

FEMCO, A MARK IV INDUSTRIES COMPANY
REFERENCE MANUAL 3-FREQUENCY GROUND CHECK MONITORS GM8900

FREQUENCY	4000HZ	3125HZ	2250HZ
MONITOR	GM8900/4000	GM8900/3125	GM8900/2250
3-PHASE FILTER	FI2559	FI2569	FI2567
P.W. FILTER, CHOKE	FI2558, FI2560		

This manual provides performance, applications, installation and operation for GM8900 Ground Monitors for systems that do or do not use a pilot wire in the power cable.

SECTION 1 - Performance Characteristics

Describes the general performance and applications of the product. Mechanical, electrical and environmental specification are included.

SECTION 2 - Installation

Covers site selection, wiring, adjustments, connections and outline and mounting dimensions.

If more detailed information is required, a complete maintenance manual can be obtained by contacting your sales representative or Headquarter Sales.

Femco, A Mark IV Industries Company
P.O. Box 33, 2000 Bethel Drive
High Point, N.C. 27261-0033
Telephone (919) 887-2611
Fax 919-841-7267

Femco Ground Monitor should be returned to the manufacturer or authorized representative for service. Substitution of components not approved by M.S.H.A. will void M.S.H.A. Acceptance number.

Circuitry described in this manual is covered by Femco Patent Nos. 3,728,582 and 3,855,501.

ARC TRAP - Femco Registered Trademark
GROUND SENTINEL - Femco Registered Trademark

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MSHA B.T.S. Acceptance No. 042390FE

INTRODUCTION

The Femco Ground Sentinel along with the associated filters is designed to monitor the integrity of the ground circuit of power distribution circuits in coal mines. Either the three phase wires or a pilot wire can be used as a return signal path for the Ground Sentinel. If the ground check circuit has fifteen ohms or less loop resistance, the internal relay will be energized and the circuit breaker that feeds power to the cable can be energized. A disruption of the ground check circuit that lasts longer than one fourth of a second will de-energize the relay and trip the circuit breaker. The time delay prevents false trips. Three LED's indicate the condition of the ground check circuit.

The three frequency system is intended for applications on circuits where the ground circuit can't be isolated by ARC TRAPS or elimination of two ARC TRAPS is desired.

SPECIFICATIONS GROUND SENTINEL

Mechanical

Size LWH (Fits on one half GM1000 Foot Print)	7.46" x 2/32" x 5.62" (189.5 x 58.9 x 142.7mm)
Construction	Stainless Steel
Weight	3 lb. 8 oz.
Serviceability	One plug in board contains all electronics including the relay.

Power

Supply Voltage	117V \pm 15% 60 Hz (105 - 135)
Supply Voltage Dip for one minute no trip w/good loop	Down to 84V
Supply Current	60 ma with good ground loop 30 ma with 75 ohm ground loop
Supply Transient Rejection	1200V - 117V terminals 2400V - 117V to GW 2400V - 117V to case
Case Ground	Terminal provided
Circuit Isolation	2500V RMS from case

Transmitter

Frequency 4000, 3125 or 2250 HZ
(PW System is 4000 Hz only) (NOM)

Signal to loop 0.3A RMS \pm 10%

Output Impedance 5 ohms

Withstand indefinite short on output terminals

Transient Rejection. 2400V

Receiver

Loop Resistance for Trip (over voltage and temperature range) 15 ohms \pm 2 ohms

Trip Time Delay (after loop opened) 250 msec (max)

Instantaneous Trip Opens relay coil circuit

Loop Resistance for Pickup 13 ohms \pm 2 ohms

Output Short Circuit Trip 0 - 1 ohm

Noise Rejection Accomplished by filters

Transient Rejection (same as transmitter)

Relay Contact Rating (UL)
Potter & Brumfield Ind or Res Load
T90 N5D12 24V or equivalent 2-20A @12-240VAC N.O.
2-10A @12-240VAC N.C.

Loop Current Indication YEL LED brightness proportional to loop resistance

Trip Indication RD LED - on when relay tripped

Trip Flag Indication RD LED - on after relay tripped until reset

3-Position Test Switch

1. Normal position (Maintained)
2. Test position (Maintained) - Trip due to 75 ohms inserted.
3. Unit check (MOMENTARY) Trip due to shorted output detector.

SECTION 2

For Wireless Installation - Use GM8900/4000 HZ, /3125 HZ (ORANGE), or/2250 HZ (BLUE); FI2559 (4000 HZ), FI2569 (3125 HZ) (ORANGE), or FI2567 (2250 HZ) (BLUE); GM1004.

