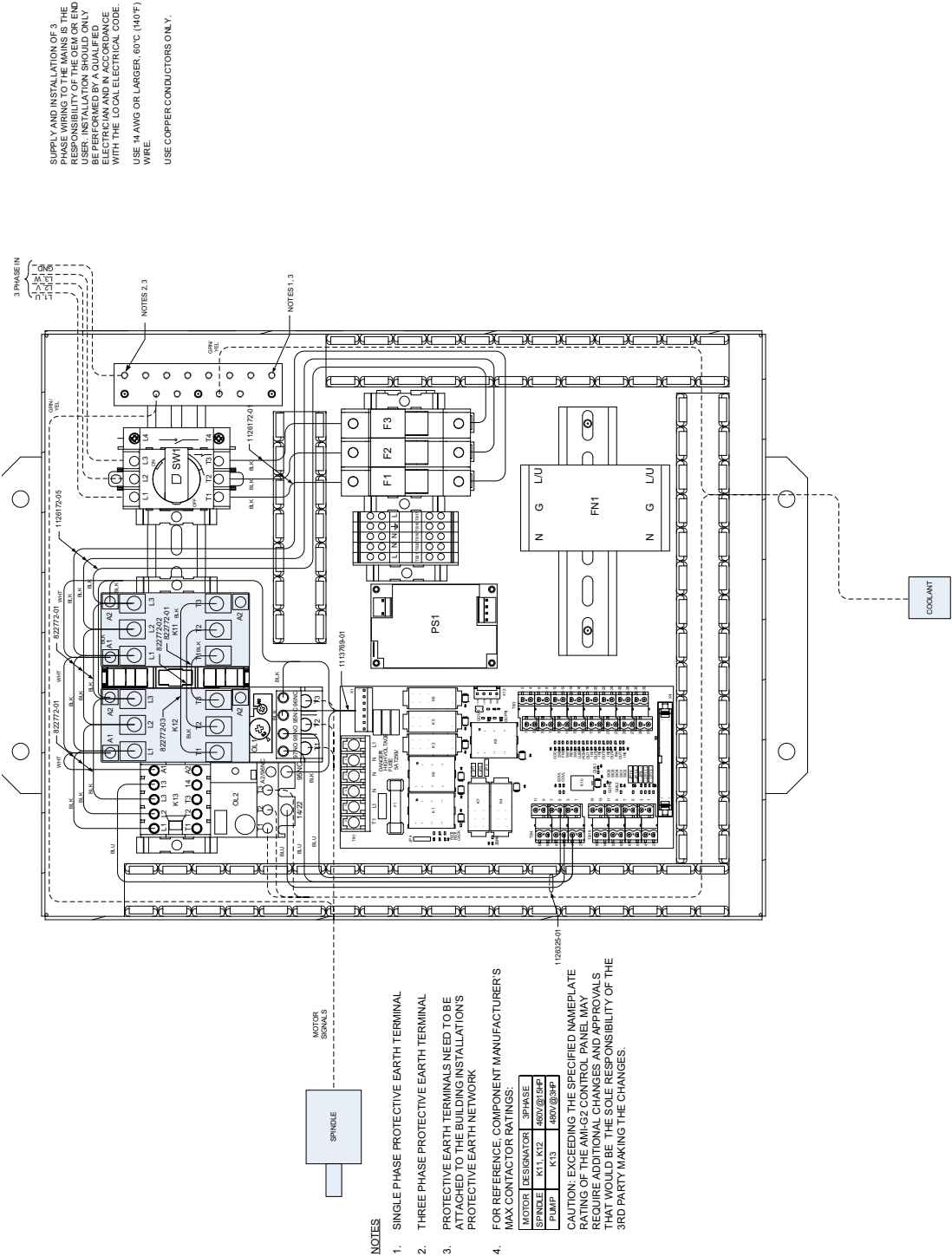
- NOTES
1. AC MUST GO TO AMI G2 BOX FIRST
 2. SEE PAGE 1 FOR WIRING
 3. SINGLE PHASE PROTECTIVE EARTH TERMINAL
 4. THREE PHASE PROTECTIVE EARTH TERMINAL
 5. PROTECTIVE EARTH TERMINALS NEED TO BE ATTACHED TO THE BUILDING INSTALLATION'S PROTECTIVE EARTH NETWORK
 6. ALL MOV LEADS MUST BE TRIMMED AS SHORT AS POSSIBLE SO BARE LEADS ARE NOT EXPOSED
 7. JUMPER POSITION DEPENDS ON WHAT NORMALLY CLOSED E-STOP DEVICES AND LIMIT SWITCHES ARE CONNECTED. REFER TO INSTALLATION MANUAL
 8. FACTORY INSTALLED JUMPER WIRE IS REQUIRED WHEN NO GUARDS ARE PRESENT. TO INSTALL GUARDS REFER TO INSTALLATION MANUAL
 9. CLASS 2 CONTROL CIRCUIT
 10. COOLANT, 3 PHASE AND M-FUNCTION WIRING ON PAGE 3

