IB-11B017

MOTION CONTROL SYSTEMS, MSC SERIES JANUARY 1995

AFC-100

ANALOG VOLTAGE/ FIBER OPTIC CONVERTER

INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, Inc.

Revision - A

Approved By:

ER-6023

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Notes:

1) Section IX, Page 21, dated July 1995, supercedes Section IX, Page 21, dated January 1995.

2) Section IX, Page 21, dated September 2000, supercedes Section IX, Page 21, dated July 1995.

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AFC-100

Analog Voltage to Fiber-Optic Converter

I. INTRODUCTION

The AFC-100 is part of a product line of converters specifically designed to provide a way of bringing some types of system parameters into the master angle bus format.

The system parameter is typically a shaft angle position. The transducer for the shaft angle could be a resolver or an encoder. The RFC-100 and EFC-100 converters have a resolver interface and encoder interface respectively. The AFC-100 is designed to convert analog voltage into the master angle format. The master angle bus format is then transmitted to the motion controller by a fiber optic cable. This format is used on all MSC controllers manufactured by Industrial Indexing Systems.

II. OPERATION

The analog voltage to fiber optic converter will take a difference in voltage from two terminals and convert it into a position value to be transmitted on the master angle bus of an MSC-250 or MSC-850/32 via a fiber optic cable. The range of the differential voltage is between +10 volts and -10 volts and within a frequency range between 0 (DC) to 100 Hz.

On power up no transmission will occur for a minimum of 100 milliseconds. When the converter starts converting, transmission of the master angle will start. The master angle is then used by the MSC by locking an axis to the angle bus in various configurations. Action will not take place until the axis controller has been locked. Lock methods are described in the Development System Manual (Refer to IB-11C001).

III. CONTROL & INDICATORS

A. Mode Select Switch

The mode select switch is a 16 position rotary switch (SWI) which is used to configure resolution of the analog voltage as it relates to master angle position and allows a selection of test modes to use in the system.

The user may select one of four different resolutions for the ±10 volts range of the input voltage. See **Table 1.1** for the selections available.

Configuration Switch Settings	Resolver Type			
	Resolution (Bit)	Counts per Voltage Range	Voltage Resolution Millivolts/Count	Description
0	12	4096	4.882	12 Bit Mode
1	14	16384	1.221	14 Bit Mode
2	16	65536	0.305	16 Bit Mode
3*	12	4096	N/A	Test Mode 100 CW
4*	12	4096	N/A	Test Mode 1000 CW
5*	12	4096	N/A	Test Mode 100 CCW
6*	12	4096	N/A	Test Mode 1000 CCW
7	12	4096		
8	12	4096		
9	12	4096		
A	12	4096		
B	12	4096		
C	12	4096		
D	12	4096		
E	12	4096		
F	10	1024	19.53	

Table 1.1 Mode Configuration Switch Selections

* Test Modes 3 - 6 simulate a mechanical shaft turning at the noted speed and direction to simulate Master Position Angle or for Trouble Shooting the system.

B. Count Indicators

Three LED indicators provide the status of most significant bit and the two least significant bits of the analog conversion into the angle bus data sent to the motion controller.

The most significant bit (MSB) is in actuality the sign indication in the data word. The least significant bit (LSB) indicators show the smallest bit resolution status of the data word.

C. Fault Indicator

The fault indicator will show status of the controller. When the fault indicator is on steady, the processor is indicating difficulty in the analog conversion process.

To show that the controller is operational, the fault indicator will flash three (3) times and then turn off. The flashing sequence will show that the processor has started properly and the fault indicator is operational.