For Pilot Wire Installation - Use GM8900/4000 HZ.; FI2558, FI2560, GM1004.

- A. GM8900* Unit Installation (Refer to Page 9)*(or Page 12 for Pilot Wire.
1. Prepare a place to mount the GM8900's either inside the power center or other enclosure.
 2. Connect terminal 10 of the GM8900 to the power center frame ground.
 3. Connect terminals 8 and 9 of the GM8900 to the 117 VAC control voltage source.
 4. Connect the instantaneous trip terminals 1 and 4 on the GM8900 to the interlock pins on the power center receptacle that break connection first when the plug is removed. The interlock pins on the plug must be jumpered together and must not be connected to any other pin or to the plug shell.
 5. Mount the approved filter* to provide convenient wiring to the associated power center receptacle.
 6. Connect terminal 2 on the GM8900 to the GREEN wire of the filter. Connect the three BLACK wires of the filter to the phase wires on the load side of the circuit breaker. Exact phase identification is not necessary. If Pilot Wire installation, connect GM8900/4000 terminal 2 to one black wire and the other to the pilot wire pin.
 7. Mount the ARC TRAP to provide convenient wiring to the power receptacles.
 8. Connect terminal 3 on the GM8900 to terminal T1 of the ARC TRAP.
 9. Connect trap terminal T1 to the power center's receptacle isolated ground pin. Connect the other terminal of the ARC TRAP to the power center AC ground.
 - a. Insure that the power receptacle's ground pin is isolated and not connected to the receptacle shell, for it will short circuit the ARC TRAP.

*CAUTION: THE GM8900 AND FILTER FREQUENCY FOR A EACH CABLE MUST MATCH OR THE SYSTEM WILL NOT WORK. COLOR CODE IS: 4000HZ NONE; 3125HZ ORANGE; AND 2250HZ BLUE.

- b. Insure that the isolated ground pin on the electrical cable plug is not connected to the plug shell, for it will also short circuit the ARC TRAP.
 - c. Insure that the wire size used in Step 9 is equal to or greater than 1/2 the phase wire size.
 - d. You must ground the shell of plug to the frame of the power center with separate strap equal to or greater than 1/2 size of phase wire.
- 10. The GM8900 has both normally open (NO) and normally closed (NC) contacts connected to the terminal strip. Circuit breakers that require an open circuit to trip (a closed contact to seal in when the ground wire is good) should be wired to terminals 6 and 7. Circuit breakers that require a closed circuit to trip should be wired to terminals 5 and 7.
 - 11. Mount the GM8900* in the prepared space. Be sure that the chassis is securely grounded.
 - 12. Put the TEST switch in the "normal" position.

B. Machine Mounted Filter Installation*

- 1. Select a mounting place for the filter* inside a permissible electrical box on the machine.
- 2. Connect the GREEN wire of the filter, or if a PW installation, connect one lead of the choke to the machine frame ground under a different bolt than the ground wire.
- 3. Connect the three BLACK wires of the filter to the three phase wires. This must be wired to the POWER INPUT side of the machine circuit breaker. Exact phase identification is not necessary in connecting the filter. If a PW installation, connect the other lead of the choke to the pilot wire.

C. Installation Testing

- 1. Apply power to the power center. If the GM8900 has been installed properly, both red indicators should be OFF and yellow tuning indicator should be ON. All controls have been factory set and do not require field adjustment.
- 2. If neither red indicator is ON, remove power to the load by opening the power center load circuit breaker and disconnect the ground wire. If both red indicators come on, the installation is operating properly. The yellow tuning indicator should be OFF.

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3. If both red indicators do not come on, put the TEST switch in the "TEST" position, the yellow tuning indicator should go OFF and the red indicators should come ON. Then hold the TEST switch in the "UNIT CHECK" position. The red trip indicator should go OFF momentarily and come back ON, the yellow tuning indicator will come on momentarily and then go back off. The red latching trip indicator will remain on. Return the TEST switch to the "NORMAL" position. Pushing the "LATCH RESET" button should cause the red latching trip indicator to go off. Operation as above indicates that the GM8900 is operating properly and any problems are a result of secondary ground paths, connector ground pins not isolated from the shell, or improper field wiring.
4. If the above procedure does not result in proper operation, see Adjustment Procedure in this manual or refer to the maintenance manual for a detailed troubleshooting guide.

