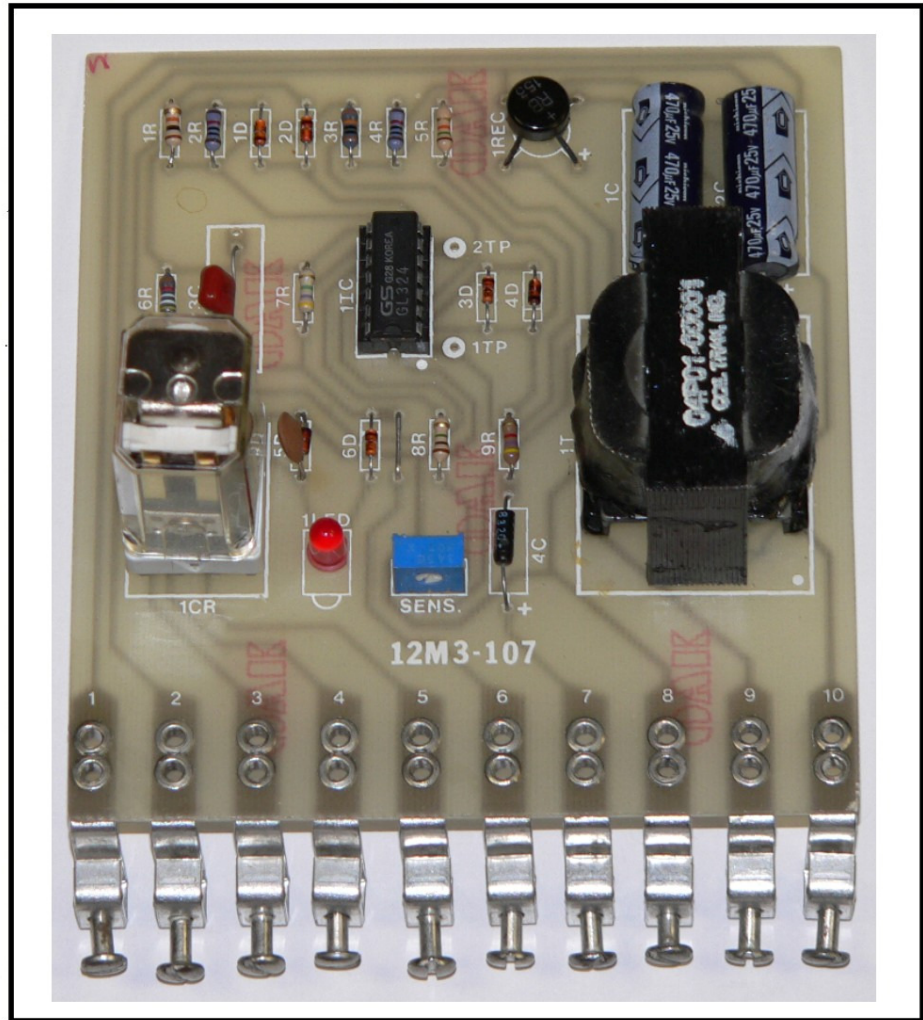




Trouble-shooting Manual Model 211 Phase-Loss and Unbalance Detector PART NUMBER 12M03-00107-01

BENCH TEST

1. Connect a 10K resistor from a variable AC (60 Hz) supply, capable of at least 0-40 volts, to terminal 7 and the other side of the variable AC supply to terminal 8. Connect a 100 Ohm Resistor from terminal 7 to terminal 8.
2. Apply 120V AC to terminals 9 and 10. With the variable AC supply set to 0V AC and "Sens" potentiometer fully CCW, the L.E.D. on the circuit card should be extinguished. Read continuity (with an ohmmeter or continuity tester) between terminals 5 and 4.
3. Slowly increase the "Sens" potentiometer just until continuity is lost between terminals 5 and 4 and established between terminals 5 and 3. The L.E.D. on the circuit card should light.
4. The voltage at terminal 6 should be -8V DC minimum.
5. Increase the AC input to 10V AC as measured at output of the variable supply. The continuity readings in Step 4 should reverse and the L.E.D. on the board should extinguish.
6. Increase the "Sens" potentiometer until the conditions of L.E.D. and continuity readings reverse again. The sensitivity potentiometer should be at approximately 1/3 turn CW.
7. Repeat steps 5 and 6 using 20V AC as an input. The "Sens" potentiometer should be approximately 1/2 turn CW.
8. Repeat steps 5 and 6 using 40V AC. The "Sens" potentiometer should be 3/4 turn CW.