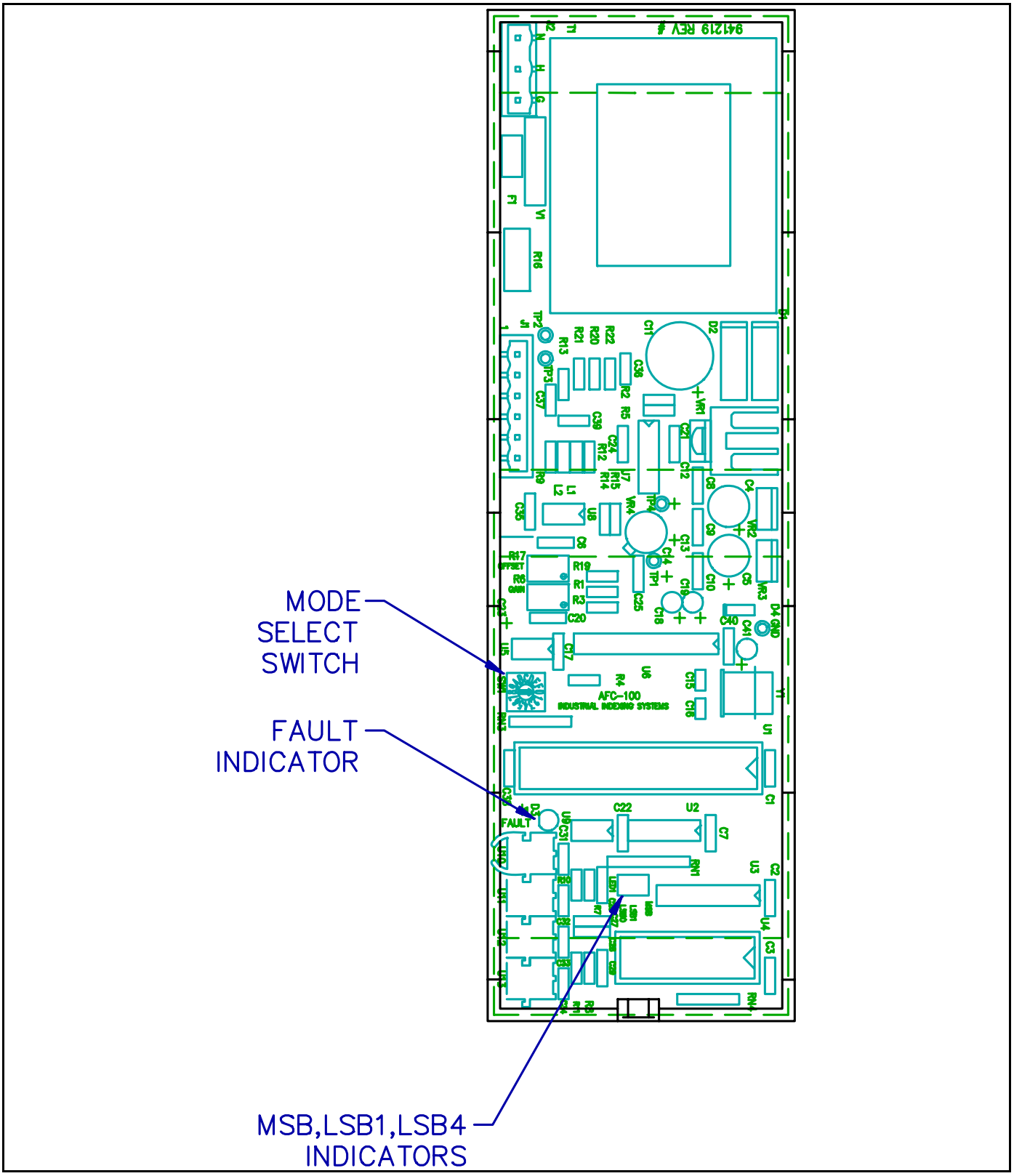


Figure 1 - Controls & Indicators

IV. INSTALLATION

A. Physical Mounting

1. Location

The AFC-100 may be mounted up to 100 feet from the Motion Controller. Preferably as close to the analog voltage source as possible but not exceeding 10 feet of analog cable. This arrangement will reduce noise pick up and keep positional variations to a minimum.

2. Position

The orientation of AFC-100 is not critical but keep in mind the fiber optic cable does have a minimum bend radius of approximately 1.5 inches. The AC power wiring should be dressed away from the analog input wiring.

3. Clearance

Keep at least 5 inches of clearance above the AFC-100 for proper ventilation for the transformer and voltage regulators.

4. Panel Mounting

Use DIN RAIL #NS35/7.5 to mount AFC-100. Size of AFC-100 is shown in **Figure 2**.

B. Cable Interface Connections

Figure 3 shows the various cable configurations to reference when installing the AFC-100 controller.