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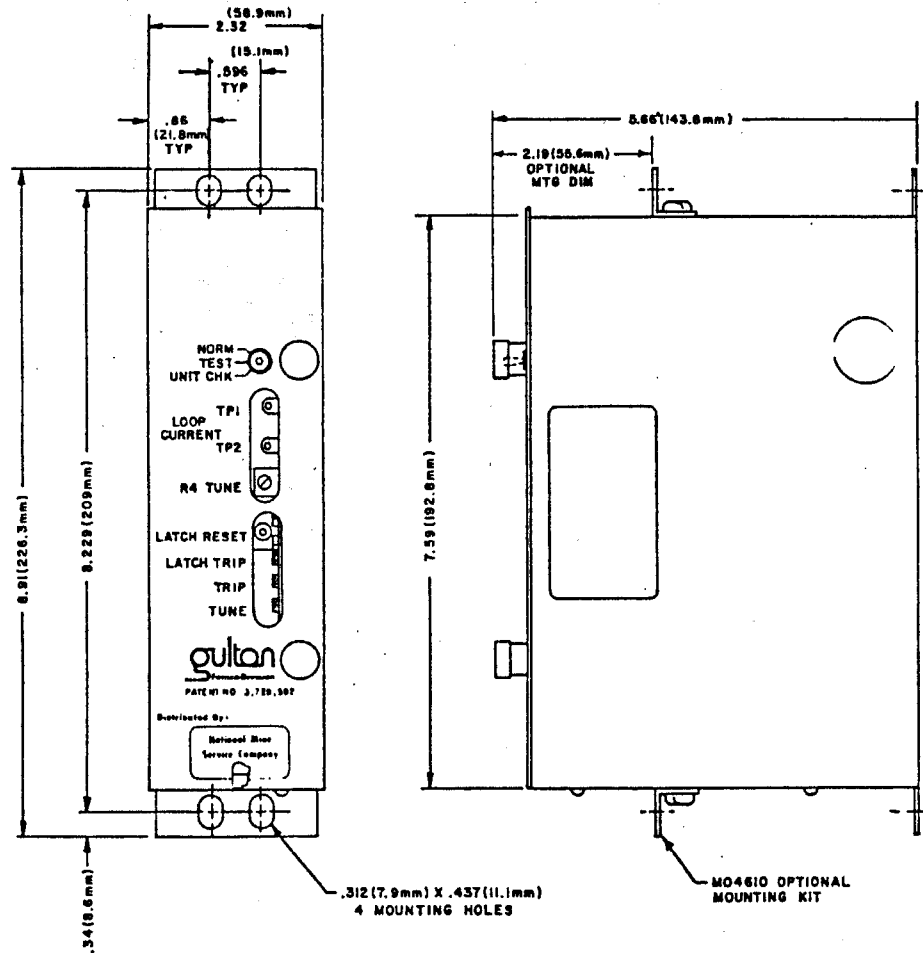
GM8900 ADJUSTMENT PROCEDURE

Adjustment of the GM8900 consists of adjusting the frequency of the transmitter oscillator to the resonant frequency of the filters and stray cable impedance. The reactive components of the circuit impedance are tuned out and the GM8900 monitors circuit resistance.

This is accomplished by placing an AC meter in TP1 and TP2 and adjusting R4 for a peak on the meter. This should occur at about 1.2V RMS with a short cable and decrease as the length of the cable monitored increases.

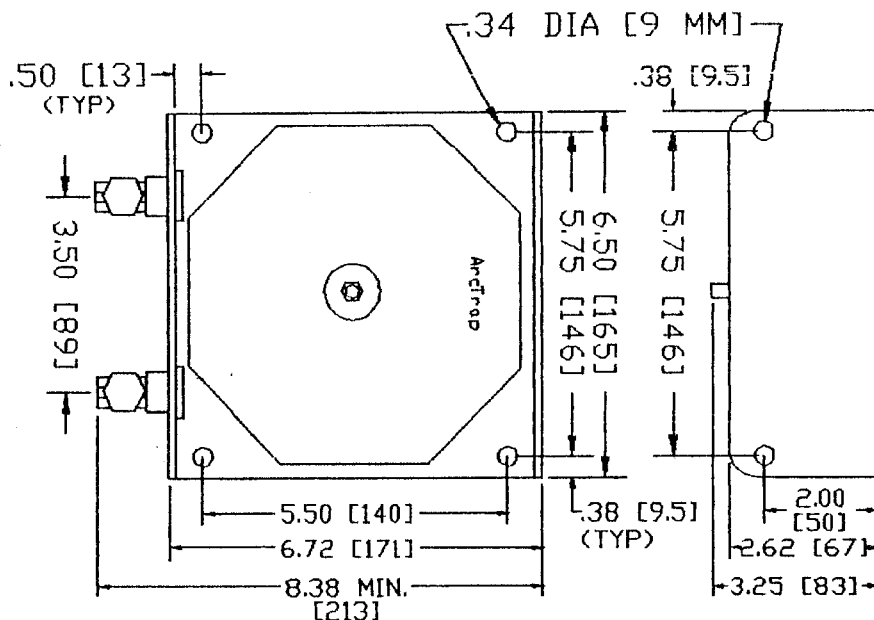
The trip may be checked by adding resistance into the circuit. With no cable (just two filters) the trip resistance should be 15 ohms.