VOLTAGE CHECKS

1. The primary voltage of 1T, leads 1 and 2 (terminals 10 and 9), should be 120V AC.
2. The secondary voltage of 1T, leads 3 to 4 and leads 5 to 6 should be 10V AC. These can be measured between circuit common, terminal 8 (leads 4 and 5), and each AC input to the bridge rectifier 1 REC (leads 3 and 6). Voltage at the AC input to the bridge rectifier (leads 3 to 6) should be 20V AC.
3. +15V DC nominal between the terminals 1 and 8 (common).
4. -15V DC nominal between terminals 2 and 8 (common).
5. -15V DC nominal between terminals 6 and 8 (common) when relay is energized.
6. +13V DC nominal between terminals 6 and 8 (common) when relay is deenergized.

GEMINI MODEL 211 PHASE LOSS AND UNBALANCE DETECTOR

PART NUMBER 12M03-00107
 SCHEMATIC DIAGRAM 12M03-00107-01

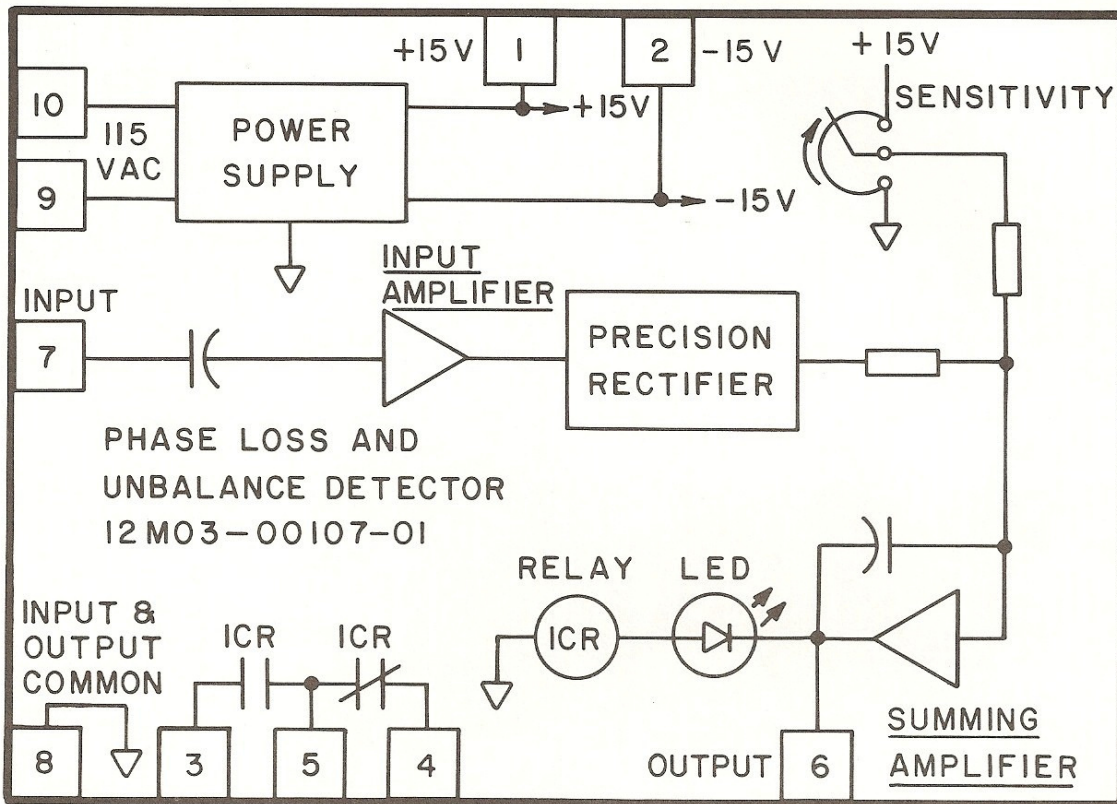


FIGURE 1. SIMPLIFIED SCHEMATIC

I. SPECIFICATIONS

SUPPLY

- 120 Volts AC \pm 10%
- 50/60 Hz, single phase

AMBIENT TEMPERATURE

- 0° to 40°C (32° to 104°F)
- 50°C in cabinet

INPUT

- Current feedback signal to inner-current loop (2 volts unfiltered DC at current limit level)

OUTPUT

- Relay contact, single pole, form C, 2A at 120V AC, 3A at 26V AC.