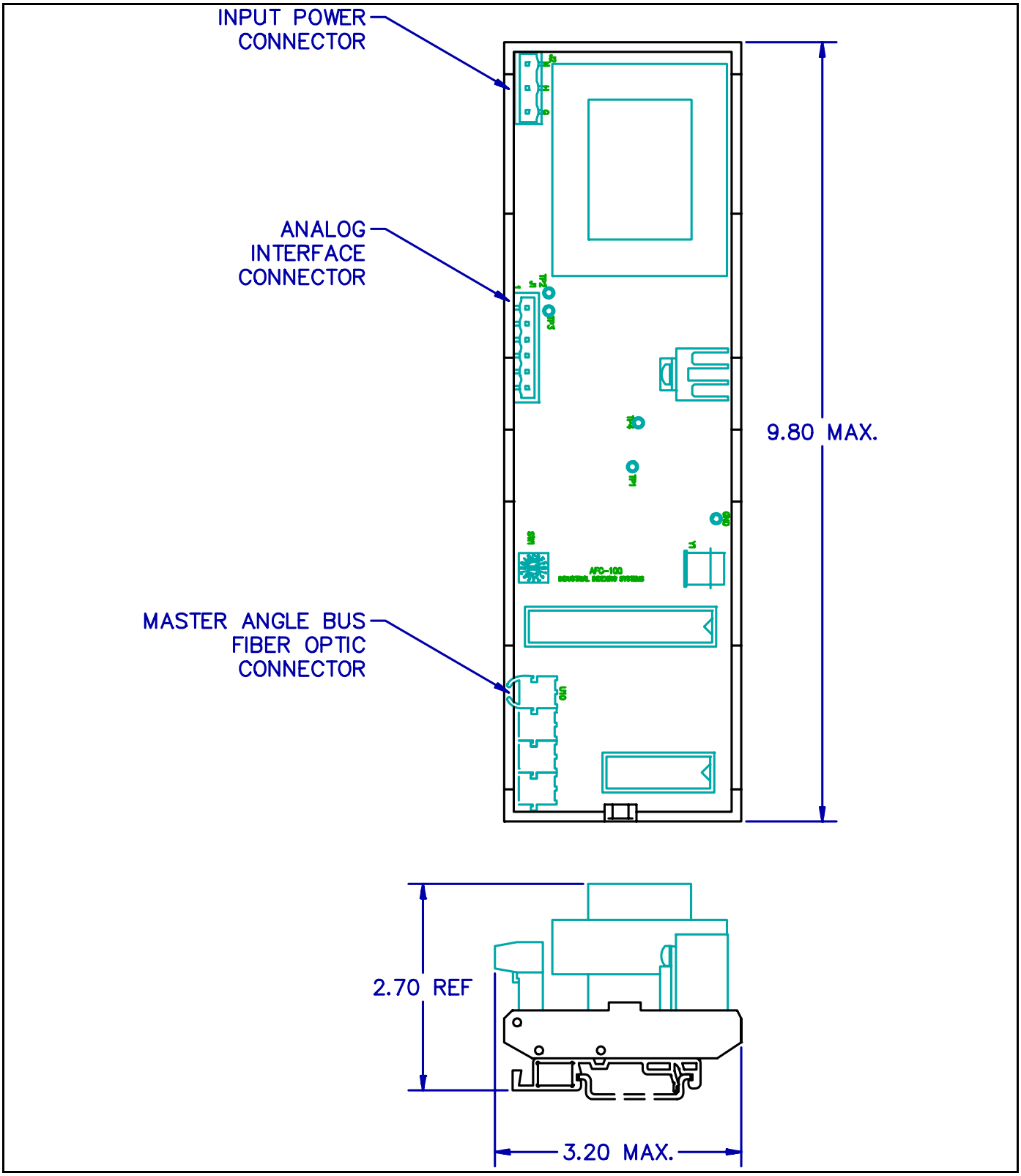


Figure 2 - AFC-100 Mounting

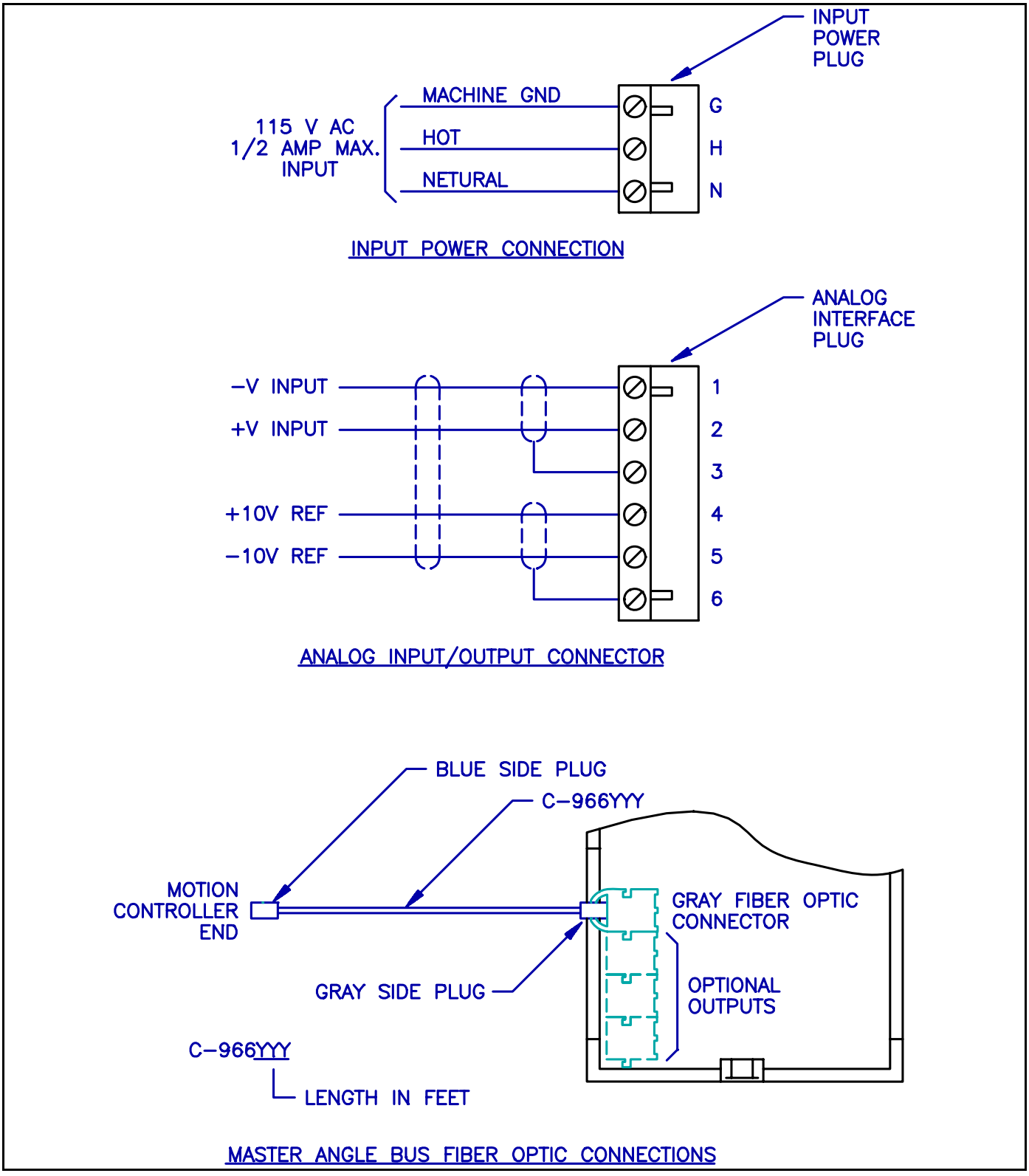


Figure 3 - Power & Interface Connections

V. ANALOG INTERFACE

The J1 connector in **Figure 4** provides a screw terminal connection for the analog voltage input. This input is a differential voltage interface. The voltage difference between +V and -V input terminals will generate a position or angle that is directly proportional to the voltage applied. Single ended operation can be accommodated by grounding either input and varying voltage on the opposite terminal.

