# INSTRUCTION MANUAL

# CLEVELAND-KIDDER® TENSION INDICATOR SERIES

**AO-70308** 





#### **REVISION HISTORY**

Rev	ECO	Author	Date	Description of Change
AA		CAD	07/28/2005	As Released

#### INTENDED USERS

This Instruction Manual is to be made available to all persons who are required to configure, install or service the equipment described in this manual or any other related activity.

#### **FURTHER INFORMATION**

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7550 Hub Parkway Cleveland, OH 44125 216-524-8800 Phone 216-642-2199 Fax

#### 1 Instruction Manual

#### 1.1 PRODUCT LINE OVERVIEW

The table below is a cross reference between the Model Description and the Model Number of the products covered by this manual.

Model No.	Model Description
MWI-13491-1	Tension Indicator, Ultra Series Amplifier, Analog Display, Non-Isolated Outputs
MWI-13491-2	Tension Indicator, Ultra Series Amplifier, Analog Display, Isolated Outputs
MWI-13491-3	Tension Indicator, Ultra Series Amplifier, Digital Display, Non-Isolated Outputs
MWI-13491-4	Tension Indicator, Ultra Series Amplifier, Digital Display, Isolated Outputs
MWI-13491-5	Dual Tension Indicator, Ultra Series Amplifier, Digital Display, Isolated Outputs
MWI-13491-6	Dual Tension Indicator, Ultra Series Amplifier, Digital Display, Isolated Outputs w/ Safety Features
MWI-13654-1	Tension Indicator, Classic Series Amplifier, Analog Display, Non-Isolated Outputs
MWI-13654-2	Tension Indicator, Classic Series Amplifier, Analog Display, Isolated Outputs
MWI-13654-3	Tension Indicator, Classic Series Amplifier, Digital Display, Non-Isolated Outputs
MWI-13654-4	Tension Indicator, Classic Series Amplifier, Digital Display, Isolated Outputs
MWI-13654-5	Dual Tension Indicator, Classic Series Amplifier, Digital Display, Isolated Outputs
MWI-13654-6	Tension Indicator, Classic Series Amplifier, Large Digital Display, Non-Isolated Outputs
MWI-13654-9	Tension Indicator, Classic Series Amplifier, Digital Display, Isolated Outputs, w/ Offset Potentiometer

#### 1.2 GENERAL DESCRIPTION

The Tension Indicator is based upon the Cleveland-Kidder DIN Rail Amplifier. Refer to the appropriate amplifier manual listed below for detailed setup and calibration information.

Document	Description of Amplifier
MAN-13261	Ultra Line DIN Rail Amplifier, Isolated Outputs
MAN-13262	Ultra Line DIN Rail Amplifier, Non-Isolated Outputs
MAN-13467	Classic Line DIN Rail Amplifier, Isolated Outputs
MAN-13466	Classic Line DIN Rail Amplifier, Non-Isolated Outputs

The tension indicator enclosure houses the amplifier, fuses, 24 VDC supply, and either analog meter or digital meter to provide a human readable indication of tension.

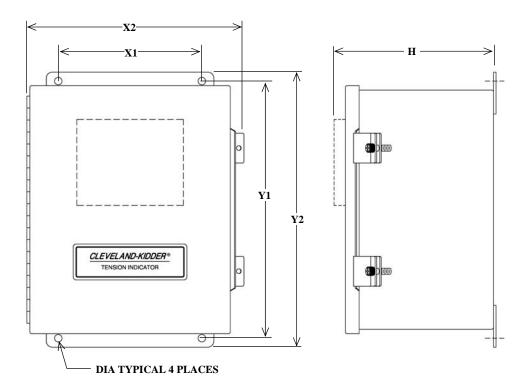
The 24 VDC power supply has a wide range "universal input" which accepts 86 to 264 VAC. No switches or jumpers need to be changed for operation at 120 or 240 VAC. The 24V output has been factory adjusted for a nominal 24 VDC, but minor changes can be invoked by adjusting the small potentiometer on the front of the supply. A green LED on the front of the supply module indicates that the 24 VDC output is active.

The left-most DIN mounted fuse holder (FU101) protects the 24 VDC power network. It has a 0.3A 250V 5x20mm fuse installed. Opening the holder will remove 24V power from the amplifier's supply and disable the entire unit.

The right-most DIN mounted fuse holder ( FU102 ) fuses the AC line input. It accepts a 1A 250V fuse. For optimum protection, it can be replaced with a 0.25A fuse when operated at 240 VAC.

The bottom of the enclosure has a #10-32 stud and nuts for making the necessary chassis-to-earth ground connection. Toothed lock-washers are provided. Do not use the #10-32 stud on the door to make the field ground connection.

#### 1.3 DIMENSIONS



DIM	<b>Models:</b> MWI-13491-[1-4] MWI-13654-[1-4, 9]	<b>Models:</b> MWI-13491-[5,6] MWI-13654-[5,6]
X1	6.00" (152mm)	10.00" (254mm)
X2	9.07" (231mm)	13.07" (332mm)
Y1	10.75" (273mm)	12.75" (324mm)
Y2	11.5" (293mm)	13.5" (343mm)
Н*	7.00" (178mm)	7.00" (178mm)
DIA	0.31" (8mm) Diameter	0.31" (8mm) Diameter

<sup>\*</sup> max dimension shown, meter faceplate thickness varies with model type

#### 1.4 DISPLAYS

Both analog and digital displays are offered. Each display affords a scaling mechanism so that the meter can be scaled independently of the amplifier's main  $\pm 10V$  ( or  $\pm 10V$  ( or  $\pm 10V$ ) output. Always calibrate the amplifier first for the desired control ( un-damped ) output. Then adjust the display to report the desired value.

It is important that the meter be wired into the correct terminals to avoid over-driving the movement. Also note that the amplifier can afford two different levels of damping. Damping is useful in reducing any fluctuations in the tension signal so that the average value is easier to read.

Inside the amplifier, there are two jumper switches that affect the meter output. Refer to the appropriate amplifier manual for details.

For reference:

Jumper J1 on the output card configures meter circuit for 1 mA analog meter, J1 (2-3) or 2V digital panel meter J1 (1-2). J2 affects damping. J2 (1-2) position Fc = 0.3 Hz, J2 (2-3) is Fc = 3.7 Hz

#### 1.4.1 ANALOG DISPLAY

The analog display uses a 1 mA D'Arsonval style meter, based upon a taut-band movement for resistance against the affects of mechanical shock.

A scaling board is affixed to the meter terminals to allow user scaling. The maximum sensitivity ( multi-turn pot fully clockwise ) is sufficient to allow a 40% F.S. signal ( referenced to the 10V output ) to be scaled to "100" F.S. on the analog meter. Adjusting the multi-turn scaling pot fully counter-clockwise will allow nearly complete attenuation ( i.e. the analog meter can display less than 10% for a F.S. signal reported on the 10V output ).

#### 1.4.2 DIGITAL DISPLAY

The digital display employs a 3 ½ digit, LED based meter. It is powered from the low voltage 24 VDC supply, and therefore needs no selection for AC line supply.

Behind the RED lens are pots for SCALING ( on the right ) and a ZEROING ( on the left ). To remove the lens, carefully use two screwdrivers. The first one is used on the center-bottom of the lens to depress and hold the red plastic latch which secures the lens to the black plastic case. The second screwdriver should be held at right angles to the first and is used to lift the lens away from the case.

A jumper in the upper right hand corner of the panel meter allows "placing" of the decimal point position. The meter normally has full scale equal to 1.999 VDC. Adjusting the span pot clockwise will boost the sensitivity such that a F.S output of only 39% on the amplifiers 10V output can be displayed as "100.0" (i.e. 1.00V, with the decimal point placed so as to read as 0 to 100%).

The unit has been factory set so that  $+\ 10.0\ VDC$  signal on the  $+/-\ 10V$  output will appear as "100.0"

#### 1.5 FIELD WIRING

AC Line power may be wired through the supplied strain relief gland on the bottom left-hand side of the enclosure. Using a standard 3-strand power cable, connect each wire to the appropriate DIN mounted terminal block. Refer to the table below for connection information.

Wire Description	Wire Color	Terminal Block
Line	Black or Red	L
Neutral	White	N
Ground	Green	G

The bottom connection plate can be removed to facilitate punching the desired holes for cable glands. The typical cables would be left transducer, right transducer and an output cable to report the tension signal to a controller. Refer to the appropriate amplifier manual for detailed wiring diagrams.

#### 1.6 SIGNAL GROUNDING

A default signal-grounding configuration has been provided that is suitable for many applications. This configuration should be reviewed by a qualified technician prior to installation. Proper grounding is necessary for reducing noise pickup, and for extending the working life of the system. Refer to the amplifier manual for more information.

### 2 REPLACEMENT PARTS

The following tables provide a listing of replacement parts for every model in the Cleveland-Kidder® Tension Indicator Series. Locate the model number for your system using the serial tag located on the inside of the enclosure door, in the upper left-hand corner.

Com	Common to All Systems		
	Part Number	Description	
	X21-00898	FUSE, 1A, 250V, TIME DELAY	
	X21-34342	FUSE, 0.3A, 250V, TIME DELAY	
	X44-34143	POWER SUPPLY, 24VDC, 1 AMP, DIN RAIL, 85-264 VAC	

Model Number: MWI-13491-1			
	Part Number	Description	
	MWI-13262	LOAD CELL AMP, ULTRA SERIES, FULL BRIDGE, DIN RAIL, NON-ISOLATED	
	B28-34125	METER, ANALOG, 0-1 mADC, 4.5" RECT, METER FACE TO READ 0.100 TENSION	
	C41-27904	PCB, TACH ASSY W/METER	

Mod	Model Number: MWI-13491-2		
	Part Number	Description	
	MWI-13261	LOAD CELL AMP, ULTRA SERIES, FULL BRIDGE, DIN RAIL, ISOLATED	
	B28-34125	METER, ANALOG, 0-1 mADC, 4.5" RECT, METER FACE TO READ 0.100 TENSION	
	C41-27904	PCB, TACH ASSY W/METER	

Mod	Model Number: MWI-13491-3		
	Part Number	Description	
	MWI-13262	LOAD CELL AMP, ULTRA SERIES, FULL BRIDGE, DIN RAIL, NON-ISOLATED	
	X28-34211	PANEL METER, NEMA STYLE, 3.5 DIGIT, 2V/20V, 9-36VDC SUPPLY, WITH OFFSET POT	

Mod	Model Number: MWI-13491-4 MWI-13491-5		
	Part Number	Description	
	MWI-13261	LOAD CELL AMP, ULTRA SERIES, FULL BRIDGE, DIN RAIL, ISOLATED	
	X28-34211	PANEL METER, NEMA STYLE, 3.5 DIGIT, 2V/20V, 9-36VDC SUPPLY, WITH OFFSET POT	

Mod	Model Number: MWI-13491-6		
	Part Number	Description	
	MWI-13261	LOAD CELL AMP, ULTRA SERIES, FULL BRIDGE, DIN RAIL, ISOLATED	
	X28-34211	PANEL METER, NEMA STYLE, 3.5 DIGIT, 2V/20V, 9-36VDC SUPPLY, WITH OFFSET POT	
	X16-33078	SELECTOR SWITCH, 2 POSTITION, MAINTAINED, CHROME BEZEL, 22mm, WITH 1 N.O. CONTACT	

Model Number: MWI-13654-1			
	Part Number	Description	
	MWI-13466	LOAD CELL AMP, CLASSIC SERIES, FULL BRIDGE, DIN RAIL, NON-ISOLATED	
	B28-34125	METER, ANALOG, 0-1 mADC, 4.5" RECT, METER FACE TO READ 0.100 TENSION	
	C41-27904	PCB, TACH ASSY W/METER	

Mod	Model Number: MWI-13654-2											
	Description											
	MWI-13467	LOAD CELL AMP, CLASSIC SERIES, FULL BRIDGE, DIN RAIL, ISOLATED										
	B28-34125	METER, ANALOG, 0-1 mADC, 4.5" RECT, METER FACE TO READ 0.100 TENSION										
	C41-27904	PCB, TACH ASSY W/METER										

Mod	Model Number: MWI-13654-3											
	Part Number	Description										
	MWI-13466	LOAD CELL AMP, CLASSIC SERIES, FULL BRIDGE, DIN RAIL, NON-ISOLATED										
	X28-34211	PANEL METER, NEMA STYLE, 3.5 DIGIT, 2V/20V, 9-36VDC SUPPLY, WITH OFFSET POT										

Model Number: MWI-13654-4 MWI-13654-5									
	Part Number	Description							
	MWI-13467	LOAD CELL AMP, CLASSIC SERIES, FULL BRIDGE, DIN RAIL, ISOLATED							
	X28-34211	PANEL METER, NEMA STYLE, 3.5 DIGIT, 2V/20V, 9-36VDC SUPPLY, WITH OFFSET POT							

Mod	Model Number: MWI-13654-6											
	Part Number	Description										
	MWI-13467	LOAD CELL AMP, CLASSIC SERIES, FULL BRIDGE, DIN RAIL, ISOLATED										
	X28-34607	METER, 5 DIGIT DIGITAL DISPLAY, 11-36VDC OR 24VAC POWER, 0-20MA OR 0-10VDC INPUT										

Mod	Model Number: MWI-13654-9												
	Part Number	Description											
	MWI-13467	LOAD CELL AMP, CLASSIC SERIES, FULL BRIDGE, DIN RAIL, ISOLATED											
	X28-34211	PANEL METER, NEMA STYLE, 3.5 DIGIT, 2V/20V, 9-36VDC SUPPLY, WITH OFFSET POT											
	X23-05435	POTENTIOMETER, 10 TURN, 1KOHM											

# 3 DRAWING INDEX

The following table provides a listing of drawings, referenced to each model in the Cleveland-Kidder<sup>®</sup> Tension Indicator Series. Locate the model number for your system using the serial tag located on the inside of the enclosure door, in the upper left-hand corner.