II. THEORY OF OPERATION

The Model 211 Phase-Loss and Unbalance Detector is used with a three-phase, full-wave power converter to sense load current unbalance among the three phases. When properly adjusted it will detect supply unbalance, isolation transformer unbalance, open thyristor, shorted thyristor, blown fuse and loss of firing pulse or gate drive. It consists of the following elements as shown in the Simplified Schematic Diagram (Figure 1).

1. Power Supply
2. Input Amplifier
3. Precision Rectifier
4. Summing Amplifier

1. **Power Supply** – The power supply uses a center-tapped transformer with 10 volts on each side of center together with a bridge rectifier and two 470 MF capacitors to provide a nominal positive and negative unregulated 15 volts DC with respect to the transformer center-tap which is connected to circuit common.
2. **Input Amplifier** – An unfiltered signal proportional to output current of the power converter of 2 volts average DC at a level of current that corresponds to the maximum current limited output of the converter is applied at terminal 7 with respect to circuit common, terminal 8. The DC component is blocked by capacitor 4C and the AC ripple is applied to the input of op-amp 11C(A), an amplifier with a nominal gain of 3.
When used with REFLEX® Power Converters the 2 volt input signal is obtained from the same source as the 2 volt feedback signal for the inner current loop of the power converter.
3. **Precision Rectifier** – The amplified output of 11C(A) is rectified by a Precision Rectifier, 11C(B) and its associated components. The unfiltered negative DC output proportional to the input AC ripple is applied to the input of the Summing Amplifier, 11C(C), pin 9, where it is compared to the positive signal from the reference "Sensitivity" potentiometer, 1P.
4. **Summing Amplifier** – The amplifier 11C(C) with capacitor 3C and resistor 7R also functions as an active filter to avoid relay chatter, and provides a negative 15 volts DC to energize relay 1CR, as indicated by a light emitting diode, 1LED.
The "Sensitivity" potentiometer, 1P, provides a positive bias current to the input of 11C(C), pin 9, which drives the output at pin 8 to approximately negative 15 volts DC, energizing relay 1CR. It is adjusted so that the relay, 1CR stays energized with the full current-limited output of the power converter, but will drop out when the magnitude of the rectified ripple exceeds the bias due to a loss of phase or an unbalanced current condition.

COMPONENT LIST - ASSEMBLY #12MO3-00107-01

Symbol	Part #	Description (Acceptable Substitute)*	Symbol	Part #	Description (Acceptable Substitute)*
1T	04P01-00001	Transformer - 120V AC PRI, two 10V AC SEC @ 220 mA (Signal-PC20-220)	1R	01P01-10300-02	Resistor - 10K, ¼W, 5%
1REC	05P01-00003	Rectifier Bridge - 50V, 1A (EDI-PF50)	3R	01P02-10031-01	Resistor - 100K, ½W, 1%
1-6D	05P02-00001	Diode - Signal, 50 mA, 200 PIV (1N4148)	2R, 4R	01P02-10021-01	Resistor - 10K, ½W, 1%
1LED	07P04-00003	Diode - Light Emitting (Litronix-RL-4403)	5R	01P01-15300-02	Resistor - 15K, ¼W, 5%
1 IC	05P08-00001	Quad Op-Amp (National LM324)	6R	01P02-49921-01	Resistor - 49.9K, ½W, 1%
1 P	02P04-10301-00	Potentiometer - 10K, ½W (Beckman 72XR10K)	7R	01P01-47500-02	Resistor - 4.7 MEG, ¼W, 5%
1 CR	06P01-00002	Relay - 12V, DPDT (Potter Brumfield R10E1Y2S)	8R	01P01-10500-02	Resistor - 1 MEG, ¼W, 5%
1C, 2C	03P01-47102-01	Capacitor - 470MF, 25V Electrolytic	9R	01P01-47200-02	Resistor - 4.7K, ¼W, 5%
3C	03P07-10410-00	Capacitor - 0.1MF, 100V, Film			
4C	03P03-10503-00	Capacitor - 1.0MF, 35V, Tantalum			
* OR EQUAL					



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