GM8900 OUTLINE



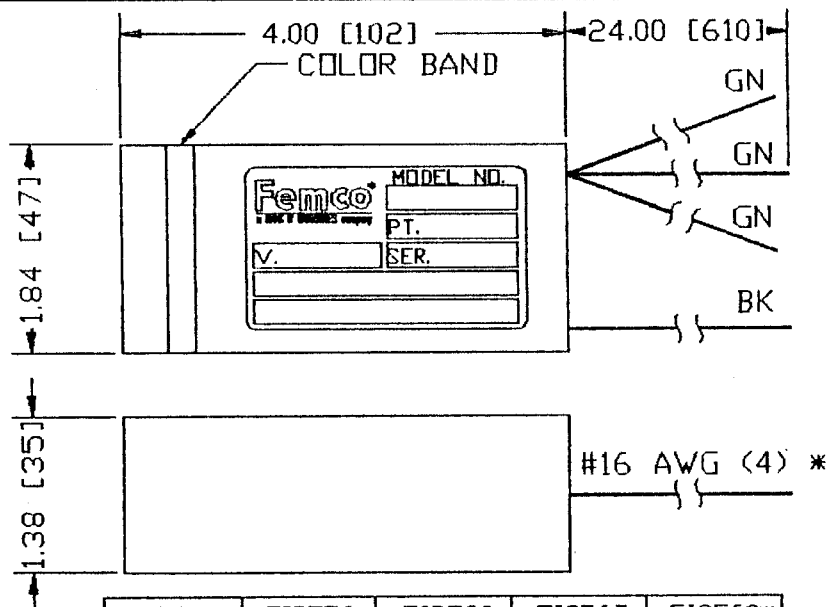
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OUTLINE - 1000 VAC 3Ø FILTER & PW FILTER



OUTLINE - GROUND WIRE TRAP (GM1004)