Model Number:	Drawing Number:	Description:
MWI-13491-1	D800-31241	Wiring Diagram
MWI-13491-2	D800-31236	Wiring Diagram
MWI-13491-3	D800-31237	Wiring Diagram
MWI-13491-4	D800-31238	Wiring Diagram
MWI-13491-5	D800-31216	Wiring Diagram
MWI-13491-6	D800-31220	Wiring Diagram
MWI-13654-1	D800-31231	Wiring Diagram
MWI-13654-2	D800-31235	Wiring Diagram
MWI-13654-3	D800-31233	Wiring Diagram
MWI-13654-4	D800-31234	Wiring Diagram
MWI-13654-5	D800-31242	Wiring Diagram
MWI-13654-6	D800-31228	Wiring Diagram
MWI-13654-9	D800-31245	Wiring Diagram

# DIGITAL DUAL TENSION INDICATOR ASSEMBLY ULTRA AMPLIFIER, ISOLATED OUTPUTS

MWI-13491-5

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FA EA DA					TOLERANCES (EXCEPT AS NOTED) DECIMAL X,X ± .030				Cle: Toti
CA						An EM	<b>C</b> Com	pany	
BA	ENGINEERING CHANGES	CLE3117	AJC	03/05	ANGULAR	7550	HUB	PARKW	'AY C
AΑ	AS RELEASED	AJC	AJC	07/04	± 0.5°	MATERIAL	FINIS		SCALE



COMPONENTS ( $\sqrt{1} - \sqrt{25}$ )

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT). USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. <u>DO NOT GROUND</u> ANY OTHER POINT.
- KEEP LEADS AS SHORT AS POSSIBLE. TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN.
- IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK
- REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED). THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2
- SEPARATELY AND DO NOT USE THEM. THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- WARNING THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>WARNING</u> DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE"
- NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE. CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER. INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER.
- CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL. THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.
- THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME
- 84 NOT USED AT THIS TIME
- 85 NOT USED AT THIS TIME 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES

### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

# CMC REPLACEMENT PARTS ORDERS — (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:
  - CLEVELAND MOTION CONTROLS, INC.
  - SERVICE PARTS DEPARTMENT
  - 7550 HUB PARKWAY
  - CLEVELAND, OHIO 44125-5794
- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

# <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

# **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

 $(MM)^2$ AWG/MCM 14 2.6 3.9 20 12

CONDUCTOR SIZES FOR GROUNDING

TABLE 250-95

COPPER

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE

7.1 30 10 40 10 7.1 60 7.1 10 100 11.0 200 17.4 300 27.0 400 34.0 500 43.0 56.0 70.0 800 89.0 1000 00 1200 000 112.0

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING (AMPERES)

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**OLERANCES** DECIMAL  $X.X \pm .030$  $X.XX \pm .01$ 00. ± XXX.X ANGULAR ± 0.5°

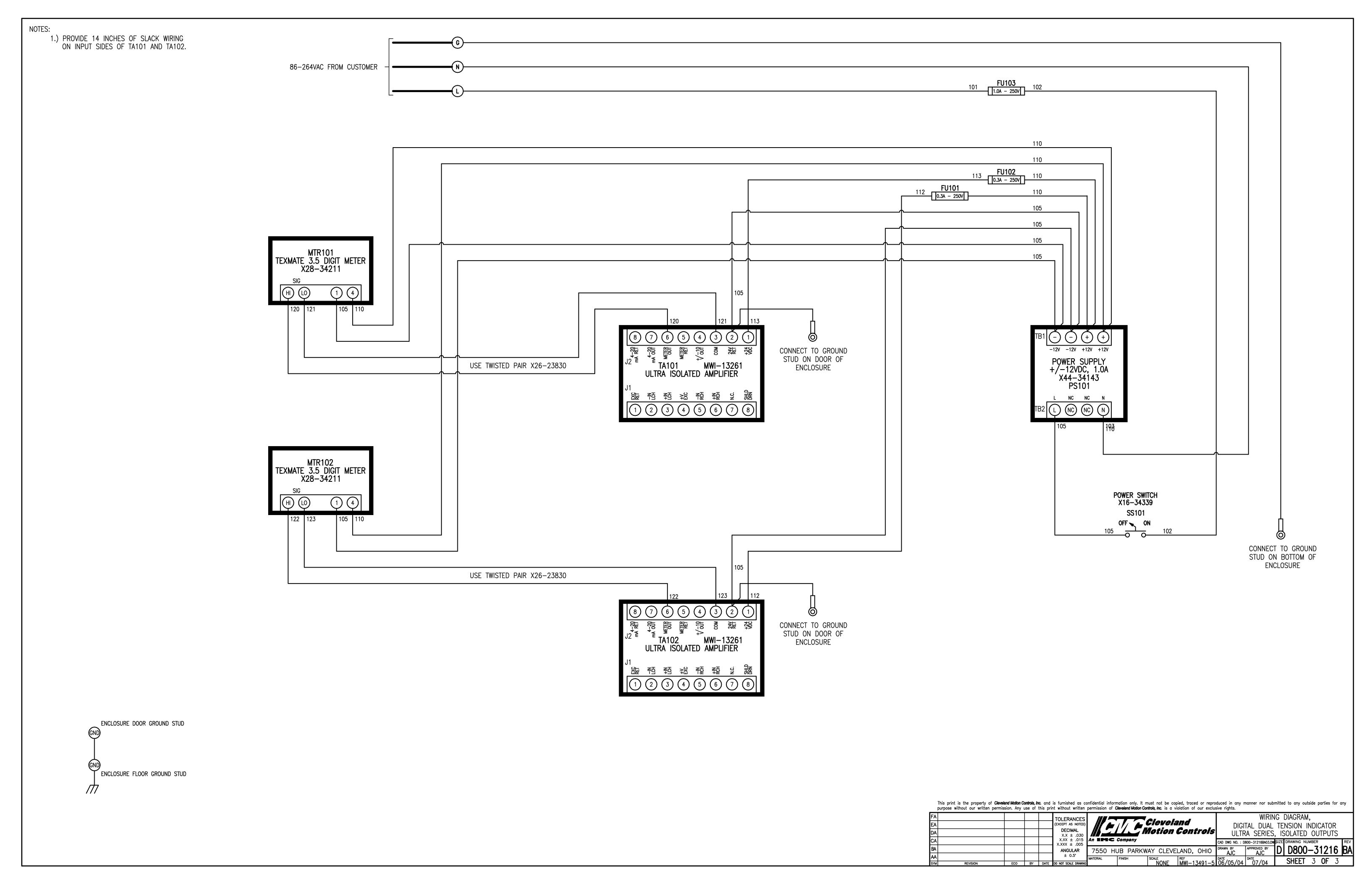
Cleveland
Motion Controls An IMC Company

WIRING DIAGRAM. DIGITAL DUAL TENSION INDICATOR, ULTRA SERIES, ISOLATED OUTPUTS AD DWG NO. :D800-31216BA02.dwg SIZE DRAWING NUMBER

NOTES

APPROVED BY D D800-31216 BA

7550 HUB PARKWAY CLEVELAND, OHIO NONE | REF | NONE | NONE | NONE | NONE | NONE | NONE | SHEET 2 OF 3



# DIGITAL DUAL TENSION INDICATOR ASSEMBLY ULTRA AMPLIFIER, ISOLATED OUTPUTS, ADDITIONAL SAFETY FEATURES

MWI-13491-6

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EΑ					(EXCEPT AS NOTED)		/// 🍎	Clevela	ina	DIGI	TAL DUAL	<b>TENSION</b>	I INDI	CATOF	₹,
DΑ					DECIMAL X.X ± .030			Totion	Controls	WITH	<b>ADDITION</b>	AL SAFE	TY FE	ATURE	<del>-</del> S
CA					X.XX ± .015 X.XXX ± .005	An IMC	Company			CAD DWG NO. :D8	100-31220BA01.DWG	SIZE DRAWING	NUMBER	₹	RE
BA	ENGINEERING CHANGES	CLE3117	AJC	03/05		7550 HI	JB PARKW	'AY CLEVE	LAND, OHIO	DRAWN BY AJC	APPROVED BY	D D80	0-3	3122	20 <b>I</b> B
AΑ	AS RELEASED	AJC	AJC	08/04	± 0.5°		FINISH		REF MWI-13491-6		7.00	SHEE		OF	7
SYM	REVISION	EC0	BY	DATE	DO NOT SCALE DRAWING			NONE	<u> MWI-13491-6</u>	08/17/04	08/04		<u> </u>	UF	<u> </u>

COMPONENTS  $(\frac{1}{25})$ 

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT). USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. DO NOT GROUND ANY OTHER POINT.
- KEEP LEADS AS SHORT AS POSSIBLE. TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN.
- IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2 SEPARATELY AND DO NOT USE THEM.
- THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- WARNING THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION
- FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>WARNING</u> DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE"
- NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE. CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER.
- INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS. NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER.
- CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL. ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL.
- THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.

THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME
- 84 NOT USED AT THIS TIME 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES

# CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

# CMC REPLACEMENT PARTS ORDERS — (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:

CLEVELAND MOTION CONTROLS, INC.

- SERVICE PARTS DEPARTMENT 7550 HUB PARKWAY
- CLEVELAND, OHIO 44125-5794

LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED

#### GROUNDING INSTALLATION NOTES

TABLE 250-95

COPPER

20

30

40

60

100

200

300

400

500

800

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

00

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

 $(MM)^2$ 

2.6 3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

# <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

# **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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7550 HUB PARKWAY CLEVELAND, OHIO

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FA										TOLERANCES
EA	\									(EXCEPT AS NOTED)
DA	\									DECIMAL X.X ± .030
CA	\									X.XX ± .015 X.XXX ± .005
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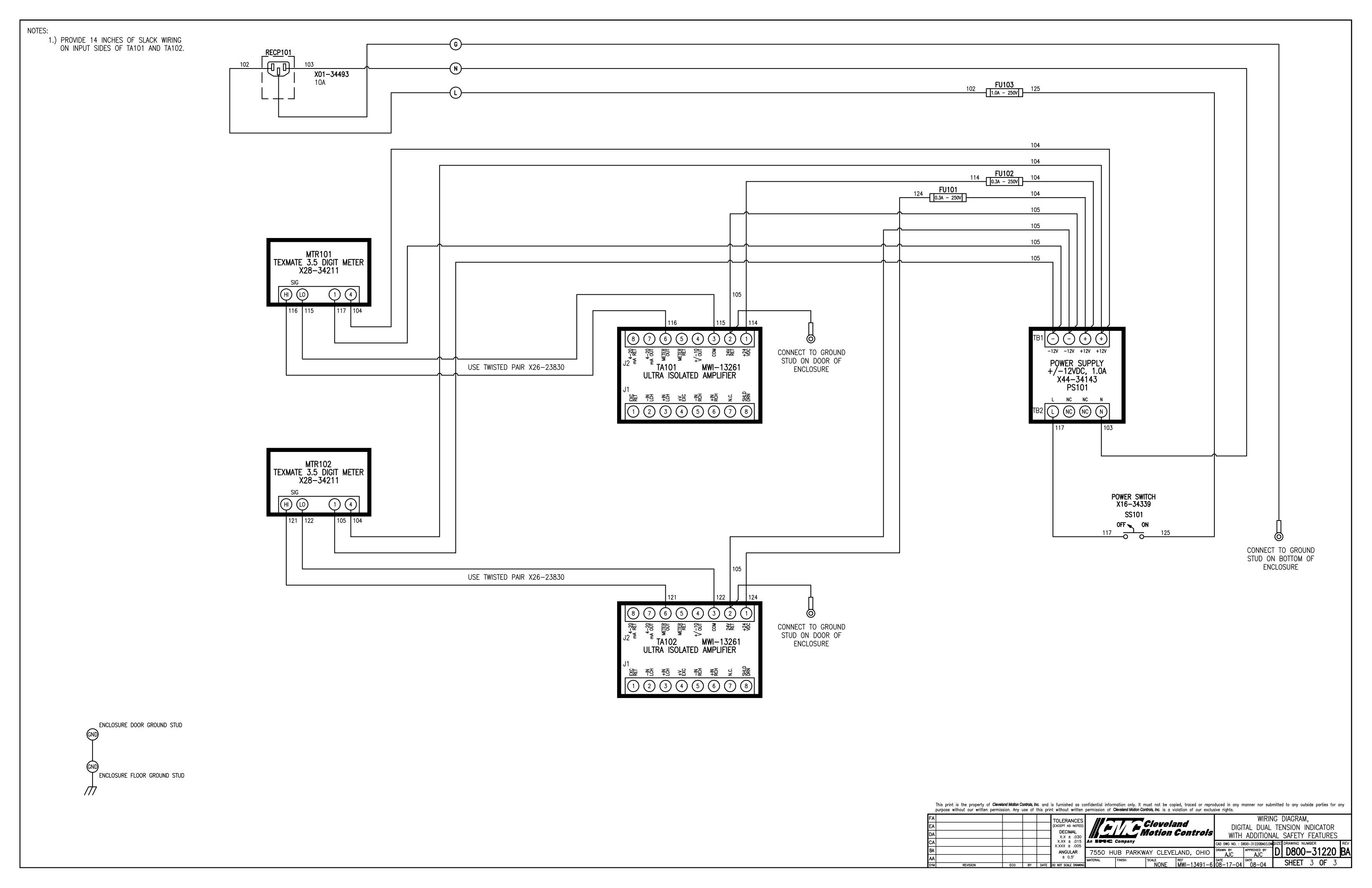
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*Cleveland* Motion Controls

WIRING DIAGRAM. DIGITAL DUAL TENSION INDICATOR WITH ADDITIONAL SAFETY FEATURES CAD DWG NO. :D800-31220BA02.dwg SIZE DRAWING NUMBER APPROVED BY D D800-31220 BA

NONE | MW|-13491-6 08/17/04 08/04 | SHEET 2 OF 3

NOTES



# DIGITAL TENSION INDICATOR ASSEMBLY CLASSIC AMPLIFIER, ISOLATED OUTPUTS, WITH LARGE DIGITAL DISPLAY

MWI-13654-6

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BA	TESTING CHANGES	CLE3043	AJC	12/04	ANGULAR	7550 HI	JB PARKW	AY CLEVE	LAND, OHIO	DRAWN BY AJC	APPROVED BY	lD	D800-	-312	2281	$\mathbb{C}$
AΑ	AS RELEASED	KAP	AJC	10/04	± 0.5°	MATERIAL	FINISH	SCALE	REE	DATE	DATE	屵	SHEET	1 OF		_
SYM	REVISION	EC0	BY	DATE	DO NOT SCALE DRAWING			NONE	<u> MWI-13654-6</u>	<u>  10/21/04</u>	10/04		SHEET	ı Ur	<u> </u>	

COMPONENTS  $(\frac{1}{25})$ 

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY. USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT).
- USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT. THIS POINT MAY BE GROUNDED IF DESIRED. DO NOT GROUND ANY OTHER POINT.
- KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2 SEPARATELY AND DO NOT USE THEM.
- THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- WARNING THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>WARNING</u> DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE" NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE. CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER.
- INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS. NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER.
- CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL.
- THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC. THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION.

CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME
- 84 NOT USED AT THIS TIME 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES

# CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

# CMC REPLACEMENT PARTS ORDERS — (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET
- TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:
  - CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT
  - 7550 HUB PARKWAY
  - CLEVELAND, OHIO 44125-5794
- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

TABLE 250-95

COPPER

20

30

40

60

100

200

300

400

500

800

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

00

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

 $(MM)^2$ 

2.6 3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

#### <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

# **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED.
- METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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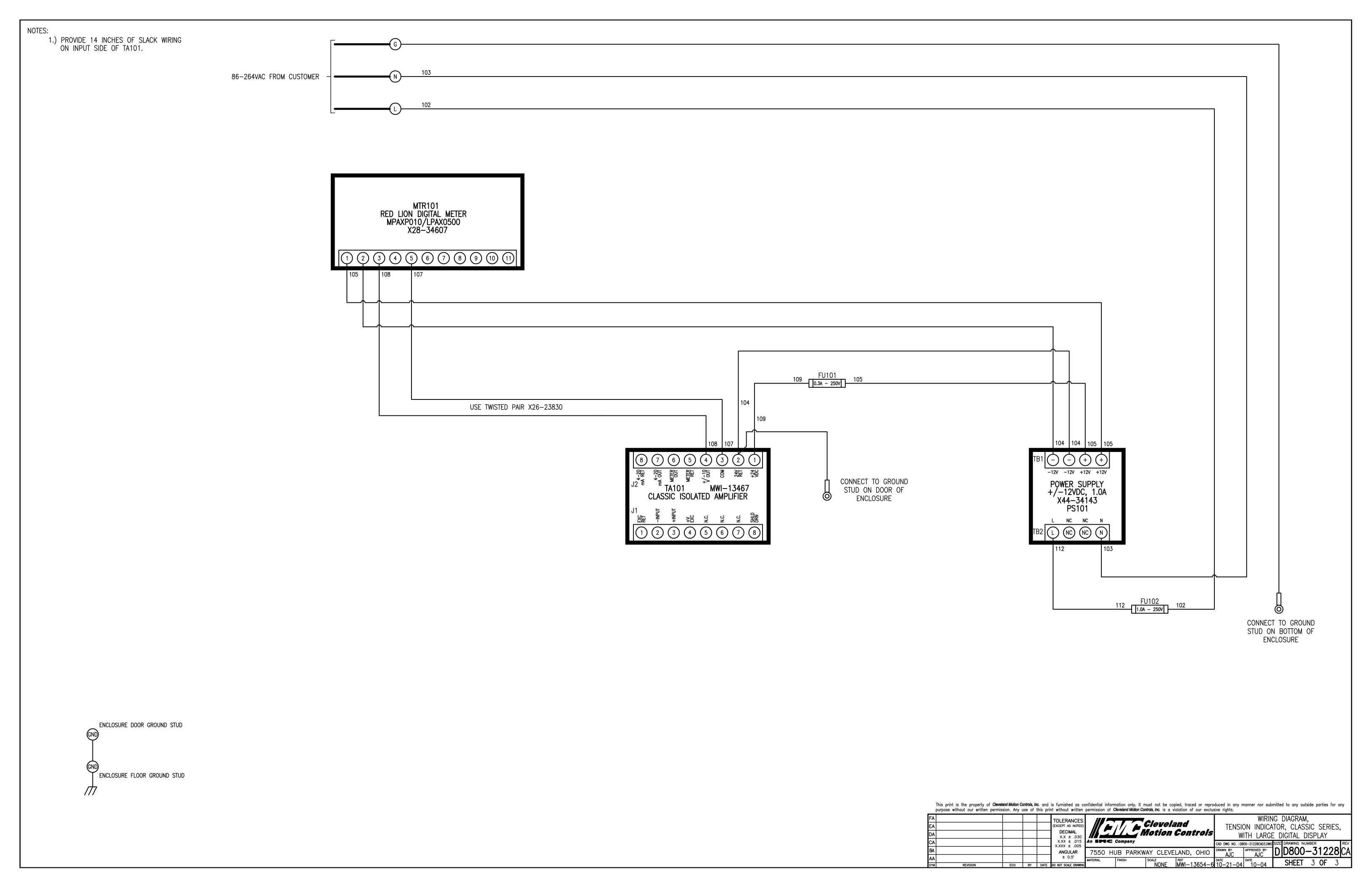
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E/	4											(EXCEPT A	s noted)	
D/	4											DECII X.X =	MAL ± .030	L
C/	4											X.XX =		A
B/	١											ANGU		Г
A	4											± C	.5°	MA

ECO BY DATE DO NOT SCALE DRAWING



WITH LARGE DIGITAL DISPLAY CAD DWG NO. :D800-31228CA02.dwg SIZE DRAWING NUMBER APPROVED BY D D800-31228 CA 7550 HUB PARKWAY CLEVELAND, OHIO SCALE NONF | REF | 13654-6 10/21/04 | DATE | 10/04 | SHEET 2 OF 3

NOTES



# ANALOG TENSION INDICATOR ASSEMBLY CLASSIC AMPLIFIER, NON-ISOLATED OUTPUTS

MWI-13654-1,7

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FA					TOLERANCES
EΑ					(EXCEPT AS NOTED)
DA					DECIMAL X.X ± .030
CA					X.XX ± .015 X.XXX ± .005
ВА	ENGINEERING CHANGES	CLE3117	AJC	03/05	
AΑ	AS RELEASED	KAP	AJC	12/04	± 0.5°
CVII	BEARCION	FOO	DV	DATE	DO NOT COME DRAWING



## CMC STANDARD NOTES

ITEMS NUMBERED 1 THROUGH 99 AND DESIGNATED WITH / REFER TO THE NOTES LISTED BELOW

# COMPONENTS $(\frac{1}{25})$

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION. MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

# WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED <u>ONLY</u>.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED <u>ONLY</u>.
- 28 USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT). USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- 30 RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. <u>DO NOT GROUND</u> ANY OTHER POINT.
- 38 KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS.
- 43 CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END.
- FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2 SEPARATELY AND DO NOT USE THEM.
- THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED, CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS.
- 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

# GENERAL $(\sqrt{51} - \sqrt{79})$

- 50 <u>Warning</u> Disconnect <u>all</u> ac input power before inserting or removing p.c. boards.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- <u> Warning</u> This motor may be at line voltage even when not in operation.
- FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>Warning</u> Do not open disconnect switch or circuit breaker while motor is in operation.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE" NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- 58 SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE.
- CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS. CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER.
- INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER. CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL.
- THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.

#### THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

# SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME
- 84 NOT USED AT THIS TIME
- NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES.

## CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF ±5% UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" <u>MUST</u> BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

# CMC REPLACEMENT PARTS ORDERS — (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:

CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT 7550 HUB PARKWAY CLEVELAND, OHIO 44125-5794

5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.

IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

TABLE 250-95

COPPER

15

20

30

40

100

200

300

400

500

600

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE |

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

AREA

 $(MM)^2$ 

2.6

3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

#### <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES. OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES. AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

# GROUNDING REQUIREMENTS

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. 10.) METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

# METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86. 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND
- CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# **INSTALLATION NOTES**

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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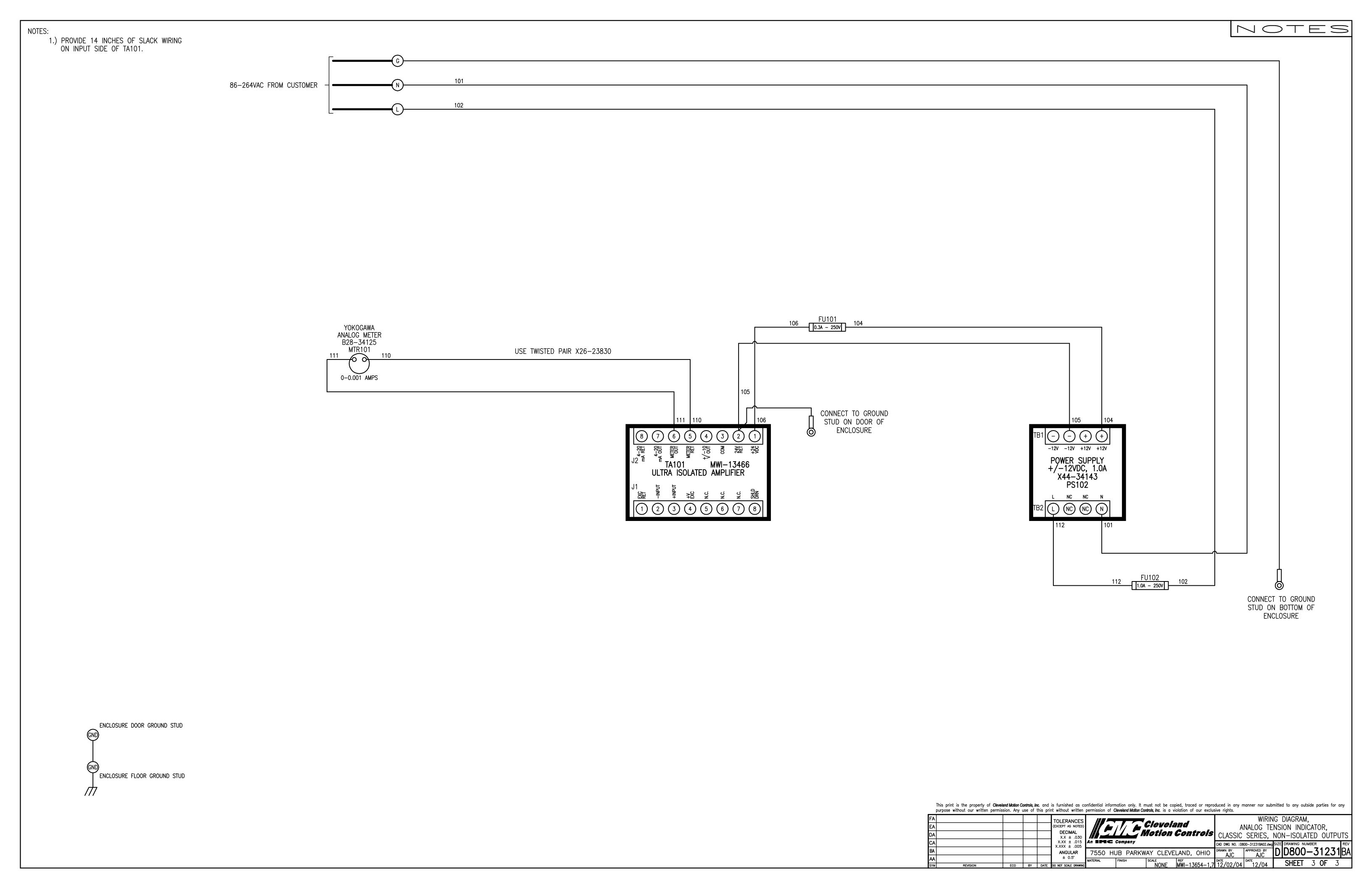
FΑ					TOLERANCES	
EΑ					(EXCEPT AS NOTED)	
DA					DECIMAL X.X ± .030	
CA						An EM
ВА					ANGULAR	7550
AΑ					± 0.5°	MATERIAL
SYM	REVISION	ECO	BY	DATE	DO NOT SCALE DRAWING	

Cleveland Motion Controls O HUB PARKWAY CLEVELAND, OHIO

ANALOG TENSION INDICATOR. CLASSIC SERIES, NON-ISOLATED OUTPUTS CAD DWG NO. :D800-31231BA02.dwg SIZE DRAWING NUMBER PRAWN BY APPROVED BY D D800-31231 BA NONE | MWI-13654-1.7 12/02/04 | SHEET 2 OF 3

WIRING DIAGRAM.

NOTES



# DIGITAL TENSION INDICATOR ASSEMBLY CLASSIC AMPLIFIER, NON-ISOLATED OUTPUTS

MWI-13654-3,8

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FA						TOLERANCES	
EΑ						(EXCEPT AS NOTED)	
DA						DECIMAL X.X ± .030	
CA						X.XX ± .015 X.XXX ± .005	An
BA						ANGULAR	7
AΑ	AS	RELEASED	AJC	AJC	03/05	± 0.5°	MAT
SYM		REVISION	ECO	BY	DATE	DO NOT SCALE DRAWING	

mission of Cleverand Modion Controls, Inc. is a violation of our exclusive rights.						
	WIRING DIAGRAM,					
	DIGITAL TENSION INDICATOR,					
Motion Controls	DIGITAL TENSION INDICATOR, CLASSIC SERIES, NON—ISOLATED OUTPUT					
n <b>IMC</b> Company	CAD DWG NO. :D800-31233AA01.DWG SIZE DRAWING NUMBER					
7550 HUB PARKWAY CLEVELAND, OHIO	DRAWN BY APPROVED BY D D800-31233					
terial finish scale ref NONE MWI-13654-3,8	DATE 12/09/04 03/05 SHEET 1 OF 3					

### CMC STANDARD NOTES

ITEMS NUMBERED 1 THROUGH 99 AND DESIGNATED WITH / REFER TO THE NOTES LISTED BELOW

# COMPONENTS ( $\sqrt{1} - \sqrt{25}$ )

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL. MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN. REPLACE FUSES ONLY WITH EXACT REPLACEMENTS

# WIRING $(\sqrt{26} - \sqrt{50})$

OR CMC APPROVED EQUIVALENTS.

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED <u>ONLY</u>.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED <u>ONLY</u>.
- 28 USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT).
- USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT). 30 RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. <u>DO NOT GROUND</u> ANY OTHER POINT.
- 38 KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS.
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END.
- FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2 SEPARATELY AND DO NOT USE THEM.
- THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED, CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS.
- 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

# GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- 50 <u>Warning</u> Disconnect <u>all</u> ac input power before inserting or removing p.c. boards.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- <u> Warning</u> This Motor may be at line voltage even when not in operation. FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>Warning</u> Do not open disconnect switch or circuit breaker while motor is in operation.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE" NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE.
- CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER.
- INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER. CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL. THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.
- THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

# SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME
- 84 NOT USED AT THIS TIME

NOT USED AT THIS TIME

- 86 NOT USED AT THIS TIME NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES.

### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF ±5% UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED"
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

# CMC REPLACEMENT PARTS ORDERS - (RPL)

- IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:
- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:

CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT 7550 HUB PARKWAY CLEVELAND, OHIO 44125-5794

5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.

IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

TABLE 250-95

AMPACITY\*

COPPER

15

20

30

40

100

200

300

400

500

600

800

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

CONDUCTOR SIZES FOR GROUNDING

| WIRE SIZE |

AWG/MCM

14

12

10

10

10

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

AREA

 $(MM)^2$ 

2.6

3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

#### <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES. OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES. AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

#### **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND.
- B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.
- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. 10.) METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

# METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT—CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE

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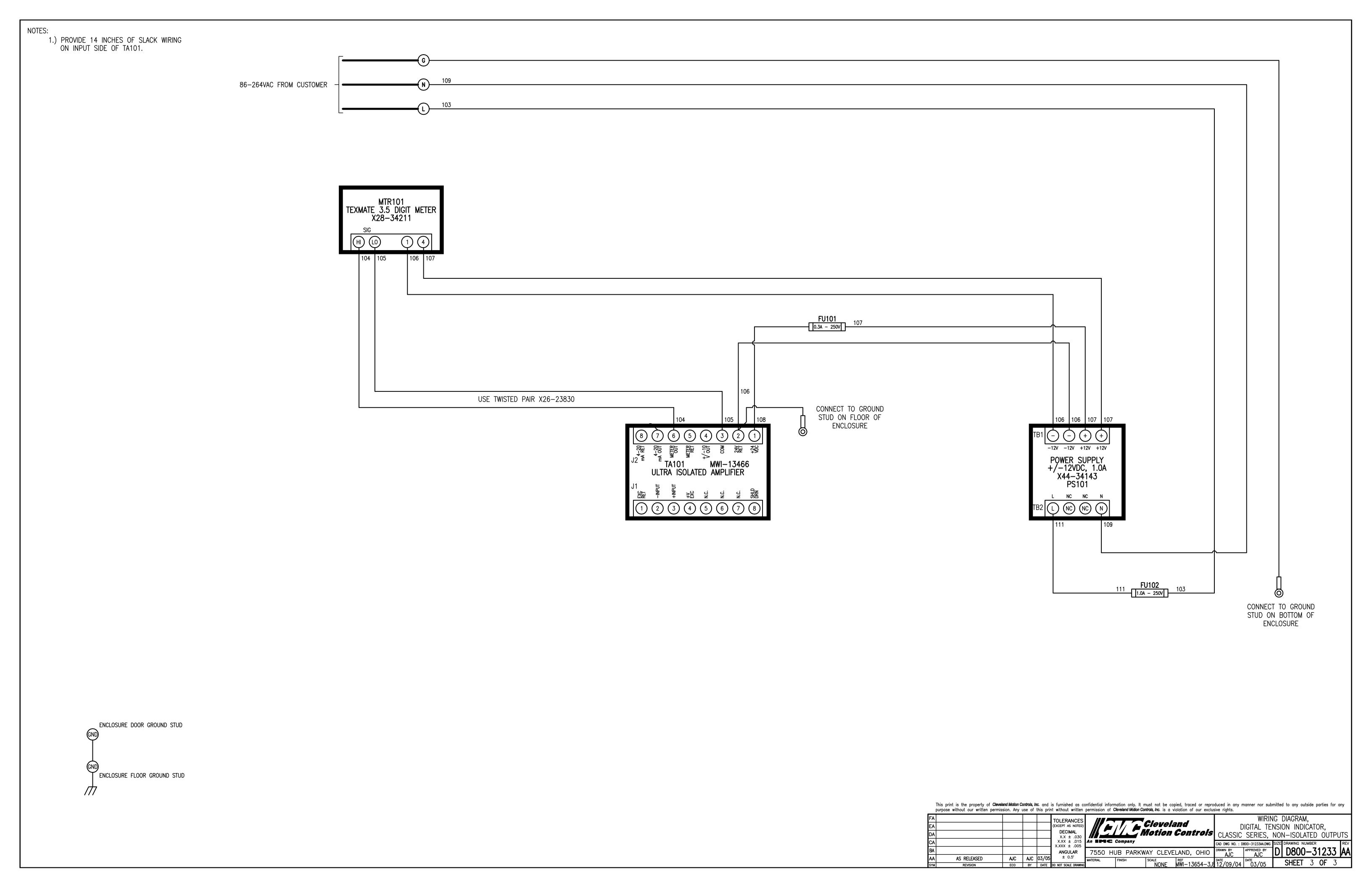
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EΑ					(EXCEPT AS NOTED)	
DΑ					DECIMAL X.X ± .030	
CA					X.XX ± .015 X.XXX ± .005	Aı
BA					ANGULAR	-
AΑ					± 0.5°	MA
SYM	REVISION	EC0	BY	DATE	DO NOT SCALE DRAWING	

Cleveland An IMC Company

WIRING DIAGRAM. DIGITAL TENSION INDICATOR. Motion Controls CLASSIC SERIES, NON-ISOLATED OUTPUTS CAD DWG NO. :D800-31233AA02.dwg SIZE DRAWING NUMBER 7550 HUB PARKWAY CLEVELAND, OHIO PRAWN BY APPROVED BY D D800-31233 AA

SCALE NONE | MWI-13654-3.8 | 12/09/04 | DAIE 03/05 | SHEET 2 OF 3

NOTES

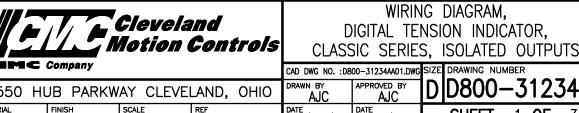


# DIGITAL TENSION INDICATOR ASSEMBLY CLASSIC AMPLIFIER, ISOLATED OUTPUTS

MWI-13654-4

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FΑ	١					TOLERANCES		_
ΕA	\					(EXCEPT AS NOTED)		///
D/	\					DECIMAL X.X ± .030		
C/	\					X.XX ± .015 X.XXX ± .005	An IMC	Compa
BA						ANGULAR	7550 HI	JB P
A/	AS	RELEASED	AJC	AJC	03/05	± 0.5°	MATERIAL	FINISH
SYN	1	REVISION	ECO	BY	DATE	DO NOT SCALE DRAWING		



WIRING DIAGRAM,

#### CMC STANDARD NOTES

ITEMS NUMBERED 1 THROUGH 99 AND DESIGNATED WITH / REFER TO THE NOTES LISTED BELOW

# COMPONENTS $(\frac{1}{25})$

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION. MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

# WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED <u>ONLY</u>.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED <u>ONLY</u>.
- 28 USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT). USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- 30 RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. <u>DO NOT GROUND</u> ANY OTHER POINT.
- 38 KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS.
- 43 CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK
- REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED). THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2
- SEPARATELY AND DO NOT USE THEM. THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

# GENERAL $(\sqrt{51} - \sqrt{79})$

- 50 <u>Warning</u> Disconnect <u>all</u> ac input power before inserting or removing p.c. boards.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR
- HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- <u> Warning</u> This motor may be at line voltage even when not in operation. FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>Warning</u> Do not open disconnect switch or circuit breaker while motor is in operation.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE" NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- 58 SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE.
- CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS. CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER.
- INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER. CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL.
- THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC. THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION.
- CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

# SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
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NOT USED AT THIS TIME

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- 89 NOT USED AT THIS TIME

# ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES.

#### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF ±5% UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" <u>MUST</u> BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

### CMC REPLACEMENT PARTS ORDERS — (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
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CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT 7550 HUB PARKWAY CLEVELAND, OHIO 44125-5794

5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.

IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

#### <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES. OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES. AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

#### GROUNDING REQUIREMENTS

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- C. ALL HAZARDOUS LOCATIONS. D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL
- OBJECTS AND SUBJECT TO CONTACT BY PERSONS. 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. 10.) METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

#### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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WIRING DIAGRAM. Cleveland Motion Controls DIGITAL TENSION INDICATOR. CLASSIC SERIES, ISOLATED OUTPUTS IMC Company

CAD DWG NO. :D800-31234AA02.dwg SIZE DRAWING NUMBER DRAWN BY APPROVED BY D D800-31234 AA NONE | MWI-13654-4 | 12/09/04 | DAIL | 03/05 | SHEET 2 OF 3

NOTES

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING (AMPERES)

000

TABLE 250-95

COPPER

15

20

30

40

100

200

300

400

500

600

1000

1200

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE |

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

AREA

 $(MM)^2$ 

2.6

3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

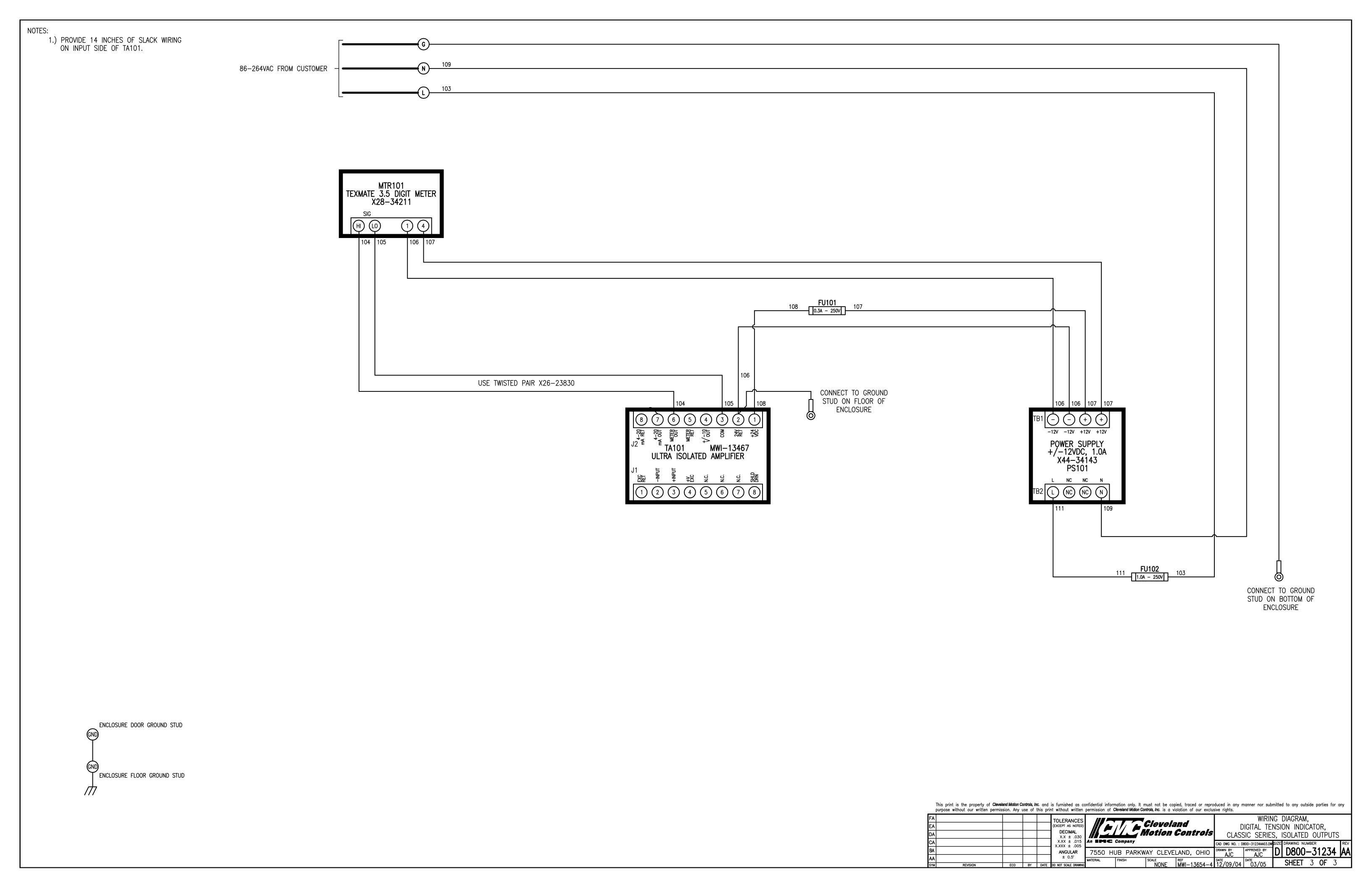
43.0

56.0

70.0

89.0

112.0



# ANALOG TENSION INDICATOR ASSEMBLY CLASSIC AMPLIFIER, ISOLATED OUTPUTS

MWI-13654-2

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CA					X.XX ± .015 X.XXX ± .005	An IMC	Company			CAD DWG NO. :D8	300-31235BA01.DWG				
BA	ENGINEERING CHANGES	CLE3117	AJC	03/05		7550 HI	JB PARKW	/AY CLEVE	LAND, OHIO	DRAWN BY AJC	APPROVED BY	lDl	D800-	-31	2351
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COMPONENTS  $(\frac{1}{25})$ 

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL. MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT). USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT. THIS POINT MAY BE GROUNDED IF DESIRED. DO NOT GROUND ANY OTHER POINT.
- KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2
- SEPARATELY AND DO NOT USE THEM. THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- WARNING THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION
- FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>WARNING</u> DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE" NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE.
- CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER. INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER.
- CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL. THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.
- THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME
- 84 NOT USED AT THIS TIME 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES

#### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

### CMC REPLACEMENT PARTS ORDERS - (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:
  - CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT
  - 7550 HUB PARKWAY
  - CLEVELAND, OHIO 44125-5794
- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

TABLE 250-95

COPPER

20

30

40

60

100

200

300

400

500

800

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

00

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

 $(MM)^2$ 

2.6 3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

#### <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

# **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED.
- METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

#### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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A	4											± C	.5°	MA