When using long cables the differential input interface will provide greater noise immunity when common mode voltages are present. The preferred mounting configuration would be to have the converter mounted as close to the analog source as possible. The fiber optic cable can be up to 100 feet long (30 meters).

To minimize the affect of analog voltage variations picked up as noise, please use instrument quality twisted pair shielded cable. Shield shall cover the full length of the cable and terminated only at the AFC-100 terminal J1-3.

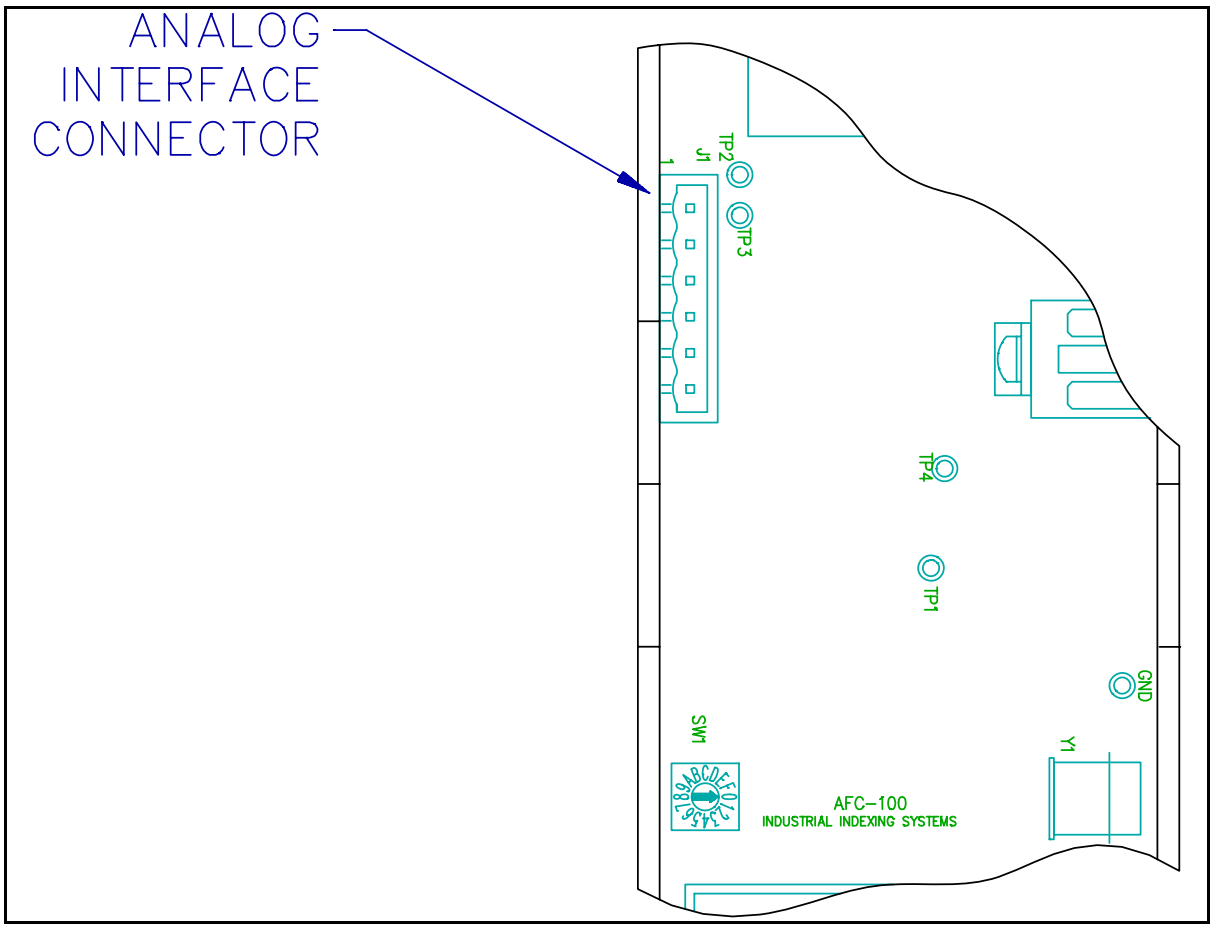


Figure 4 - Analog Interface Connector

VI. SPECIFICATIONS

A. Analog Input

Differential Input Voltage:	+10 volt -10 volt range
Overvoltage Protection:	max ±40 volts
Maximum Frequency:	100 Hz

B. Voltage Reference

+V Output:	+10 volt buffered 10 ma Max.
-V Output:	-10 volt buffered 10 ma Max.

C. Input Filtering

Hi-frequency Oscillation:	Low pass set @ 3.81 KHz
Impedance Mismatches:	Inductors in each input line
DC Input Bias Currents:	60 KΩ input impedance

D. Power Requirements

Input Voltage:	115V AC ± 10%
Frequency:	50-60 Hz
Input Current:	1.0 Amp Maximum

E. Size

Length:	9.80 in. Max.
Width:	3.20 in. Max.
Height:	2.70 in. Ref.