FOR USE IN GROUND WIRES OF CABLES
WITH 250 MCM OR SMALLER POWER CONDUCTORS

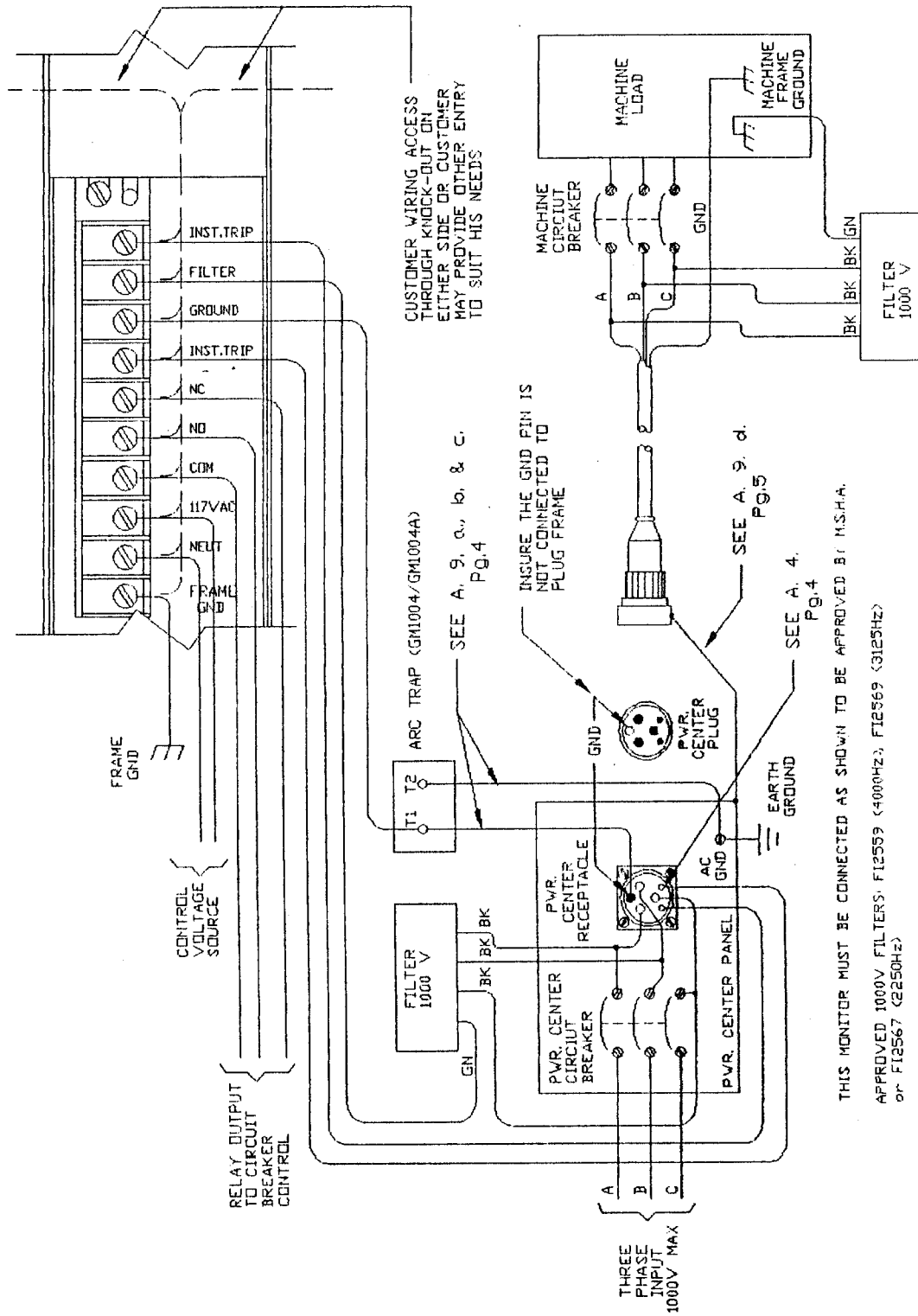


PART NO.	FI2559	FI2569	FI2567	FI2560*
FREQUENCY	4000 Hz	3125 Hz	2250 Hz	4000 Hz
COLOR BAND	NONE	ORANGE	BLUE	NONE

* PW FILTER HAS 2 BK LEADS ONLY, USED W/FI2558

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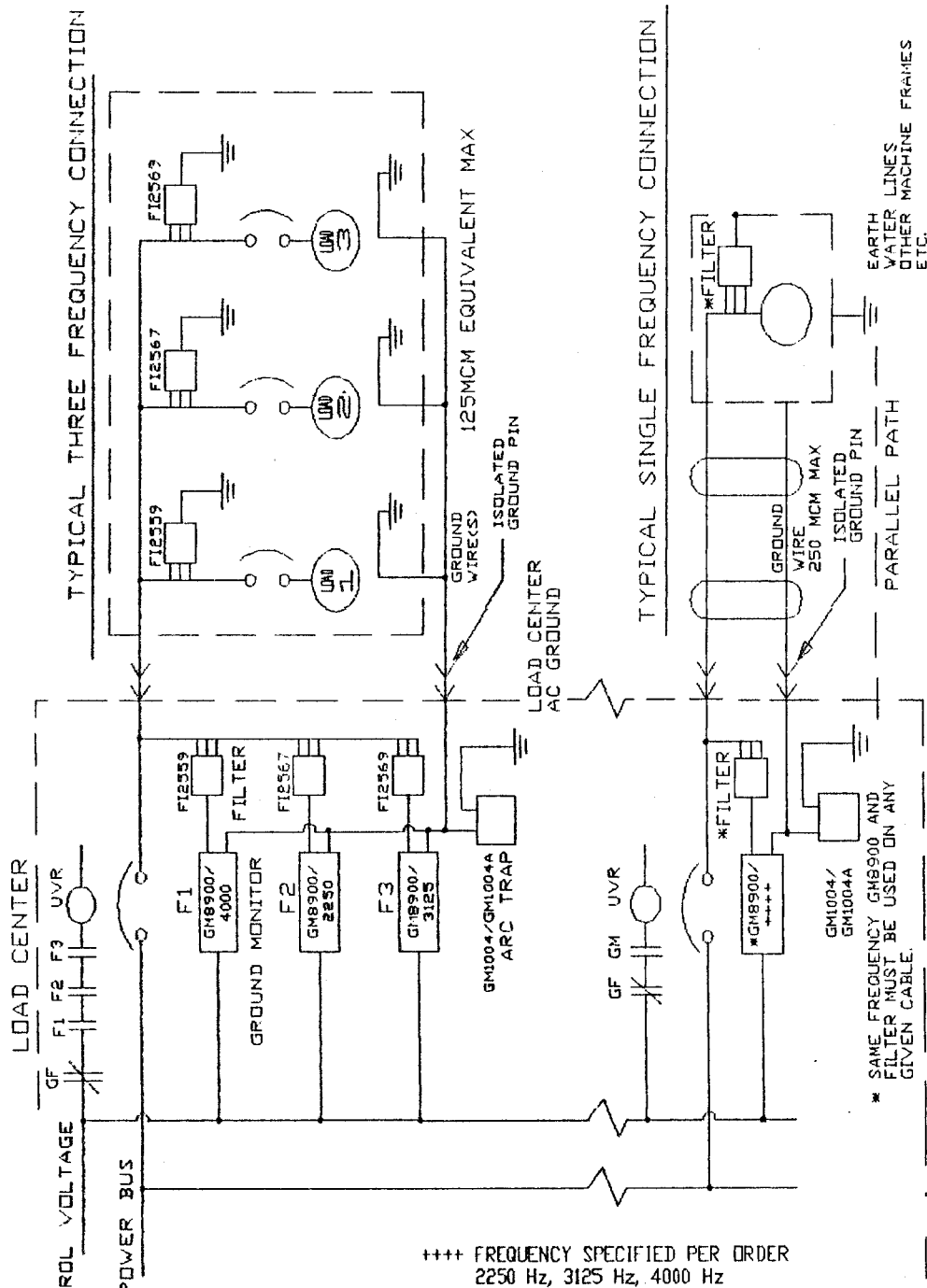
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INSTALLATION GROUND MONITOR GM8900/++++
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THIS MONITOR MUST BE CONNECTED AS SHOWN TO BE APPROVED BY M.S.H.A.
APPROVED 1000V FILTERS: F12559 (<400Hz), F12569 (<3125Hz)
or F12567 (<250Hz)