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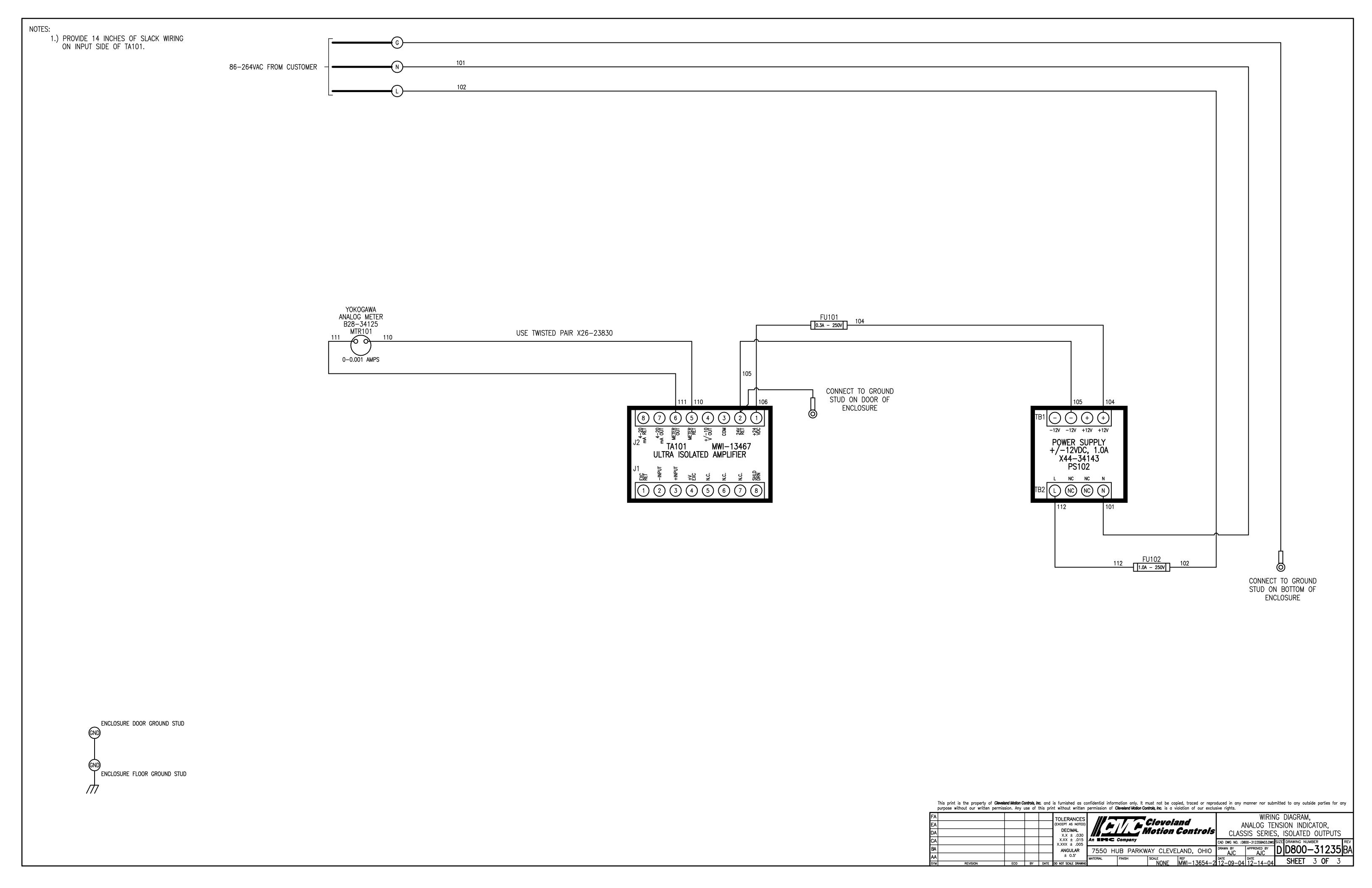


WIRING DIAGRAM. ANALOG TENSION INDICATOR, CLASSIC SERIES, ISOLATED OUTPUTS CAD DWG NO. :D800-31235BA02.dwg SIZE DRAWING NUMBER

NOTES

TAWN BY APPROVED BY D D800-31235 BA 7550 HUB PARKWAY CLEVELAND, OHIO

SCALE NONF | REF | 13654-2 | 12/09/04 | DATE | 12/04 | SHEET 2 OF 3



# ANALOG TENSION INDICATOR ASSEMBLY ULTRA AMPLIFIER, ISOLATED OUTPUTS

MWI-13491-2

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DA						DECIMAL X.X ± .030	
CA						X.XX ± .015 X.XXX ± .005	An
BA						ANGULAR	7
AA	AS	RELEASED	AJC	AJC	03/05	± 0.5°	MAT



ITEMS NUMBERED 1 THROUGH 99 AND DESIGNATED WITH 🔼 REFER TO THE NOTES LISTED BELOW

COMPONENTS  $(\frac{1}{25})$ 

SEPARATELY MOUNTED - SUPPLIED BY CMC.

MOUNTED IN OPERATOR STATION.

- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT). USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT. THIS POINT MAY BE GROUNDED IF DESIRED. DO NOT GROUND ANY OTHER POINT.
- KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2
- SEPARATELY AND DO NOT USE THEM. THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- WARNING THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION
- FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>WARNING</u> DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE"
- NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES. SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE.
- CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER. INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER.
- CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL. THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.
- THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME 84 NOT USED AT THIS TIME
- 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES

#### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

### CMC REPLACEMENT PARTS ORDERS - (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:
  - CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT
  - 7550 HUB PARKWAY
  - CLEVELAND, OHIO 44125-5794
- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

TABLE 250-95

COPPER

20

30

40

60

100

200

300

400

500

800

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

00

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

 $(MM)^2$ 

2.6 3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

# <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

# **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

# METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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CA										X.XX ± .015 X.XXX ± .005
BA										ANGULAR
AA										± 0.5°

ECO BY DATE DO NOT SCALE DRAW

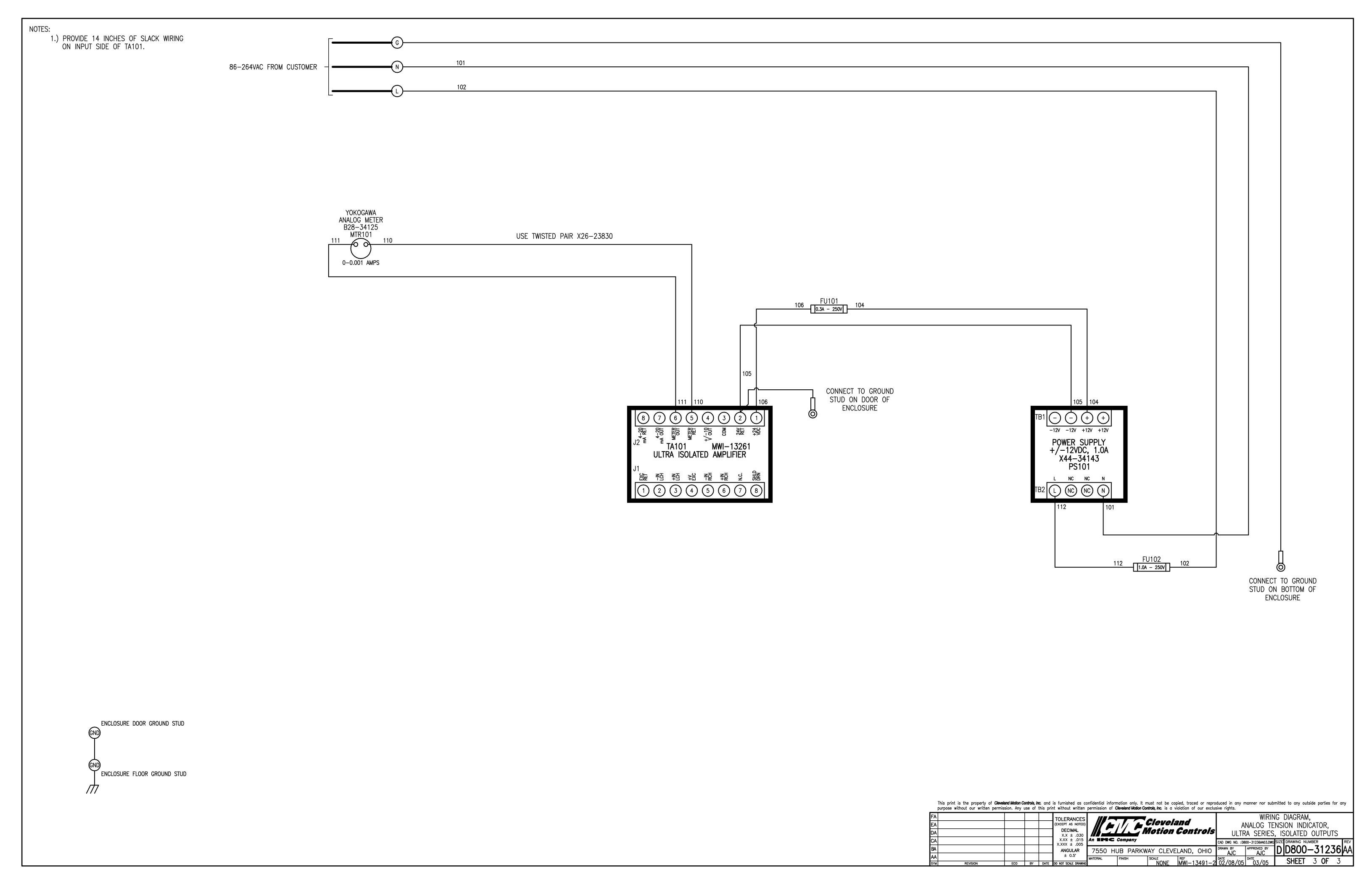
*Cleveland* Motion Controls

WIRING DIAGRAM. ANALOG TENSION INDICATOR, UTRA SERIES, ISOLATED OUTPUTS CAD DWG NO. :D800-31236AA02.dwg SIZE DRAWING NUMBER

NOTES

APPROVED BY D D800-31236 AA





# DIGITAL TENSION INDICATOR ASSEMBLY ULTRA AMPLIFIER, NON-ISOLATED OUTPUTS

MWI-13491-3

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WIRING DIAGRAM,
DIGITAL TENSION INDICATOR,
ULTRA SERIES, NON-ISOLATED OUTPUTS

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FA EA DA CA						TOLERANCES (EXCEPT AS NOTED) DECIMAL X.X ± .030 X.XX ± .015	<u> </u>	Clevela Notion	and Contro
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COMPONENTS  $(\frac{1}{25})$ 

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.

REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY. USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT).
- USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT. THIS POINT MAY BE GROUNDED IF DESIRED. DO NOT GROUND ANY OTHER POINT.
- KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2
- SEPARATELY AND DO NOT USE THEM. THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- WARNING THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION
- FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>WARNING</u> DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE" NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE.
- CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS. CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER.
- INSTALL IN A CLEAN. DRY ATMOSPHERE, CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER. CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL.
- THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.
- THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME 84 NOT USED AT THIS TIME
- 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES

#### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

### CMC REPLACEMENT PARTS ORDERS - (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:
  - CLEVELAND MOTION CONTROLS, INC.
  - SERVICE PARTS DEPARTMENT
  - 7550 HUB PARKWAY
  - CLEVELAND, OHIO 44125-5794
- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

TABLE 250-95

COPPER

20

30

40

60

100

200

300

400

500

800

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

00

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

 $(MM)^2$ 

2.6 3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

# <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

# **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.
- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

#### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS. 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY
- SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED. 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC.,
- SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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7550 HUB PARKWAY CLEVELAND, OHIO

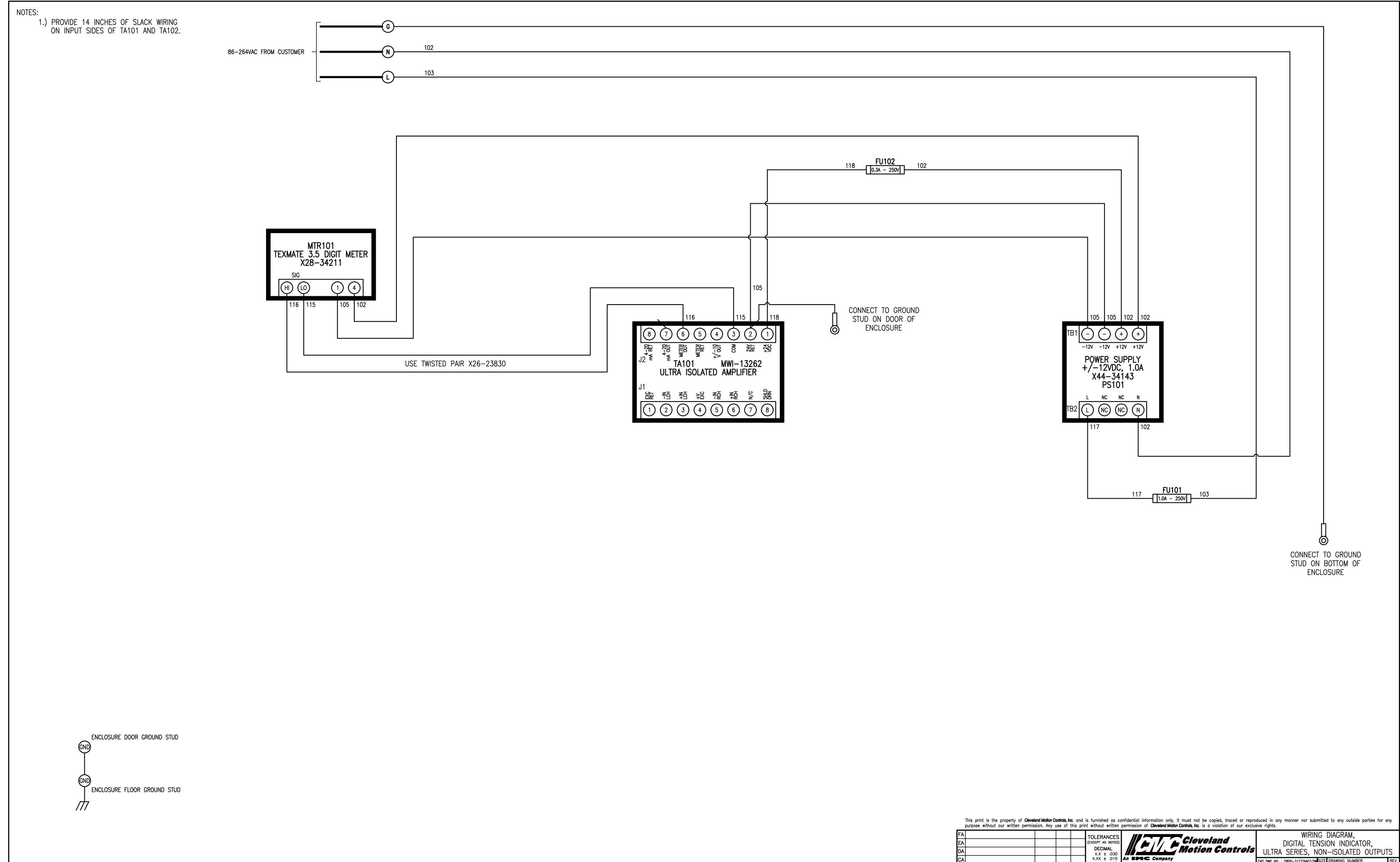
	our written permission. Any	
FA		TOLERANCES
EA		(EXCEPT AS NOTED)
DA		DECIMAL X.X ± .030
CA		X.XX ± .015 X.XXX ± .005
ВА		ANGULAR
		1 0 50

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WIRING DIAGRAM. DIGITAL TENSION INDICATOR, UTRA SERIES, NON-ISOLATED OUTPUTS CAD DWG NO. :D800-31237AA02.dwg SIZE DRAWING NUMBER

NOTES

APPROVED BY D D800-31237 AA NONE | MWI-13491-3 02/01/05 DATE 03/05 SHEET 2 OF 3



7550 HUB PARKWAY CLEVELAND, OHIO

ANGULAR ± 0.5°

# DIGITAL TENSION INDICATOR ASSEMBLY ULTRA AMPLIFIER, ISOLATED OUTPUTS

MWI-13491-4

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FA						TOLERANCES	
EΑ						(EXCEPT AS NOTED)	<i>                                     </i>
DA						DECIMAL X.X ± .030	
CA						X.XX ± .015 X.XXX ± .005	An EMS
BA						ANGULAR	7550 H
AΑ	AS	RELEASED	AJC	AJC	02/05	± 0.5°	MATERIAL



COMPONENTS ( $\sqrt{1} - \sqrt{25}$ )

- 1 SEPARATELY MOUNTED SUPPLIED BY CMC.
- 2 SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- 4 MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- 8 OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- 9 REPLACE FUSES ONLY WITH <u>EXACT</u> REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- 26 USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE NON—SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT).
  USE NON—SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- 30 RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. <u>DO NOT GROUND</u> ANY OTHER POINT.