3.14 Interconnect and Wiring Diagram (Deluxe)

3.14 Interconnect and Wiring Diagram (Deluxe)

Deluxe three phase wiring diagram

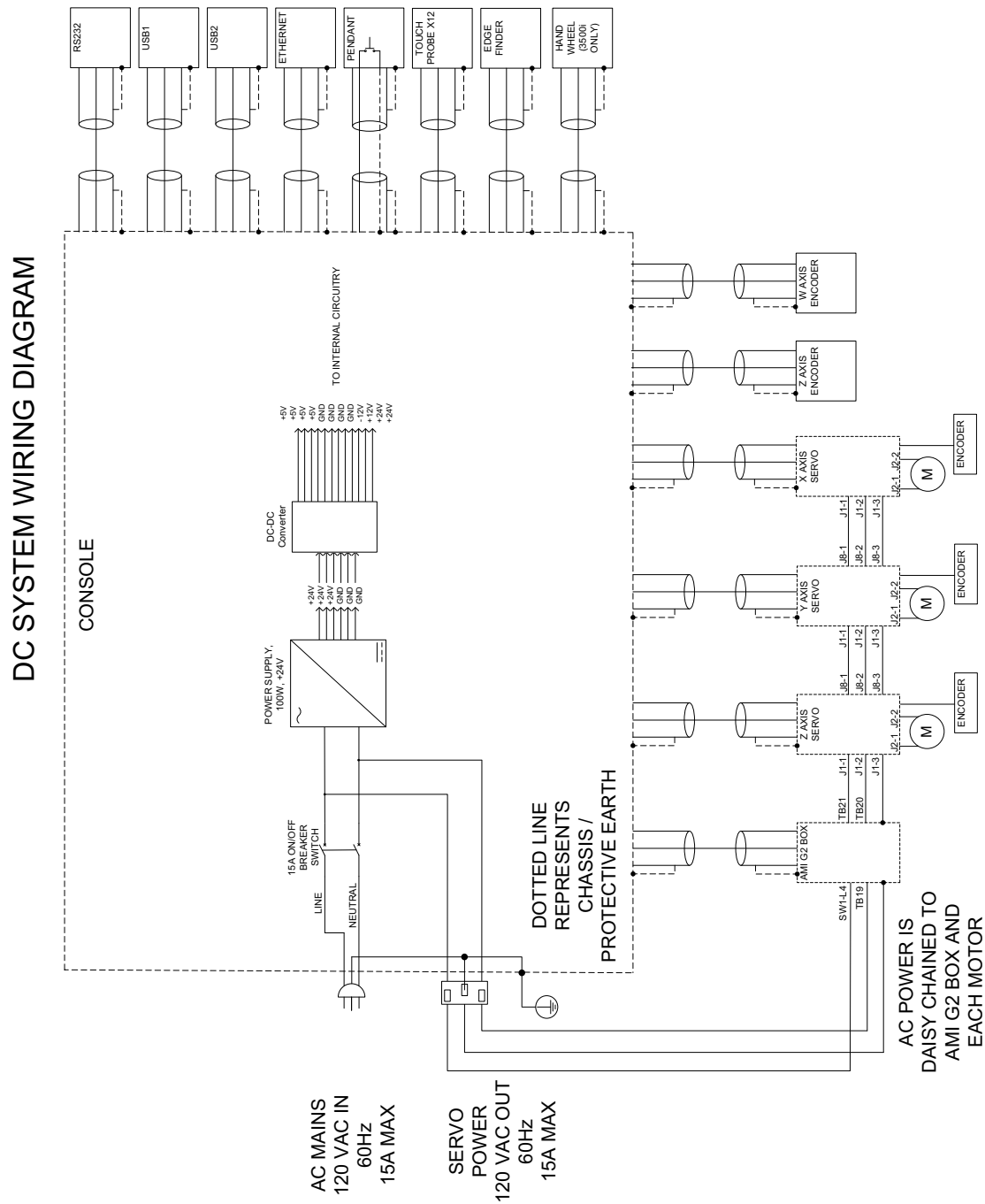
Document ID 1117579 Page 3 of 3



3.15 Wiring Diagram

Electrical wiring

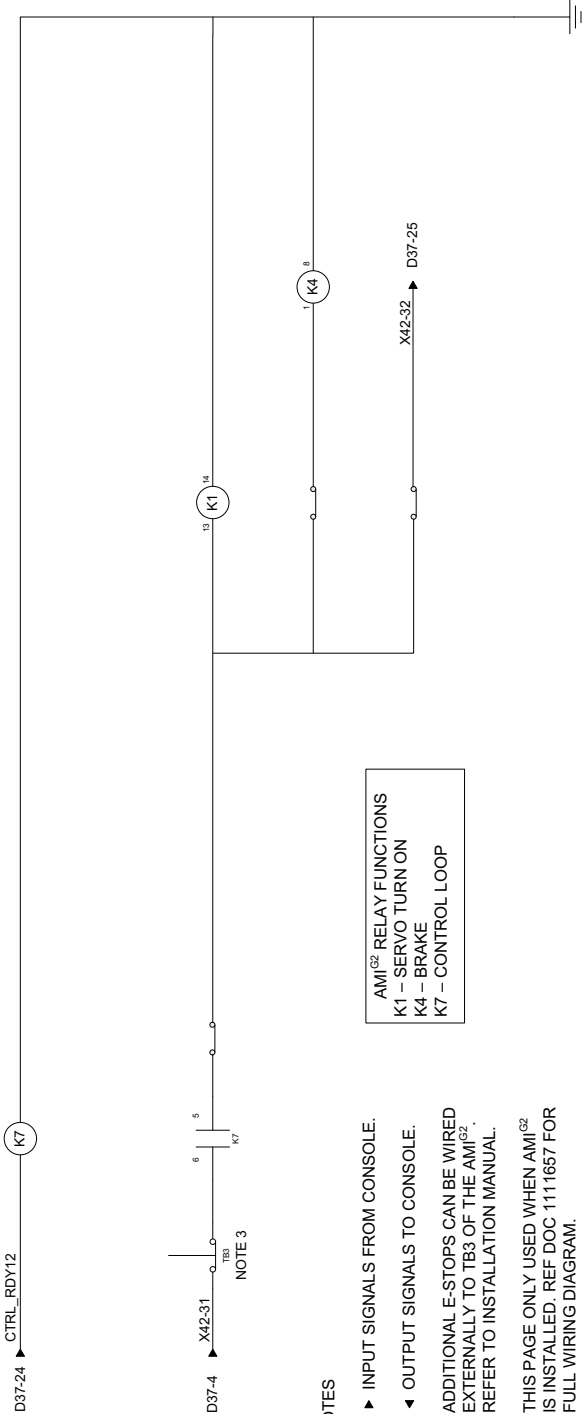
Document ID 1117582



E-Stop ladder wiring diagram

Document ID 1117581

AMIG2 E-STOP LADDER DIAGRAM

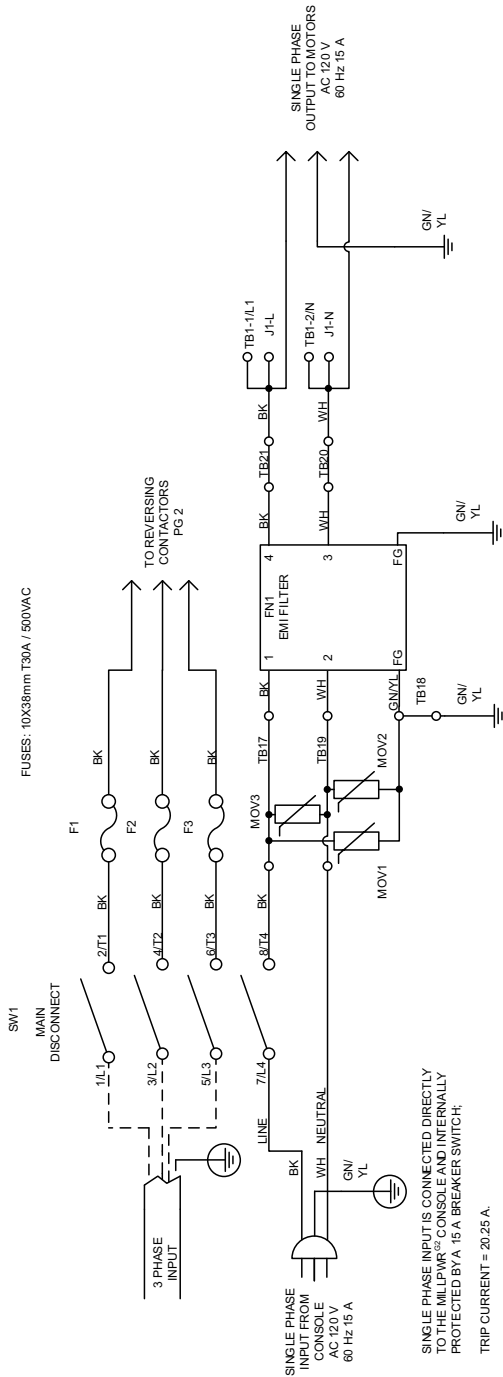


3.16 Control Panel Wiring Diagram

Electrical wiring

Document ID 1111657 Page 1 of 3

MILLPWR^{G2} AUXILIARY MACHINE INTERFACE (AMI^{G2}) INDUSTRIAL CONTROL PANEL WIRING DIAGRAM



SUPPLY AND INSTALLATION OF 3 PHASE WIRING TO THE MAINS IS
THE RESPONSIBILITY OF THE OEM OR END USER. INSTALLATION
SHOULD ONLY BE PERFORMED BY A QUALIFIED ELECTRICIAN AND
IN ACCORDANCE WITH THE LOCAL ELECTRICAL CODE.

USE 14 AWG OR LARGER, 60°C (140°F) WIRE.