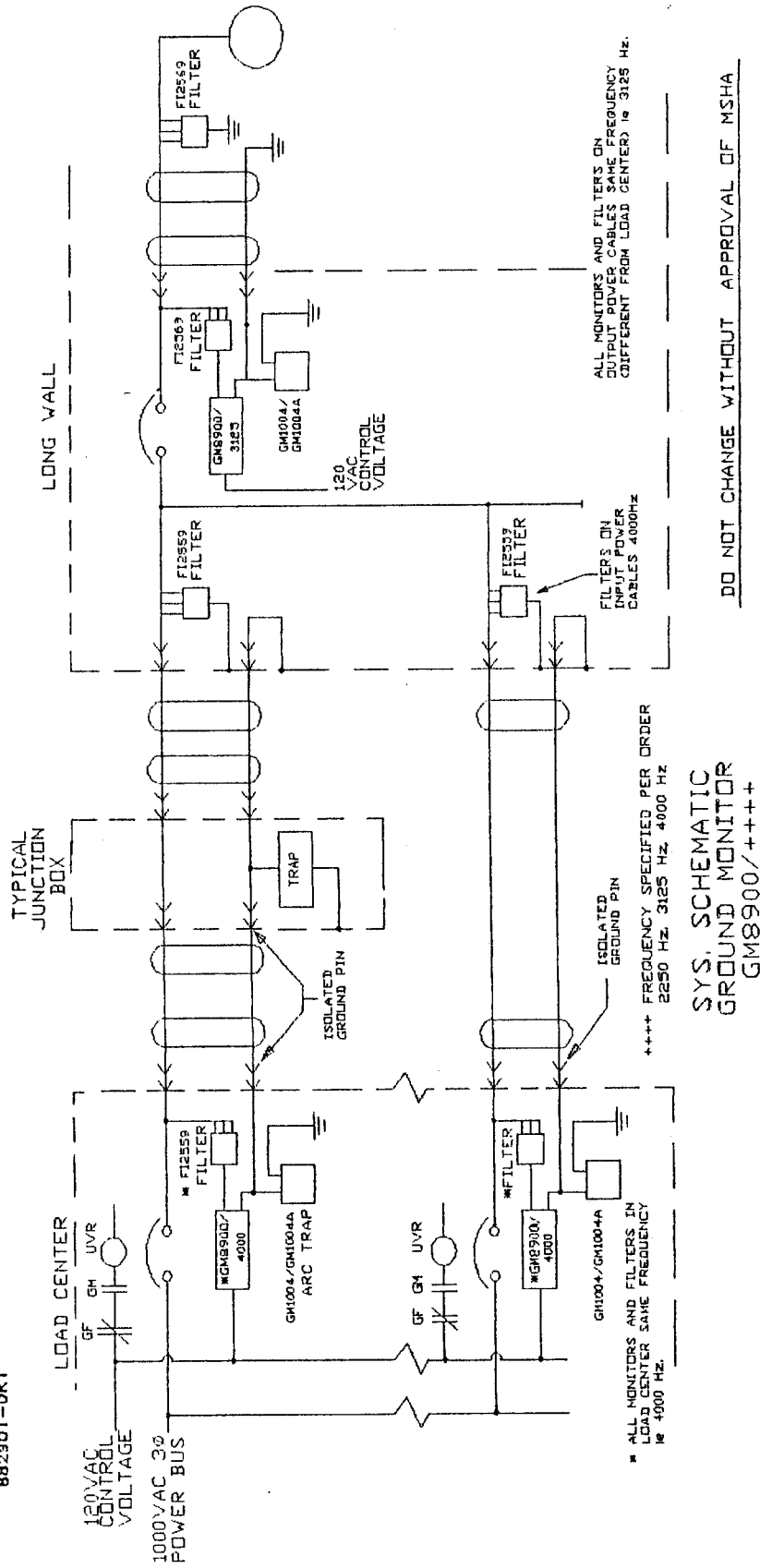
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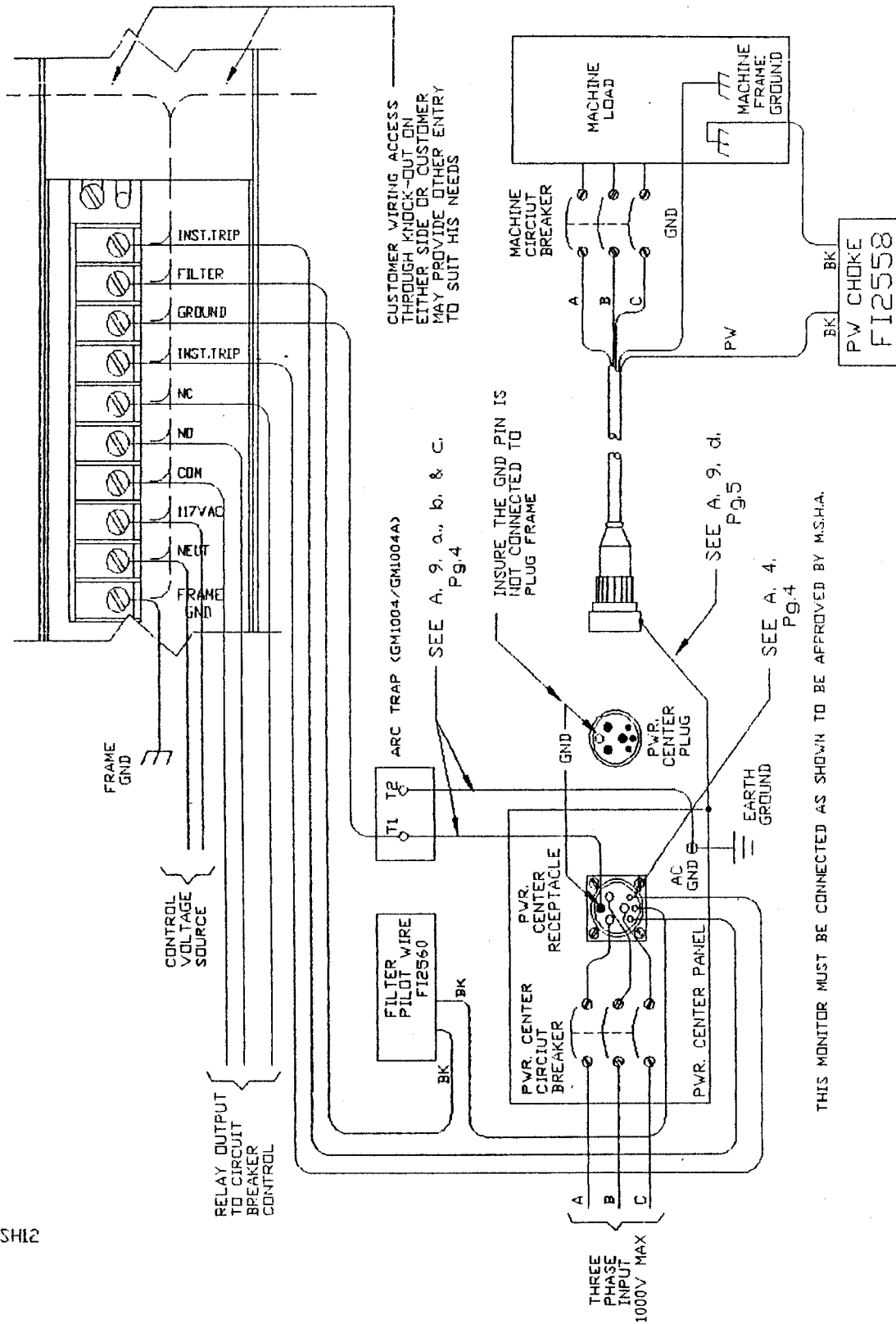
SY. SCHEMATIC GROUND MONITOR
GM8900/++++