  KEEP LEADS AS SHORT AS POSSIBLE.
- 39 TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- 40 POLARITIES SHOWN MUST BE OBSERVED.
- 41 SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN.

  IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS.
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- 44 MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK
- REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).

  THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2
- SEPARATELY AND DO NOT USE THEM.

  THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- 18 IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS.

  49 DO NOT GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- 50 <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- 52 <u>Warning</u> During Normal Operation the Test Reference Switch <u>Must</u> be in the "off" position. The indicator light will be lit if this switch is <u>not</u> in the "off" position.
- 53 <u>WARNING</u> THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION.
- FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>WARNING</u> DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- 56 CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- 57 EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE" NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- 58 SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE.
- 59 CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER.

  60 INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER.
- CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL. THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.
- THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION.
  CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL ( $\sqrt{80} - \sqrt{99}$ )

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME

  84 NOT USED AT THIS TIME
- 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER.

ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES.

#### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF ±5% UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

#### CMC REPLACEMENT PARTS ORDERS - (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:
  - CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT
  - 7550 HUB PARKWAY
  - CLEVELAND, OHIO 44125-5794
- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

#### GROUNDING INSTALLATION NOTES

TABLE 250-95

COPPER

20

30

40

60

100

200

300

400

500

800

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

00

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

 $(MM)^2$ 

2.6 3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

# **GROUNDING**

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

# GROUNDING REQUIREMENTS

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND.
  B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL.
  C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS 1 AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED.

  10.) METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

#### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT—CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

# INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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	purpose without our written permis	ssion. Any	use of	this pri	nt without written
FΑ					TOLERANCES
EΑ					(EXCEPT AS NOTED)
DΑ					DECIMAL X.X ± .030
CA					X.XX ± .015 X.XXX ± .005
BA					ANGULAR
AΑ					± 0.5°

ECO BY DATE DO NOT SCALE DRAW

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WIRING

DIGITAL TENS

MOTION CONTROLS

WIRING

DIGITAL TENS

WIRING DIAGRAM,
DIGITAL TENSION INDICATOR,
ULTRA SERIES, ISOLATED OUTPUTS

AD DWG NO.: D800-31238A02.dwg SIZE DRAWING NUMBER

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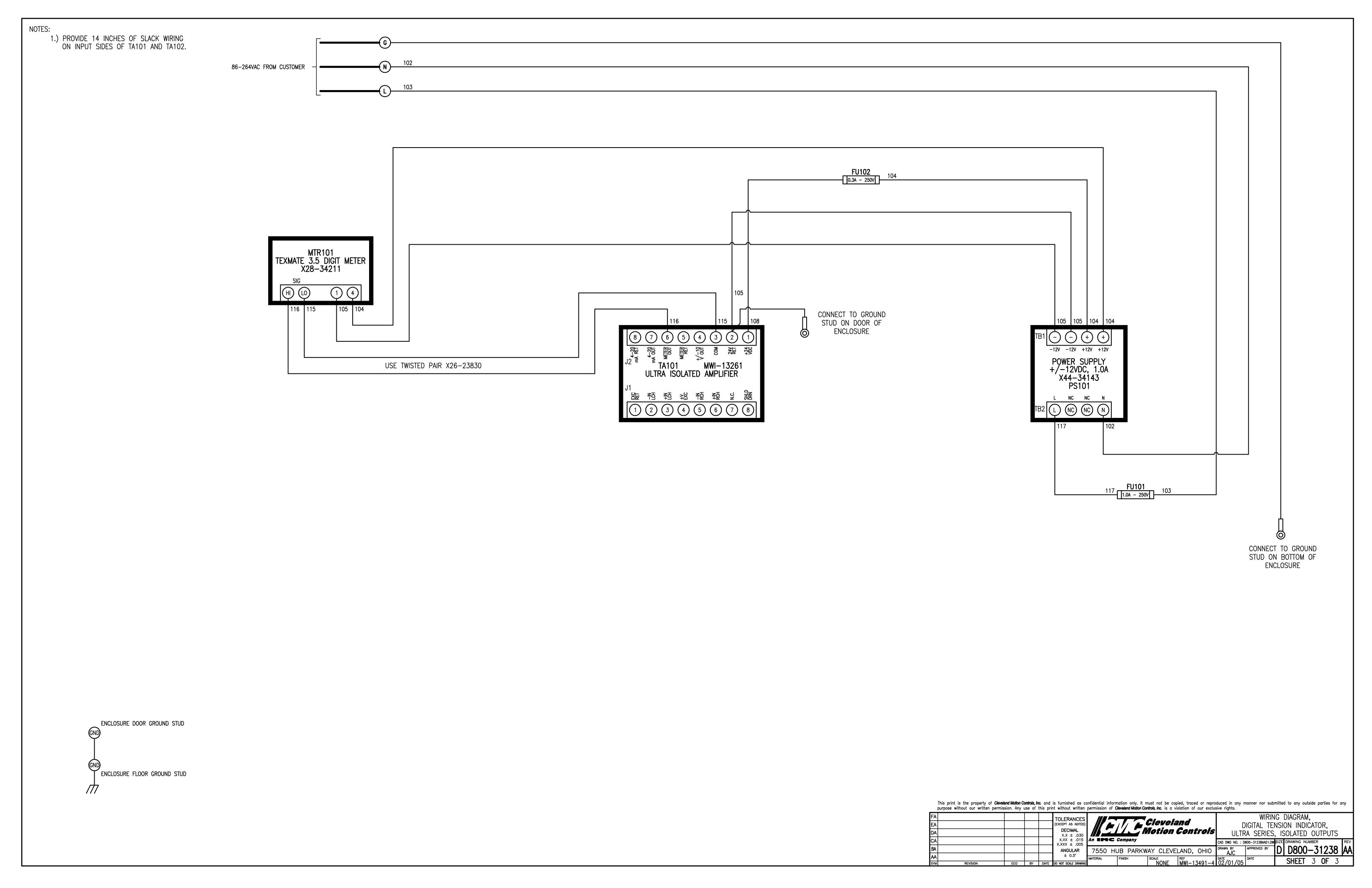
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D D800-31238AA

NOTES

7550 HUB PARKWAY CLEVELAND, OHIO AJC AJC DIDIDIO DATE NONE MWI-13491-5 02/01/05 DATE 03/05 SHEET 2 OF 3



# ANALOG TENSION INDICATOR ASSEMBLY ULTRA AMPLIFIER, NON-ISOLATED OUTPUTS

MWI-13491-1

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DA					DECIMAL X.X ± .030			<i>Totion</i>	Controls	ULTRA	SERIES, N	ION-ISOLAT	ED OU
CA					X.XX ± .015 X.XXX ± .005	An IMC	Company			CAD DWG NO. :D8	00-31241AA01.DWG	SIZE DRAWING NU	JMBER
BA					ANGULAR	7550 HI	JB PARKW	AY CLEVE	LAND, OHIO	DRAWN BY AJC	APPROVED BY	D D800	-312
AA	AS RELEASED	AJC	AJC	07/05	± 0.5°	MATERIAL	FINISH	SCALE	REF	DATE	DATE	SHEET	1 OF
SYM	REVISION	ECO	BY	DATE	DO NOT SCALE DRAWING			l nonf	MWI-13491-1	0//29/05	l 07/05 l	SHEET	I Ur

### CMC STANDARD NOTES

ITEMS NUMBERED 1 THROUGH 99 AND DESIGNATED WITH / REFER TO THE NOTES LISTED BELOW

## COMPONENTS ( $\sqrt{1} - \sqrt{25}$ )

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH **EXACT** REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

# WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- 28 USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT).
- 29 USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT). 30 RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. <u>DO NOT GROUND</u> ANY OTHER POINT.
- 38 KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS.
- 43 CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS NOT USED. TAPE LEADS S1 AND S2 SEPARATELY AND DO NOT USE THEM.
- THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY

# GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- 50 <u>Warning</u> Disconnect <u>all</u> ac input power before inserting or removing p.c. boards.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- WARNING THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION.
- FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 WARNING DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING. CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE"
- NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- 58 SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE.
- CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS. CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER.
- INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER. CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL.
- THESE ADJUSTMENTS MUST NOT BE CHANGED WITHOUT APPROVAL FROM CMC. THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

# SPECIAL ( $\sqrt{80} - \sqrt{99}$ )

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
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- 83 NOT USED AT THIS TIME
- 84 NOT USED AT THIS TIME 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES.

### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" <u>MUST</u> BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

### CMC REPLACEMENT PARTS ORDERS — (RPL)

- IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:
- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:

CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT 7550 HUB PARKWAY CLEVELAND, OHIO 44125-5794

- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

### GROUNDING INSTALLATION NOTES

### <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES. AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

### **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND.
- B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL.
- C. ALL HAZARDOUS LOCATIONS. D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.
- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. 10.) METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

### INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE

AMDACITY\* | WIDE SIZE | ADEA

CONDUCTOR SIZES FOR GROUNDING

TABLE 250-95

RACEWAY & EQUIPMENT

COPPER	AWG/MCM	AREA (MM) <sup>2</sup>
15	14	2.6
20	12	3.9
30	10	7.1
40	10	7.1
60	10	7.1
100	8	11.0
200	6	17.4
300	4	27.0
400	3	34.0
500	2	43.0
600	1	56.0
800	0	70.0
1000	00	89.0
1200	000	112.0

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING (AMPERES)

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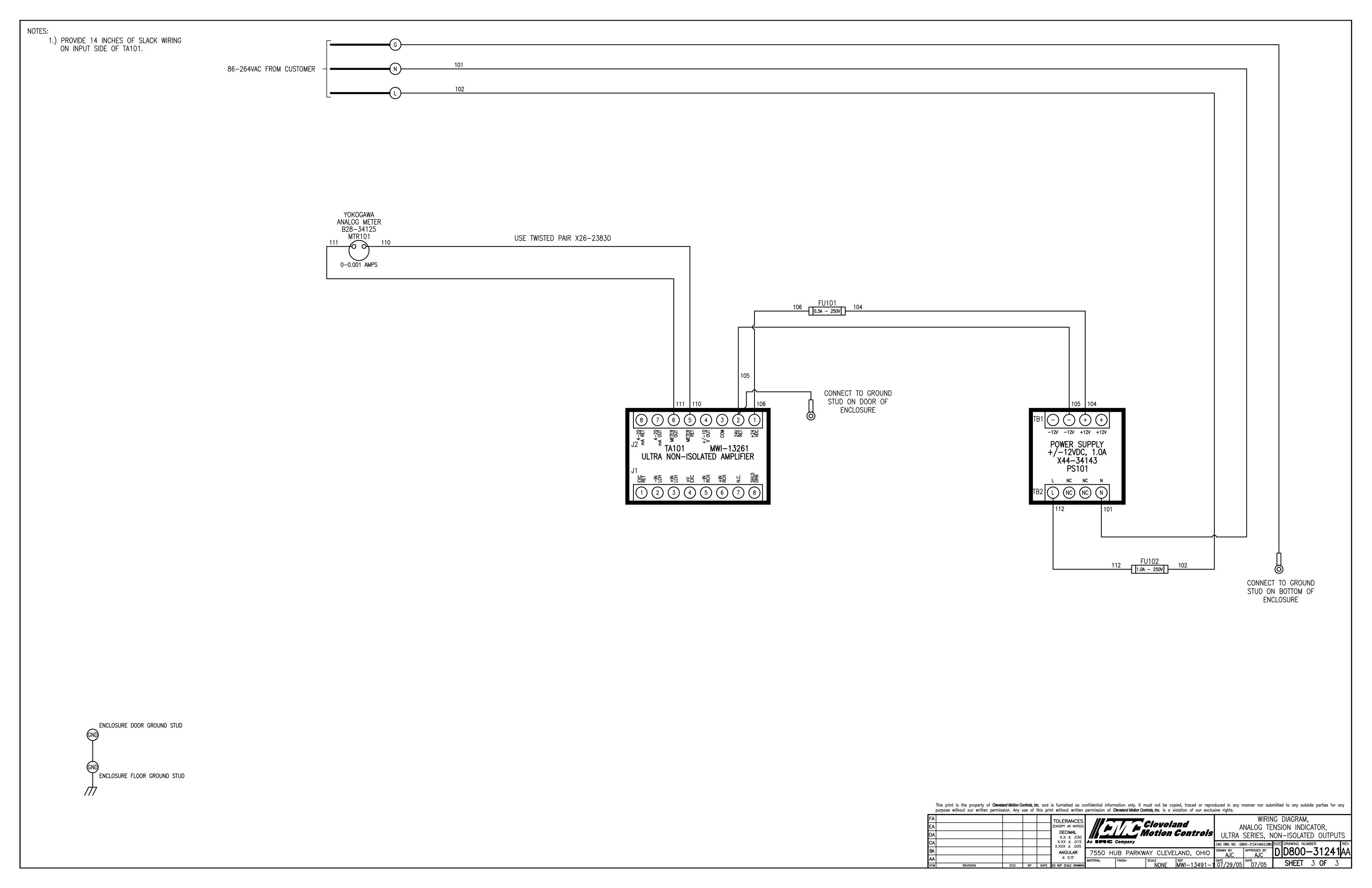
OLERANCES  $X.X \pm .030$  $X.XX \pm .015$ 0. ± XXX.> ANGULAR ± 0.5°