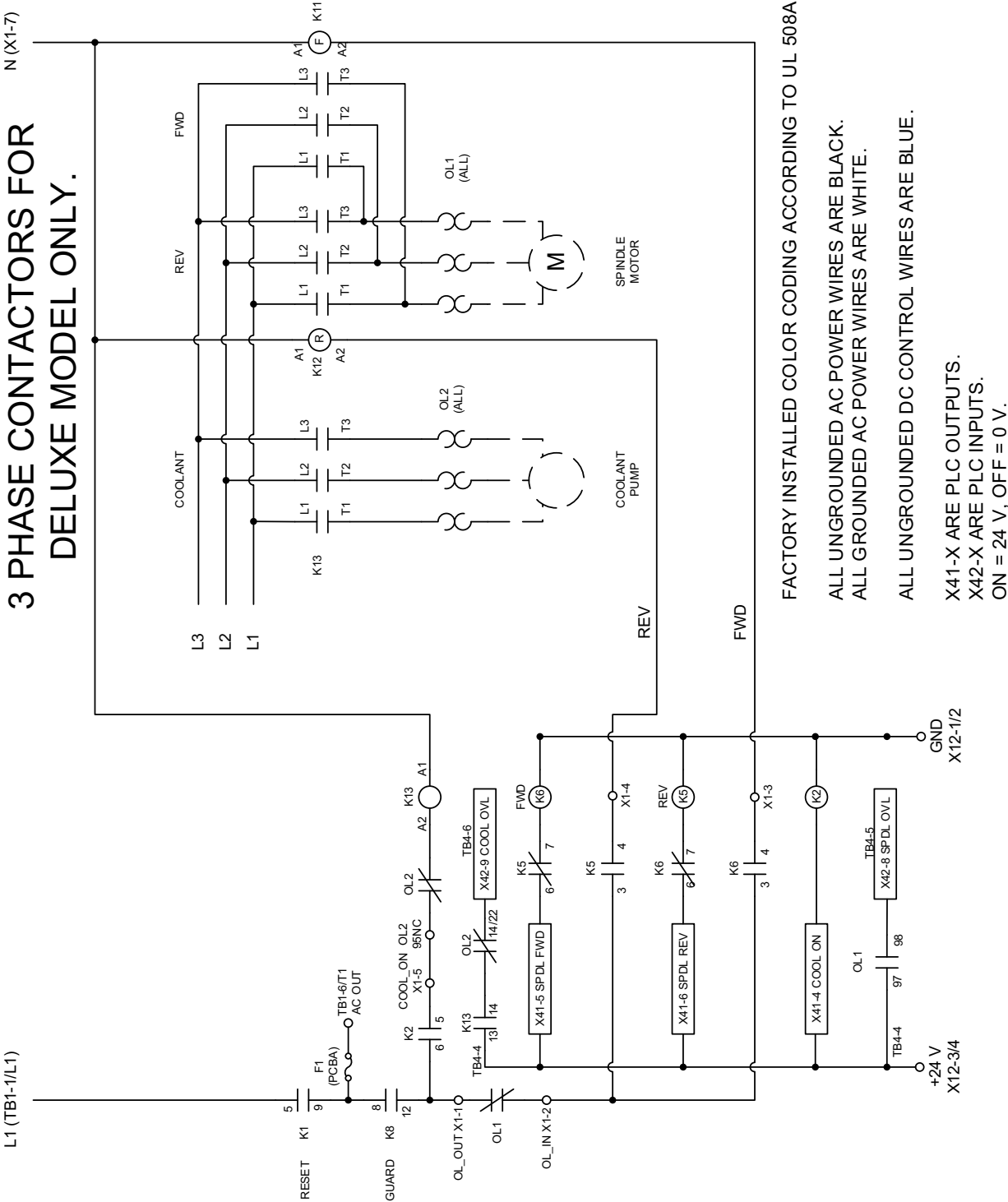
USE COPPER CONDUCTORS ONLY.

TORQUE SW1 TO 15 lb·in.