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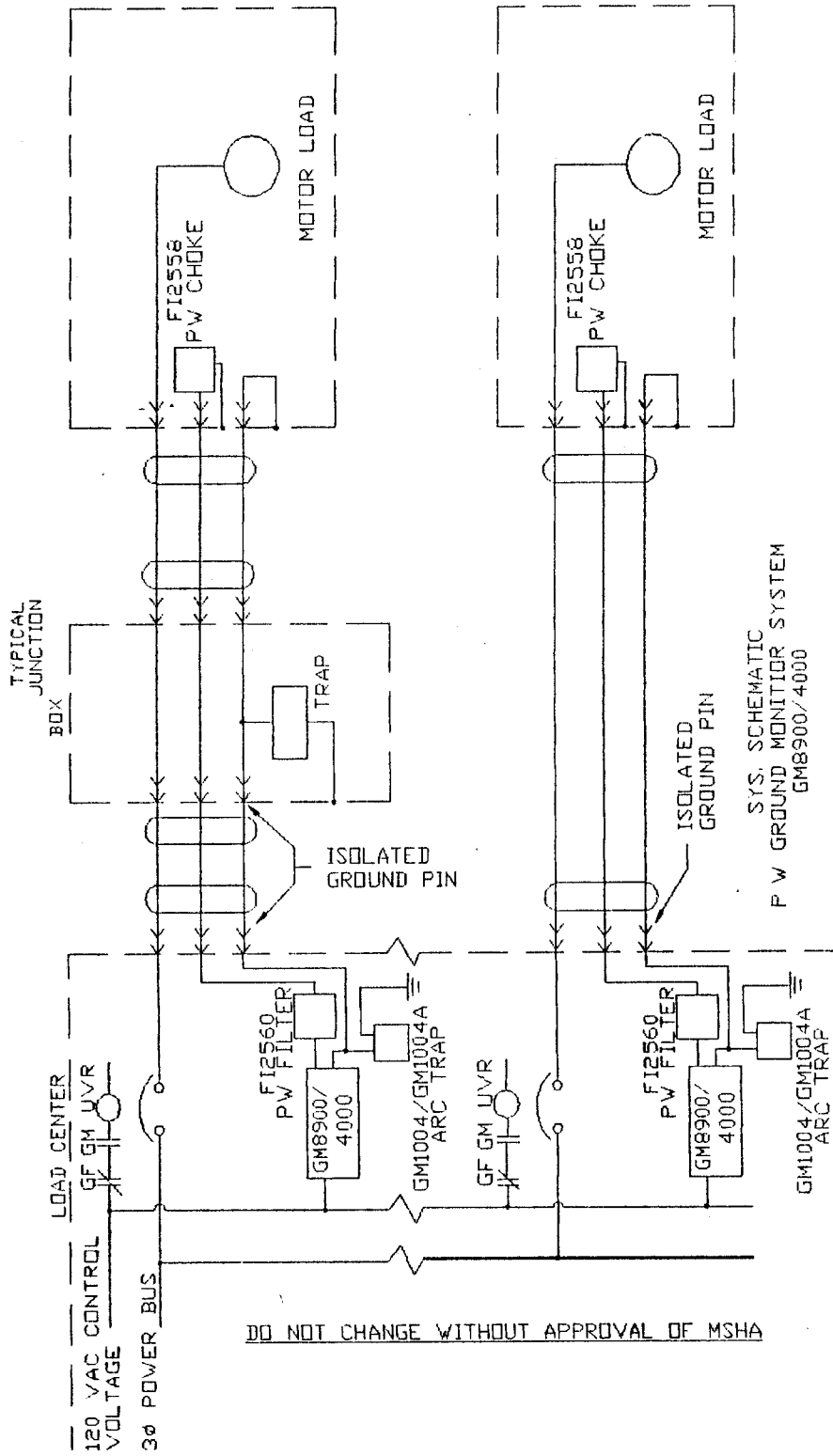


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PW INSTALLATION GROUND MONITOR GM8900/40000
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02-1SH13



TECHNICAL PUBLICATION ADDENDUM

PUBLICATION TITLE:

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DESCRIPTION OF CHANGE: C091165 (change order number)

Added Pilot Wire System

Replaced pages 1 - 13 with the exception of 7.