Cleveland Motion Controls An EMEC Company 7550 HUB PARKWAY CLEVELAND, OHIO

WIRING DIAGRAM. ANALOG TENSION INDICATOR, UTRA SERIES. NON-ISOLATED OUTPUTS CAD DWG NO. :D800-31241AA02.dwg SIZE DRAWING NUMBER

NOTES

RAWN BY APPROVED BY D D800-31241AA **SHEET** 2 **OF** 3 NONE | | | NOTE | | NOTE | NOT



# DIGITAL DUAL TENSION INDICATOR ASSEMBLY CLASSIC AMPLIFIER, ISOLATED OUTPUTS

MWI-13654-5

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FA						TOLERANCES			<u> </u>	
EΑ						(EXCEPT AS NOTED)			Clevela	
DA						DECIMAL X.X ± .030			lotion (	Coi
CA						X.XX ± .015 X.XXX ± .005	An EMC	Company		
BA						ANGULAR	7550 HI	JB PARKW	AY CLEVEI	LAND
AA	AS	RELEASED	AJC	AJC	03/05	± 0.5°	MATERIAL	FINISH	SCALE	REF
SYM		REVISION	EC0	BY	DATE	DO NOT SCALE DRAWING			NONE	MWI-



COMPONENTS (1 - 25)

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION. MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT). USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. <u>DO NOT GROUND</u> ANY OTHER POINT. KEEP LEADS AS SHORT AS POSSIBLE.
- TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN. IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED).
- THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2
- SEPARATELY AND DO NOT USE THEM. THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- <u>Warning</u> This motor may be at line voltage even when not in operation FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE.
- 54 <u>WARNING</u> DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE"
- NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE. CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER. INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER.
- CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL. THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.
- THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME
- 84 NOT USED AT THIS TIME 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES

### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

## CMC REPLACEMENT PARTS ORDERS — (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:
  - CLEVELAND MOTION CONTROLS, INC. SERVICE PARTS DEPARTMENT
  - 7550 HUB PARKWAY CLEVELAND, OHIO 44125-5794

LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED

5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.

### GROUNDING INSTALLATION NOTES

### <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

### **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

### INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

CONDUCTOR SIZES FOR GROUNDING RACEWAY & EQUIPMENT

TABLE 250-95

AMPACITY* COPPER	WIRE SIZE AWG/MCM	AREA (MM) <sup>2</sup>
15	14	2.6
20	12	3.9
30	10	7.1
40	10	7.1
60	10	7.1
100	8	11.0
200	6	17.4
300	4	27.0
400	3	34.0
500	2	43.0
600	1	56.0
800	0	70.0
1000	00	89.0
1200	000	112.0

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING (AMPERES)

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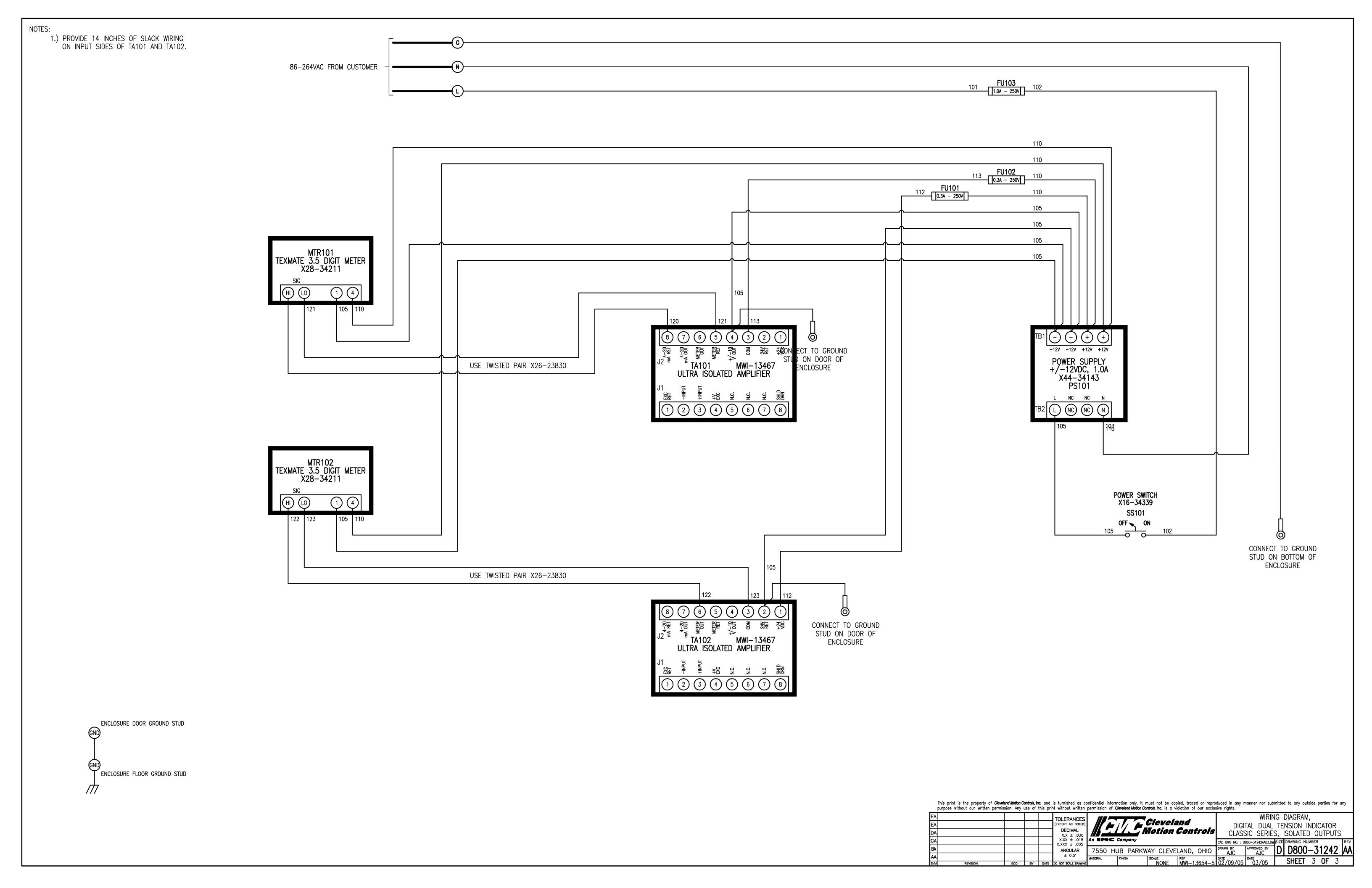
**OLERANCES** DECIMAL  $X.X \pm .030$  $X.XX \pm .01$ 00. ± XXX.X ANGULAR ± 0.5°



WIRING DIAGRAM. DIGITAL DUAL TENSION INDICATOR, CLASSIC SERIES, ISOLATED OUTPUTS AD DWG NO. :D800-31242AA02.dwg SIZE DRAWING NUMBER

NOTES

APPROVED BY D D800-31242 AA 7550 HUB PARKWAY CLEVELAND, OHIO NONE | REF | 13654-5 | 02/09/05 | DATE | 03/05 | SHEET 2 OF 3



# DIGITAL TENSION INDICATOR ASSEMBLY CLASSIC AMPLIFIER, ISOLATED OUTPUTS, WITH POT TRIM OUTPUT

MWI-13654-9

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	<u> </u>			•		•										
FA					TOLERANCES			<u> </u>		WIRI	NG DIAGRA	ΑM,	DIGITAL	TENS	SION	
EΑ					(EXCEPT AS NOTED)		/// 🚈 🖰	Clevela	ana	11	NDICATOR,	CL	ASSIC S	SERIES	,	
DA					DECIMAL X.X ± .030			Notion	Controls	ISOLATI	ED OUTPL	JTS,	, POT T	RIM O	UTPU	Τ
CA					X.XX ± .015 X.XXX ± .005	An IMC	Company			CAD DWG NO. :D8	00-31245AA01.DWG	SIZE	DRAWING NU	JMBER		RE
BA					ANGULAR	7550 HU	JB PARKW	/AY CLEVE	LAND, OHIO	DRAWN BY AJC	APPROVED BY	D	D800-	-312	245	A
AΑ	AS RELEASED	AJC	AJC	03/05	± 0.5°	MATERIAL	FINISH	SCALE	RFF	DATE	DATE	H	SHEET	1 0	<del>- 7</del>	_
SYM	REVISION	EC0	BY	DATE	DO NOT SCALE DRAWING			NONE	<u> MWI-13654-9</u>	02/30/05	03/05		SHEET	0	<u>г</u>	

COMPONENTS  $(\frac{1}{25})$ 

- SEPARATELY MOUNTED SUPPLIED BY CMC.
- SEPARATELY MOUNTED CUSTOMER FURNISHED.
- MOUNTED ON CONTROL PANEL.
- MOUNTED IN OPERATOR STATION.
- MOUNTED ON ENCLOSURE.
- FOR CONNECTION OF CUSTOMER FURNISHED METER ONLY.
- OPTIONAL COMPONENT. IF NOT USED, WIRE A JUMPER IN ITS PLACE.
- OPTIONAL COMPONENT. IF NOT USED, LEAVE TERMINALS OPEN.
- REPLACE FUSES ONLY WITH EXACT REPLACEMENTS OR CMC APPROVED EQUIVALENTS.

WIRING ( $\sqrt{26} - \sqrt{50}$ )

- USE SHIELDED 2 CONDUCTOR CABLE (BELDEN 8719 OR EQUIVALENT)
- CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE SHIELDED 3 CONDUCTOR CABLE (BELDEN 8618 OR EQUIVALENT) CONNECT SHIELD AT CONTROLLER TERMINAL INDICATED ONLY.
- USE NON-SHIELDED TWISTED 2 CONDUCTOR CABLE (ALPHA 1899 OR EQUIVALENT). USE NON-SHIELDED TWISTED 3 CONDUCTOR CABLE (ALPHA 1899/3 OR EQUIVALENT).
- RUN THESE LEADS IN A SEPARATE CONDUIT.
- 30-1 ALL LEADS WITH THE SAME DASH NUMBER MAY BE RUN IN THE SAME CONDUIT.
- THIS POINT MAY BE GROUNDED IF DESIRED. DO NOT GROUND ANY OTHER POINT.
- KEEP LEADS AS SHORT AS POSSIBLE. TACHOMETER GENERATOR MAY BE CONNECTED WITH EITHER POLARITY.
- POLARITIES SHOWN MUST BE OBSERVED.
- SEE TRANSFORMER NAMEPLATE FOR PROPER CONNECTION OF PRIMARY LEADS.
- CONNECT THE AC INPUT POWER TO L1, L2, AND L3 AS SHOWN.
- IF THE PHASE SEQUENCE INDICATOR DOES NOT LIGHT, INTERCHANGE ANY TWO CONNECTIONS
- CONSULT BLOWER MOTOR NAMEPLATES FOR PROPER CONNECTIONS.
- MOTORS WITH DUAL SHUNT FIELDS MUST BE CONNECTED FOR THE PROPER VOLTAGE.
- THE MOTOR IS SHOWN CONNECTED FOR CCW ROTATION FACING THE COMMUTATOR END. FOR OPPOSITE ROTATION, INTERCHANGE LEADS A1 AND A2. (NOTE: ON TACHOMETER FEEDBACK
- REGULATED CONTROLLERS, THE TACHOMETER GENERATOR LEADS <u>MUST ALSO</u> BE REVERSED). THE SERIES FIELD OF THIS MOTOR IS <u>NOT USED</u>. TAPE LEADS S1 AND S2
- SEPARATELY AND DO NOT USE THEM. THE SERIES FIELD OF THIS MOTOR SHOULD BE CONNECTED TO CONTROLLERS TERMINALS S1 AND S2.
- IF THE MOTOR OVERTEMPERATURE SWITCH IS NOT FURNISHED OR USED,
- CONNECT A WIRE JUMPER BETWEEN THESE TERMINALS. 49 DO <u>NOT</u> GROUND TRANSFORMER SECONDARY.

GENERAL ( $\sqrt{51} - \sqrt{79}$ )

- <u>WARNING</u> DISCONNECT <u>ALL</u> AC INPUT POWER BEFORE INSERTING OR REMOVING P.C. BOARDS.
- IN NORMAL OPERATION THIS CONTROLLER WILL NOT TURN OFF UNTIL THE MOTOR
- HAS COME TO ZERO SPEED AFTER DEPRESSING THE STOP PUSHBUTTON.
- <u>WARNING</u> DURING NORMAL OPERATION THE TEST REFERENCE SWITCH <u>MUST</u> BE IN THE "OFF" POSITION. THE INDICATOR LIGHT WILL BE LIT IF THIS SWITCH IS <u>NOT</u> IN THE "OFF" POSITION.
- WARNING THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN NOT IN OPERATION
- FOR SAFETY'S SAKE, DISCONNECT ALL AC POWER BEFORE ATTEMPTING SERVICE OR MAINTENANCE. 54 <u>WARNING</u> - DO NOT OPEN DISCONNECT SWITCH OR CIRCUIT BREAKER WHILE MOTOR IS IN OPERATION.
- DO NOT OPERATE MOTOR UNLESS BLOWER IS OPERATING.
- CUSTOMER CONTROL PANEL. DO NOT EXCEED VA CAPACITY SHOWN.
- EACH ENCLOSURE SHOULD BE SOLIDLY GROUNDED. FOLLOW THE "NATIONAL ELECTRICAL CODE"
- NFPA PUBLICATION No.70 AND/OR OTHER APPLICABLE CODES.
- SEE INSTRUCTION MANUAL FOR RECOMMENDED MAINTENANCE. CHECK CONTROLLER NAMEPLATE FOR PROPER POWER REQUIREMENTS.
- CONNECTION TO INCORRECT POWER MAY CAUSE DAMAGE TO THE CONTROLLER. INSTALL IN A CLEAN, DRY ATMOSPHERE. CONSULT INSTRUCTION MANUAL FOR AMBIENT REQUIREMENTS.
- NO ADDITIONAL EQUIPMENT OR WIRES, ETC. SHOULD BE PLACED IN THIS CONTROLLER.
- CONTROLLER OPERATION CANNOT BE GUARANTEED BY CMC IF THIS IS DOE WITHOUT PRIOR APPROVAL.
- ADJUSTMENTS ON P.C. BOARDS WHICH ARE FACTORY SET WILL BE INDICATED BY DABS OF GLYPTOL. THESE ADJUSTMENTS MUST <u>NOT</u> BE CHANGED WITHOUT APPROVAL FROM CMC.
- THIS EQUIPMENT HAS BEEN ADJUSTED FOR 50Hz OPERATION. CONSULT THE FACTORY BEFORE ATTEMPTING TO USE ON 60Hz.