F. Mounting

DIN Rail Snap-in Mounting: #NS35/7.5

G. Environment

Operating Temperature:	0 to 60°C
Ventilation:	Unit must have 5 inches of free air flow above
Humidity:	30% to 90% relative (non-condensing)

VII. UNIT SET-UP

To set-up the adjustments for zero offset and GAIN load the following program (**Figure 5**) into an MSC-250 or MSC-850/32 with an axis card in slot #1 and on MCF-850 in slot #3.

```
                msc_type 850
                declare on
MCF850          equ         3
mcf_setup       integer
FoA_To_AngleA   equ         8

map             integer
MasterA_IsS2    equ         30
MasterA_IsS3    equ         29
SlaveA_IsS1 equ         23

ACE850          equ         1

angle           integer
timer           equ         72

Start
                let             mcf_setup=0
                set_bit         FoA_To_AngleA,mcf_setup
                set_mcf         MCF850,mcf_setup

                let             map=000
                set_bit         MasterA_IsS3,map
                set_bit         SlaveA_IsS1,map
                set_map         map
loop
                get_angle       ACE850,angle
                set_tmr         timer,50

loop1           no_op
                if_tmr_on       timer,loop1

                goto loop
```

Figure 5 - Set-up Program

Using the READ DATA CONTINUOUS function from the toolkit, monitor variable "angle".

With the AFC-100 connected to the MSC turn power on. Jumper TP2, TP3 and TP4 together. Adjust 'OFFSET' (R17) until a reading of 000 angle is obtained on the toolkit. Disconnect jumpers from TPs and reconnect TP1, TP2 and TP3 together. Adjust 'OFFSET' (R17) until angle reads 000.

Disconnect TPs and connect TP2 to TP4 connect TP1 to TP3. Adjust 'GAIN' (R6) until 'angle' reads off.

Repeat the above procedure to recheck the offset zero.