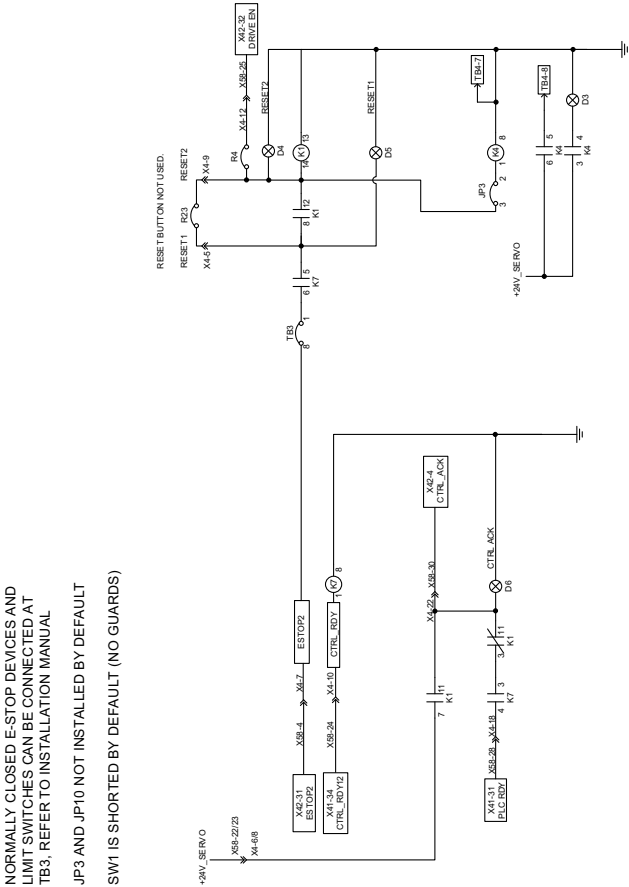
3.16 Control Panel Wiring Diagram

Electrical wiring diagram

Document ID 1111657 Page 2 of 3

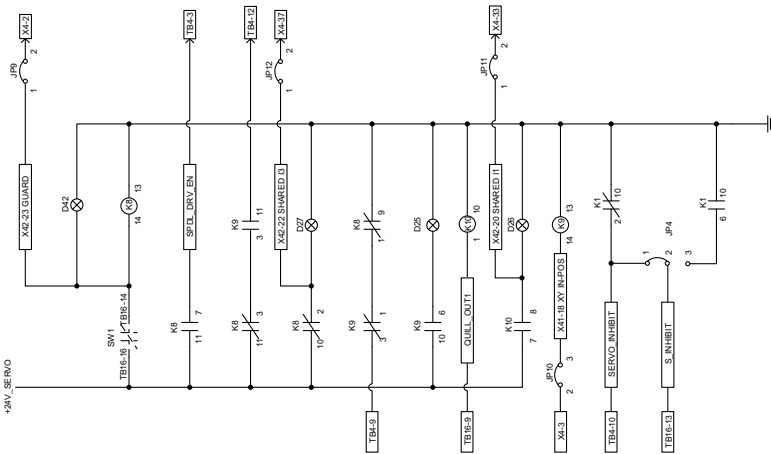


NORMALLY CLOSED E-STOP DEVICES AND
LIMIT SWITCHES CAN BE CONNECTED AT
TB3. REFER TO INSTALLATION MANUAL
JP3 AND JP10 NOT INSTALLED BY DEFAULT
SW1 IS SHORTED BY DEFAULT (NO GUARDS)



Electrical wiring diagram

Document ID 1111657 Page 3 of 3



3.16 Control Panel Wiring Diagram

4

Software Setup and Configuration AMI^{G2}

4.1 Software Setup and Configuration

Configuring AMI^{G2} in MILLPWR^{G2} Software

The default MILLPWR^{G2} software and corresponding AMI^{G2} PLC are preconfigured for most default machine behaviors. It may still be necessary to enable, disable, or configure some features for a particular machine.

- ▶ To alter most settings, use the Machine Functions dialogue in the Installation Setup area of the MILLPWR^{G2} control software. For more details, refer to Chapter 4.6 "Installation Setup" in the MILLPWR^{G2} User Manual (ID 1034382-2x).
- ▶ To alter configuration data parameters, refer to the MILLPWR^{G2} Installation Manual (ID 1034382-2x). See Chapter 4.6 "Installation Setup" for instructions on how to access the Advanced Configuration mode of the software.
- ▶ Contact HEIDENHAIN Corporation for assistance to alter PLC source.

External E-Stop

- When all external E-Stop switches are properly wired in series with the dead-stop limit circuit at TB3, there is no software or PLC configuration necessary.

Remote GO