SPECIAL (/80 - /99)

THESE NOTES ARE SPECIAL INSTRUCTIONS FOR USE ON SPECIFIC APPLICATIONS. THESE WILL BE DEFINED ON THE RELEVANT DRAWING/SHEETS.

- 80 NOT USED AT THIS TIME
- 81 NOT USED AT THIS TIME
- 82 NOT USED AT THIS TIME
- 83 NOT USED AT THIS TIME 84 NOT USED AT THIS TIME
- 85 NOT USED AT THIS TIME
- 86 NOT USED AT THIS TIME
- 87 NOT USED AT THIS TIME
- 88 NOT USED AT THIS TIME
- 89 NOT USED AT THIS TIME

ALL WIRING SHOULD BE DONE USING <u>STRANDED</u>, MACHINE TOOL TYPE WIRE ALL WIRING SHOULD BE WITH AN INSULATION RATING OF 600V OR GREATER. ALL WIRING SHOULD CONFORM TO ALL APPLICABLE SAFETY CODES

### CMC REPLACEMENT PARTS LIST

- 1.) ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE INDICATED.
- 2.) ALL RESISTORS HAVE A TOLERANCE OF  $\pm 5\%$  UNLESS OTHERWISE INDICATED.
- 3.) CAPACITORS LISTED AS "NP" MUST BE NON-POLARIZED TYPES.
- 4.) ZENER DIODES LISTED AS "TC" ARE "TEMPERATURE COMPENSATED".
- 5.) POTENTIOMETERS LISTED AS "PC MOUNT", MOUNT DIRECTLY TO THE PRINTED CIRCUIT BOARD.

FOR ALL PARTS DESIGNATED WITH AN ASTERISK (\*) IN THE RSP COLUMN OF THE ITEM PARTS LIST, IT IS RECOMMENDED THAT AT LEAST ONE SPARE PART OF THIS TYPE BE STOCKED TO MINIMIZE DOWN TIME IN THE EVENT OF A SYSTEM FAILURE. IT IS STRONGLY URGED THAT YOU STOCK AT LEAST TWICE THE ACTUAL NUMBER OF FUSES LISTED OF EACH TYPE.

FOR COMPONENTS NOT LISTED, CONSULT THE SALES DEPARTMENT OF CMC REGARDING FEASIBILITY OF REPLACEMENT IN THE FIELD.

### CMC REPLACEMENT PARTS ORDERS — (RPL)

IT IS RECOMMENDED THAT SPARE PARTS BE ORDERED AS SOON AS THE EQUIPMENT IS INSTALLED TO PREVENT DELAY IN REPAIRS IF A MALFUNCTION SHOULD OCCUR. A RECOMMENDED COMPLEMENT OF PARTS ARE SHOWN ON THE REPLACEMENT PARTS LIST. MOST PARTS AND SUB-ASSEMBLIES ARE STOCKED AT THE FACTORY FOR IMMEDIATE DELIVERY. PLEASE FOLLOW THESE STEPS WHEN ORDERING REPLACEMENT PARTS:

- 1.) INCLUDE THE SERIAL NUMBER SHOWN ON THE NAMEPLATE ON THE MAIN CONTROLLER.
- 2.) DETERMINE THE DESIGNATION OF THE PART NEEDED (I.E. SCR-1, FU101) BY USE OF THE TROUBLE SHOOTING GUIDE AND THE SCHEMATIC DIAGRAMS.
- 3.) REFER TO THE ITEM PARTS LIST CONTAINED IN THE DOCUMENTATION SET TO ESTABLISH THE SPECIFIC CMC PART NUMBER (I.E. X18-00185).
- 4.) ORDER FROM THE FACTORY DIRECT:
  - CLEVELAND MOTION CONTROLS, INC.
  - SERVICE PARTS DEPARTMENT
  - 7550 HUB PARKWAY
  - CLEVELAND, OHIO 44125-5794
- 5.) SPECIFY HOW SHIPMENT IS TO BE MADE. IF NOT SPECIFIED, ORDERS UNDER 20 POUNDS WILL BE SHIPPED PARCEL POST OR UPS AND HEAVIER ORDERS SHIPPED BY TRUCK.
- IF THE EQUIPMENT IS IN WARRANTY, PARTS WILL FURNISHED AT NO CHARGE, EXCEPT FOR SHIPPING, IF THE DEFECTIVE COMPONENT IS RETURNED. IF A CHARGE IS MADE INITIALLY, CREDIT WILL BE ALLOWED LATER IF THE DEFECTIVE UNIT IS RETURNED AFTER THE REPAIR IS MADE.

### GROUNDING INSTALLATION NOTES

TABLE 250-95

COPPER

20

30

40

60

100

200

300

400

500

800

1000

1200

NOT EXCEEDING (AMPERES)

RACEWAY & EQUIPMENT

AMPACITY\* | WIRE SIZE

CONDUCTOR SIZES FOR GROUNDING

AWG/MCM

14

12

10

10

10

00

000

\* RATING OR SETTTING OF AUTOMATIC OVERCURRENT

DEVICE IN CIRCUIT AHEAD OF EQUIPMENT, CONDUIT, ETC.,

 $(MM)^2$ 

2.6 3.9

7.1

7.1

7.1

11.0

17.4

27.0

34.0

43.0

56.0

70.0

89.0

112.0

### <u>GROUNDING</u>

THE NATIONAL ELECTRIC CODE SETS THE STANDARD TO DEFINE THE INSTALLATION PRACTICES REQUIRED TO INSURE THE SAFTEY OF PERSONNEL AND EQUIPMENT. SYSTEMS AND CIRCUIT CONDUCTORS ARE GROUNDED TO LIMIT VOLTAGES DUE TO LIGHTING, AND LINE SURGES, OR UNINTENTIONAL CONTACT WITH HIGHER VOLTAGE LINES, AND TO STABILIZE THE VOLTAGE TO GROUND DURING NORMAL OPERATION. THE GROUNDING OF CONTROL EQUIPMENT SHOULD BE INTEGRATED BY THE EQUIPMENT USER INTO A COORDINATED GROUND SYSTEM.

### **GROUNDING REQUIREMENTS**

- 1.) THE FRAMES OF STATIONARY MOTORS AND ELECTRICAL EQUIPMENT SHALL BE GROUNDED UNDER ANY OF THE FOLLOWING CONDITIONS:
- A. WHERE ANY DEVICE OPERATES AT OVER 150 VOLTS TO GROUND. B. WHERE ANY ELECTRICAL DEVICE COMES INTO CONTACT WITH METAL. C. ALL HAZARDOUS LOCATIONS.
- D. WHERE ELECTRICAL WIRING IS PROTECTED BY METAL CONDUIT AND WIREWAYS.
- 3.) MCC, SWITCHGEAR, AND TRANSFORMER ENCLOSURES ARE SUBJECT TO THE CONDITIONS OF ITEM 1, OR WHEN PLACED WITHIN 8 FEET (2.44 M) VERTICALLY OR 5 FEET (1.2 M) HORIZONTALLY OF GROUND OR GROUNDED METAL OBJECTS AND SUBJECT TO CONTACT BY PERSONS.

2.) CONTROLLER ENCLOSURES SHALL BE GROUNDED REGARDLESS OF VOLTAGE.

- 4.) ISOLATION TRANSFORMERS USED EXCLUSIVELY TO POWER ADJUSTABLE SPEED DRIVES SHALL NOT HAVE THE PRIMARY OR SECONDARY WINDINGS GROUNDED.
- 5.) OPERATOR STATIONS AND DESKS ARE SUBJECT TO THE CONDITIONS OF ITEMS AND 3, AND ARE RECOMMENDED TO BE GROUNDED EVEN IF TERMINAL VOLTAGES ARE OPERATING AT LESS THEN 150 VOLTS.
- 6.) CONTROLLER MOUNTED DEVICES SUCH AS CONTROL TRANSFORMERS SHALL HAVE ITS SECONDARIES AND EXPOSED NONCURENT-CARRYING METAL CASES GROUNDED. NONCURRENT CARRYING METAL CASES HOUSING METERS, INSTRUMENTS, AND RELAYS, SHALL BE GROUNDED ACCORDING TO NEC CODE, SECTIONS 250.121-125.
- 7.) ALL LOW LEVEL AND REGULATOR CIRCUITS OF DC AND AC DRIVES SHALL REMAIN UNGROUNDED.
- 8.) ALL CONDUIT, WIREWAYS, AND JUNCTION BOXES MUST PROVIDE CONTINUOUS GROUND PATHS TO THE GROUNDED ENCLOSURES.
- 9.) THE NONELECTRIC METAL FRAMES AND TRACKS OF ELECTRICALLY OPERATED CRANES AND
- ELEVATOR CARS TO WHICH ELECTRIC CONDUCTORS ARE ATTACHED SHALL BE GROUNDED. METAL ENCLOSURES FOR SERVICE CONDUCTORS AND EQUIPMENT SHALL BE GROUNDED.

### METHODS OF GROUNDING

- 1.) FIXED EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH NEC CODE 250.91-99.
- 2.) THE STRUCTURAL METAL FRAME OF A BUILDING SHALL NOT BE USED AS THE REQUIRED EQUIPMENT GROUNDING CONDUCTOR FOR AC EQUIPMENT.
- 3.) WHERE POSSIBLE, THE ONLY CONNECTION FROM CABINET TO GROUND MUST BE FROM THE DESIGNATED EQUIPMENT GROUND REFERENCE POINT.
- 4.) THE GROUNDING ELECTRODE SYSTEM REQUIREMENT IS DESCRIBED IN THE NEC SECTION 250.81-86.
- 5.) THE GROUNDING OF ELECTRIC SYSTEMS, CIRCUIT CONDUCTORS, SURGE ARRESTERS AND CONDUCTIVE NONCURRENT-CARRYING MATERIALS AND EQUIPMENT SHALL BE INSTALLED AND ARRANGED IN A MANNER THAT WILL PREVENT AN OBJECTIONABLE FLOW OF CURRENT OVER THE GROUNDING CONDUCTORS OR GROUNDING PATHS.
- 6.) MINIMUM SIZE EQUIPMENT GROUNDING CONDUCTORS FOR GROUNDING RACEWAY AND EQUIPMENT ARE SHOWN IN TABLE 250-95.

### INSTALLATION NOTES

- 1.) THE GROUND CABLE SHOULD BE BRAZED OR CAD WELDED BY THE USER TO THE BUILDING GROUND ELECTRODE AND CONNECTED TO A BUILDING STEEL STRUCTURE THAT IS CLOSEST TO THE GROUNDING ELECTRODE.
- 2.) THE EQUIPMENT END OF THE GROUND CABLE SHOULD BE BOLTED OR BRAZED TO A GROUND TERMINATION POINT ON THE GROUNDING ELECTRODE.
- 3.) THE EQUIPMENT GROUNDING TERMINAL IS A COPPER GROUND BUS OR STUB BUS BONDED TO THE PANEL ENCLOSURE USING BRAZING OR BOLTING IN A MANNER THAT THE CONDUCTING PATH HAS A RESISTANCE OF ONE OHM OR LESS.
- 4.) THE GROUNDING CONDUCTORS MUST BE CAPABLE OF HANDLING ANTICIPATED GROUND FAULT CURRENTS.
- 5.) THERE SHOULD BE A JUMPER CABLE ACROSS THE GROUND BUS OR FLOOR SILL BETWEEN ANY SHIPPING SPLITS AND SIZED THE SAME AS THE SAFETY GROUND UNLESS OTHERWISE SPECIFIED.
- 6.) ALL METAL BUILDING STRUCTURES SUCH AS COLUMNS, FLOOR BEAMS, ETC., SHOULD BE GROUNDED BY AN INTERCONNECTING HEAVY GROUND CABLE IN ACCORDANCE WITH RECOMMENDED BUILDING PRACTICES AND LOCAL CODES.
- 7.) THESE PROTECTIVE MEASURES DESCRIBED ABOVE FOR POWER CONVERSION AND CONTROL CABINETS ARE ALSO NEEDED FOR MOTORS, TRANSFORMERS, AND REACTORS. EACH OF THESE SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING DIRECTLY TO CORRESPONDING GROUNDING SYSTEM. THE GROUNDING SYSTEM SHOULD HAVE ITS OWN GROUNDING CONDUCTOR GOING TO THE BUILDING GROUNDING ELECTRODE.

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	purpose without our written permis		
FA			TOLERANCES
EΑ			(EXCEPT AS NOTED)
DA			DECIMAL X.X ± .030
CA			X.XX ± .015 X.XXX ± .005
BA			ANGULAR
			± 0.5°

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WIRING DIAGRAM, DIGITAL TENSION INDICATOR, CLASSIC SERIES, ISOLATED OUTPUTS, POT TRIM OUTPUT CAD DWG NO. :D800-31245AA02.dwg SIZE DRAWING NUMBER

NOTES

APPROVED BY D D800-31245 AA 7550 HUB PARKWAY CLEVELAND, OHIO

 $^{\text{CALE}}_{\text{NONE}} |_{\text{MWI}-13654-9}^{\text{REF}}|_{02/30/05}^{\text{DATE}}|_{03/05}$  SHEET 2 OF 3