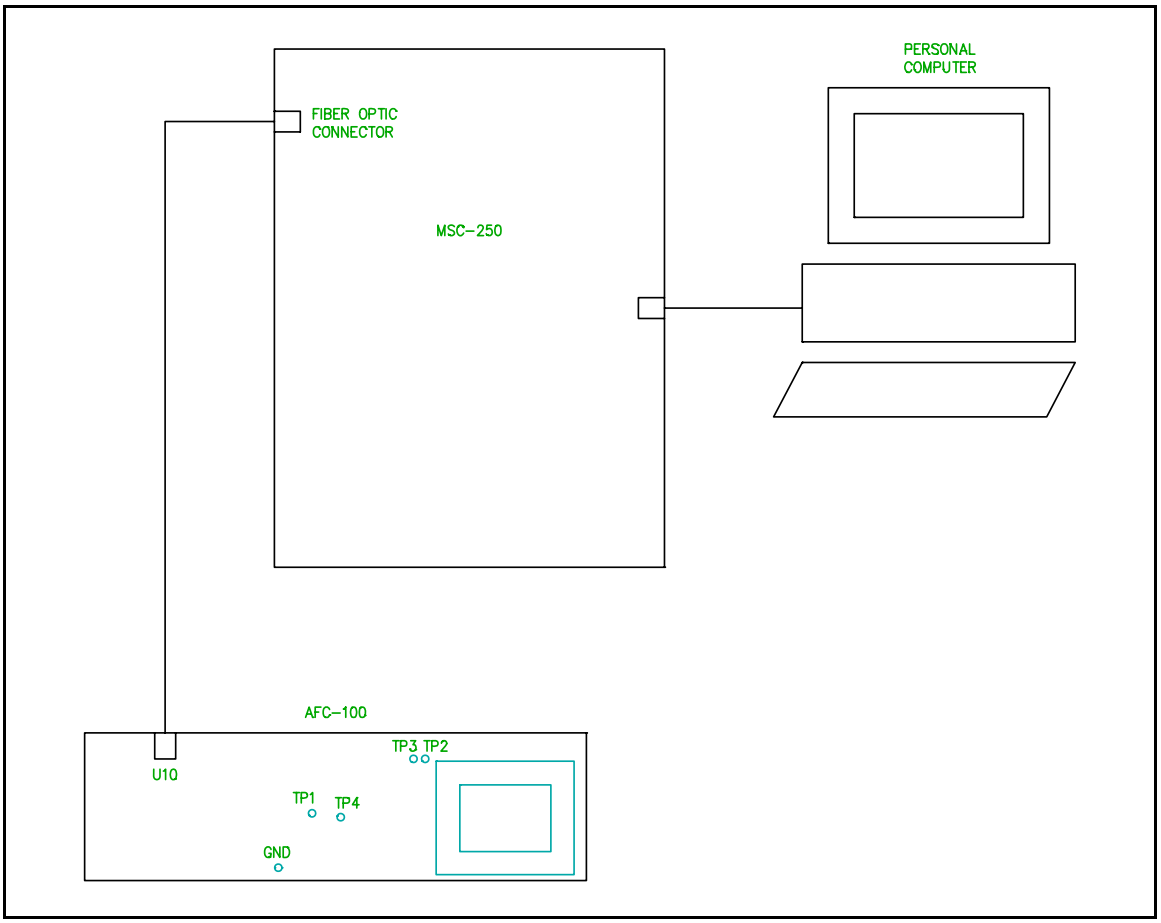


Figure 6 - MSC-250 Connections

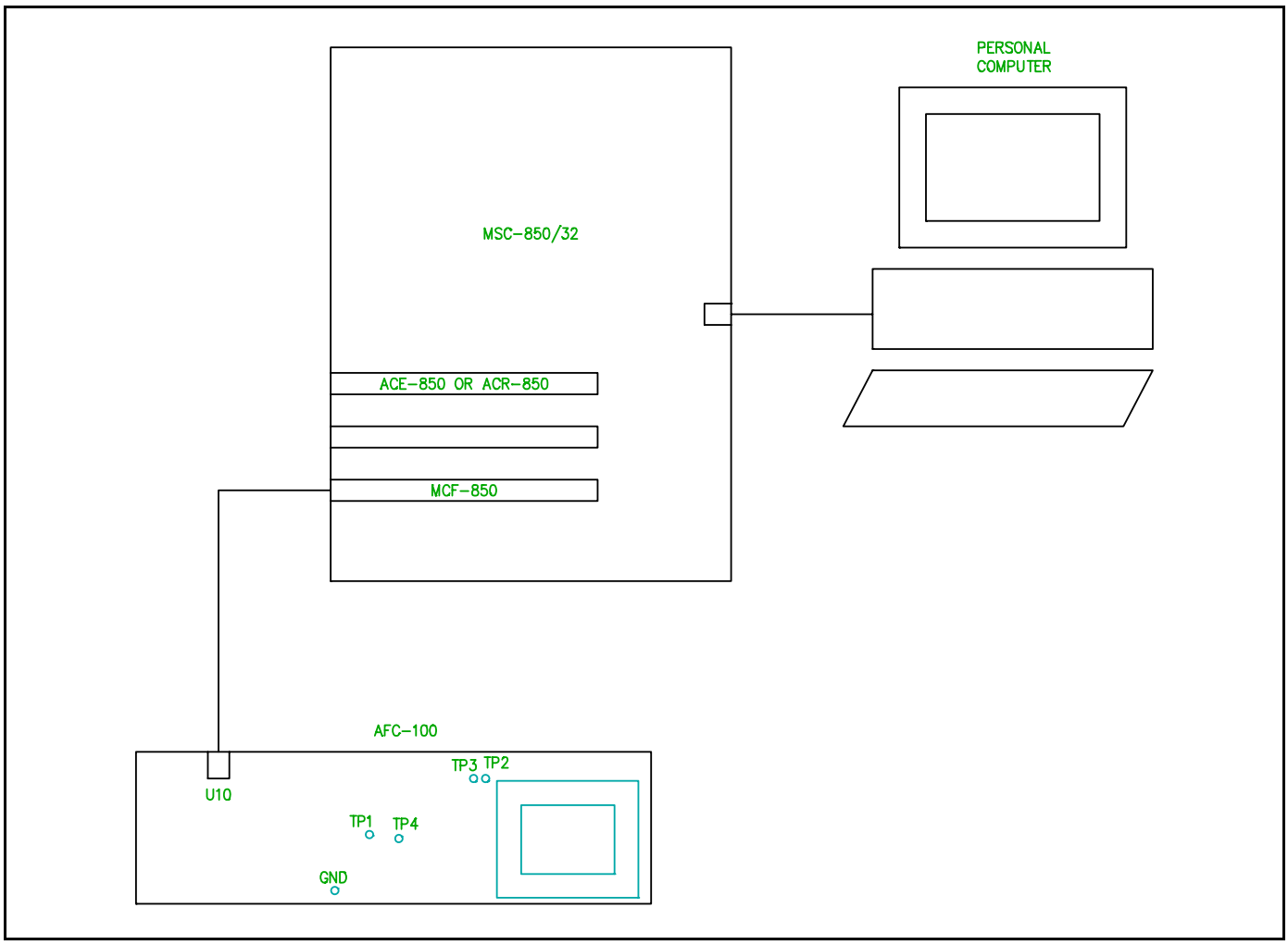


Figure 7 - MSC-850/32 Connections

VIII. FUNCTIONAL TEST

1. Set a Multimeter to a scale to read 115V AC.

2. Turn on the system power.

3. Verify 115V AC $\pm$ 10% from P2-N to P2-H.

4. If the voltage is within specification, then continue with the next step. If the voltage is out of specification, then correct the voltage supply before proceeding.

5. Turn the system power ON. The 'FAULT LED' should flash three (3) times and then turn off. If it stays on, the fault signifies that there are problems with the analog conversion process. The AFC-100 should be replaced. If the 'FAULT LED' does not flash, then the processor has not started up. Replace the AFC-100.

6. With power ON, disconnect the Fiber Optic Cable from the Fiber Optic Transmitter on the AFC-100.

7. Verify a red glow emanating from the Fiber Optic Transmitter.

8. If there is no glow, then replace the AFC-100. If a red glow is present, go on to the next step.

9. Reconnect the Fiber Optic Cable to the Fiber Optic Transmitter on the AFC-100.

10. Disconnect the opposite end of the Fiber Optic Cable from the motion controller.

11. Verify a red glow emanating from the end of the Fiber Optic Cable.

12. If there is no glow, then replace the Fiber Optic Cable. If a red glow is present, go to the next step.

13. Slowly vary voltage applied to V_{INPUT} connections. The LSB0 and LSB1 LEDs on the AFC-100 should toggle on and off as the voltage on the input varies. Note in 12 bit mode the LSB0 will toggle every 5 millivolt change: The MSB LED should be on when the applied voltage is negative at the +V terminal (2) with respect to -V terminal (1).

    If the LSB0, LSB1 and MSB LEDs do not toggle, replace the AFC-100.

14. If the LED tests are correct, then any other problems that occur may be from the Fiber Optic Receiver end of the Motion Controller, or the Motion Control software.