- When a remote GO input is properly wired to TB3, there is no software or PLC configuration necessary.

Indexer

The indexer output is controlled via a running program using the Auxiliary Function step and the corresponding auxiliary output.

- When an indexer control output is properly wired to TB3, there is no software or PLC configuration necessary.

Machine Guards

The use of machine guards can be enabled or disabled by setting the Guards field within the Machine Functions setup dialogue, to the appropriate Enabled or Disabled value.

Coolant Flood and Mist

- When the coolant flood and coolant mist outputs are properly wired at TB3, there is no software or PLC configuration necessary.

The coolant outputs are controlled via a running program, using the Coolant field in the Auxiliary Function step.

Automatic Lubrication

- AMI^{G2} is capable of controlling a lubrication pump automatically, allowing for machine lubrication based on axes travel distance.
- ▶ To enable the lubrication pump control, set the Lube field within the Machine Functions setup dialogue to Enabled. This will also enable the monitoring of the oil level, so the input signal must be properly wired at TB3.
- ▶ Once the Lube field is set to Enabled, the Distance field becomes editable. Enter the distance any of the axes (X, Y, or Z) should travel before the pump is activated.

Spindle Control

Directional Control

- When a spindle motor is properly wired to an AMI^{G2} with supplied forward / reverse contactors, there is no additional setup required to control only the spindle direction.