IX. CABLE DATA

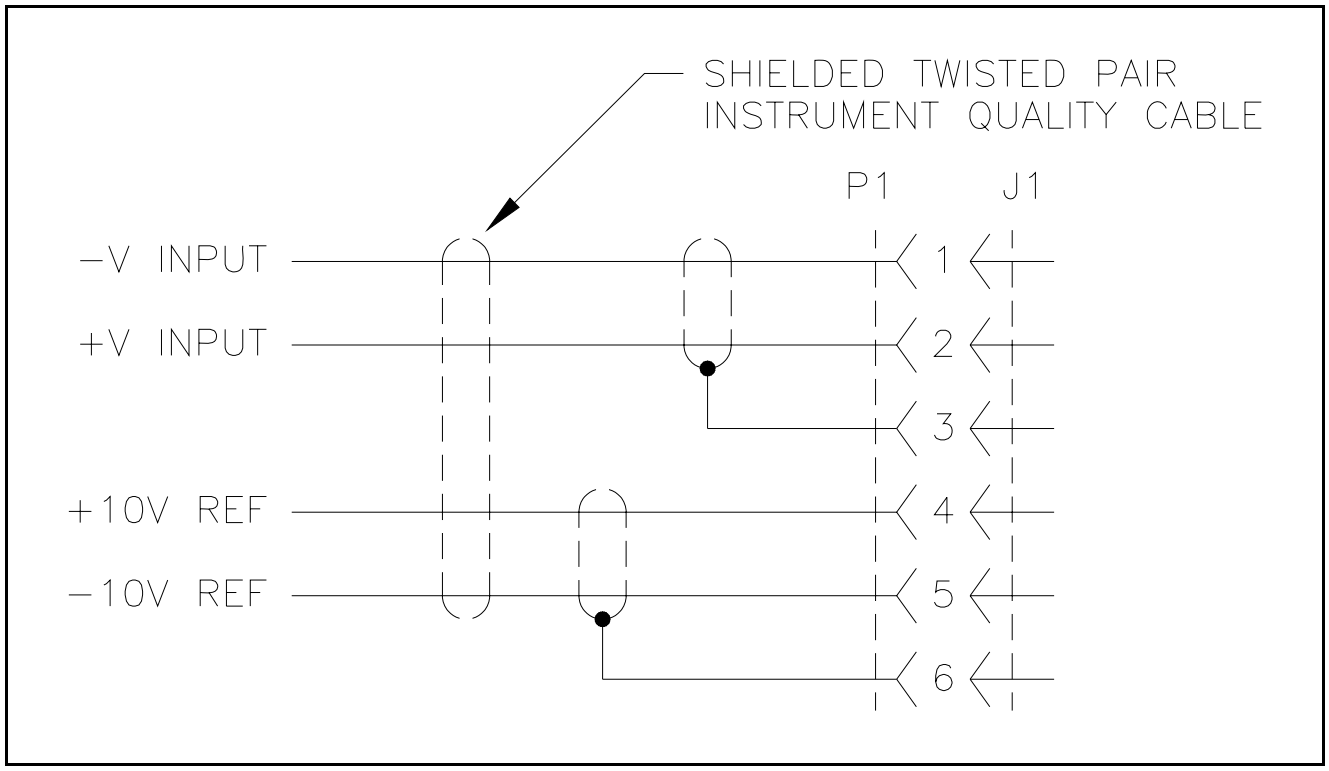


Figure 8 - Analog Input/Output Connections

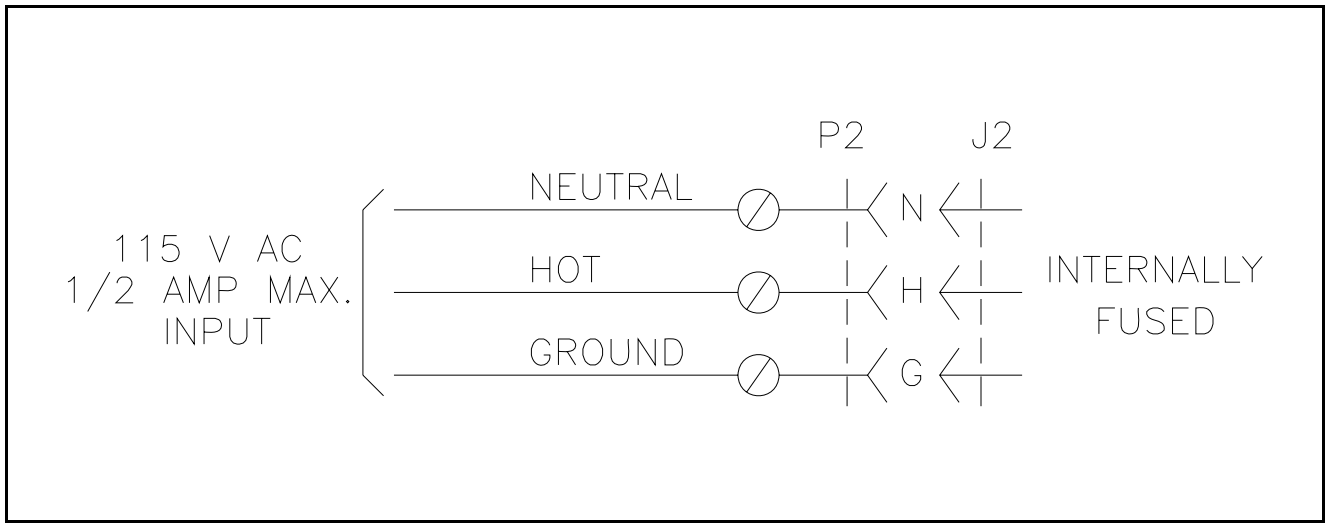
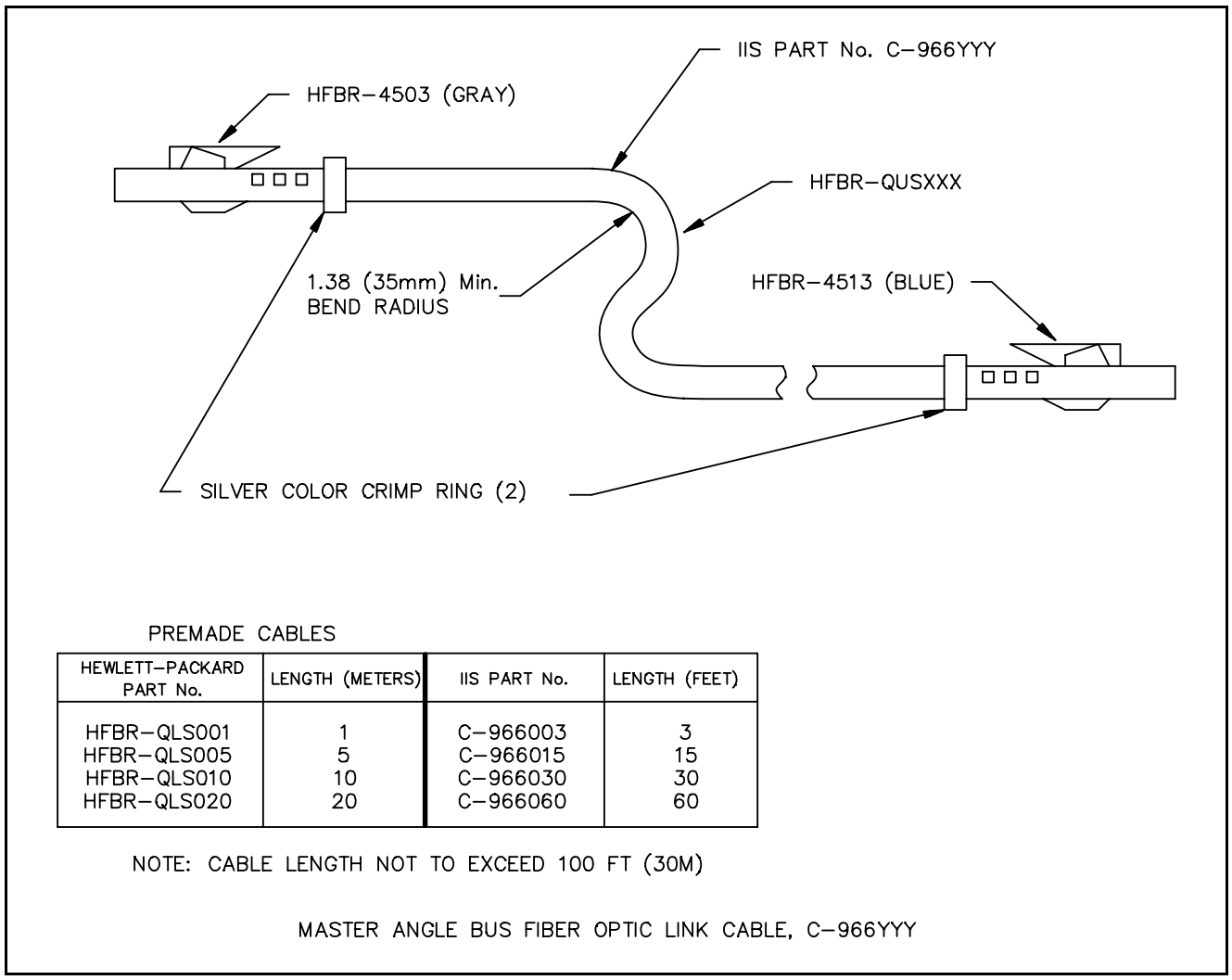


Figure 9 - Input Power Connection



PREMADE CABLES

HEWLETT–PACKARD PART No.	LENGTH (METERS)	IIS PART No.	LENGTH (FEET)
HFBR–QLS001	1	C–966003	3
HFBR–QLS005	5	C–966015	15
HFBR–QLS010	10	C–966030	30
HFBR–QLS020	20	C–966060	60

NOTE: CABLE LENGTH NOT TO EXCEED 100 FT (30M)

MASTER ANGLE BUS FIBER OPTIC LINK CABLE, C–966YYY

Figure 10 - Master Angle Bus Fiber Optic Link Cable, C-966YYY

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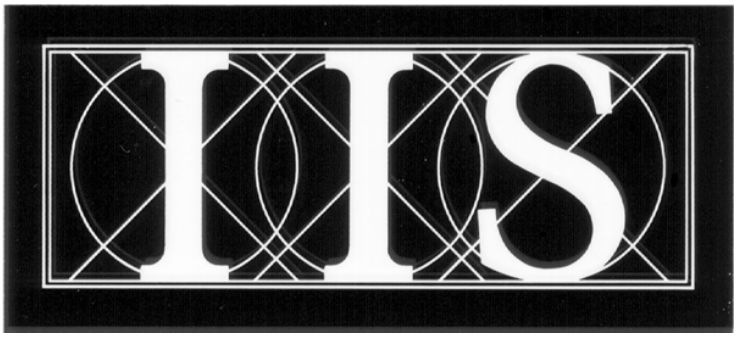

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