DAC Output Voltage

- The MILLPWR^{G2} control must be configured to output the correct DAC voltage required by the spindle drive, if one is in use.
- ▶ In the Machine Functions setup dialogue, set the Polarity field to Bipolar (+/-10 Vdc) or to Unipolar (0 Vdc to +10 Vdc) as required.

Speed Inputs

If a spindle drive is to be used which supports outputting signals to the NC controller, then these two “at speed” and “at rest” signal outputs can be connected to AMI^{G2} at TB3.

- ▶ In the Machine Functions setup dialogue, set the Inputs field to Enabled or Disabled as required.
- If set to Enabled, you may want to set the Delay field to “0”, as any delay value will still take effect, essentially overriding the status of the at-speed and at-rest input signals.

Spindle Delay

- ▶ The MILLPWR^{G2} control must be configured with the amount of delay time for the spindle in use. This is done by setting the number of seconds that the MILLPWR^{G2} should wait to allow for a spindle command to take effect.
- ▶ In the Machine Functions setup dialogue, enter the amount of time delay (in seconds) required into the Delay field.
- A running program will wait this amount of time for any spindle command before continuing to run, including spindle ramp up, ramp down, and switching directions.

RPM Definitions

- ▶ The MILLPWR^{G2} control must be configured with the supported RPM speeds of the spindle in use.

The RPM speeds are defined in the Machine Functions setup dialogue, using the following fields:

- Low MIN: Define the minimum RPM speed of the spindle in LOW gear.
- Low MAX: Define the maximum RPM speed of the spindle in LOW gear.
- High MIN: Define the minimum RPM speed of the spindle in HIGH gear.
- High MAX: Define the maximum RPM speed of the spindle in HIGH gear.
- ▶ If no gear changing is necessary, set the Low MAX speed to the spindle’s highest RPM, and then adjust the High MIN value to be at least 1 RPM greater, and then again the High MAX value to at least 1 RPM greater still.

Machine Functions Soft Keys

The MILLPWR^{G2} software can be configured to access the Machine Functions Soft Keys (MFSK). The MFSK set of soft keys provide manual access and control of some features specific to AMI^{G2}. For details on how to access and use the Installation Settings dialogue refer to the MILLPWR^{G2} Installation Manual (ID 1034382-2x); see Chapter 4.6 "Installation Setup".

- ▶ To enable these soft keys choose **Machine Functions** from the Installation Settings dialogue.
- ▶ Set the parameter MFSK Menu to **Enabled** to display the **Machine Functions** softkey, or select **Disabled** to hide the soft key.
- Once enabled, the soft keys can be accessed while at the DRO screen, or while running a program, by pressing the **Machine Functions** soft key.
- ▶ To exit the Machine Functions softkeys and return to the main operations softkeys, press the **CANCEL** key.

The Machine Functions Menu has the following soft keys and features:

Soft key	Function
	S_FWD: Turns the spindle motor ON in the Forward direction.
	S_REV: Turns the spindle motor ON in the Reverse direction
	S_OFF: Turns the spindle motor OFF
	Cool: Toggles the Coolant Flood circuit ON or OFF
	Mist: Toggles the Coolant Mist circuit ON or OFF
	Auxiliary Functions: Switches the menu to the Auxiliary Functions menu that provides the following soft keys:
	Aux Output 1: Toggles the Auxiliary Output 1 ON or OFF
	Aux Output 2: Toggles the Auxiliary Output 2 ON or OFF
	Aux Output 3: Toggles the Auxiliary Output 3 ON or OFF
	Aux Output 4: Toggles the Auxiliary Output 4 ON or OFF
	Back: Switches the menu back to the previous set of soft keys.

5

Maintenance
AMI^{G2}

5.1 Maintenance

General care



Periodically inspect the system and connecting cables for damage or poor connections. Correct problems before operating the equipment.

Cleaning

- ▶ Power off the AMI^{G2}.
- ▶ Disconnect the power cable from the source of power.
- ▶ Clean exterior surfaces with a cloth dampened with water and a mild detergent.

Never use abrasive cleaners, strong detergents , or solvents.

- A**
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