

REFLEX[®] MODEL 211
PHASE-LOSS AND UNBALANCE DETECTOR

PART NUMBER 12M03-00107-01
APPLICATION NOTES

1. Adjustment - The Phase Loss and Unbalance Detector is adjusted as follows:
 - a. Temporarily jumper the output contacts, so that the circuit can be adjusted without stopping the drive.
 - b. Start with the "Sensitivity" at zero and repeatedly operate the drive in current limit, by accelerating rapidly. The relay should drop out as indicated by the LED. Advance the potentiometer just far enough so that the relay does not drop out and note the position of the potentiometer.
 - c. Short circuit the gate to cathode of any one of the thyristors, thus preventing firing. Repeat acceleration and deceleration and adjust so that the relay just does not drop out. Note the potentiometer position.

CAUTION: DO NOT ATTEMPT TO OPERATE A FIELD REVERSING REGENERATIVE DRIVE IN THE REGENERATIVE MODE WITH THE GATE TO CATHODE OF A THYRISTOR SHORTED.
 - d. Set the potentiometer approximately midway between the two positions noted.
 - e. Remove jumper from contacts.
2. The relay contact between terminals 3 and 5 is held closed until an unbalance is detected, then opens. It can be wired directly into the normal stop circuit. It may be wired through a time delay relay or to an alarm to allow time for an orderly shutdown of the operation.
3. The output at terminal 6 swings to plus 13 volts when an unbalance is detected and may be used with solid-state fault logic.
4. This assembly may be used with any three-phase, full-wave power converter. The 2 volt signal may be obtained from a shunt in the DC output, or an isolated signal such as that obtained from the REFLEX Model 213 Signal Isolator or Model 224 Current Isolator.

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REFLEX® PHASE-LOSS & UNBALANCE DETECTOR

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

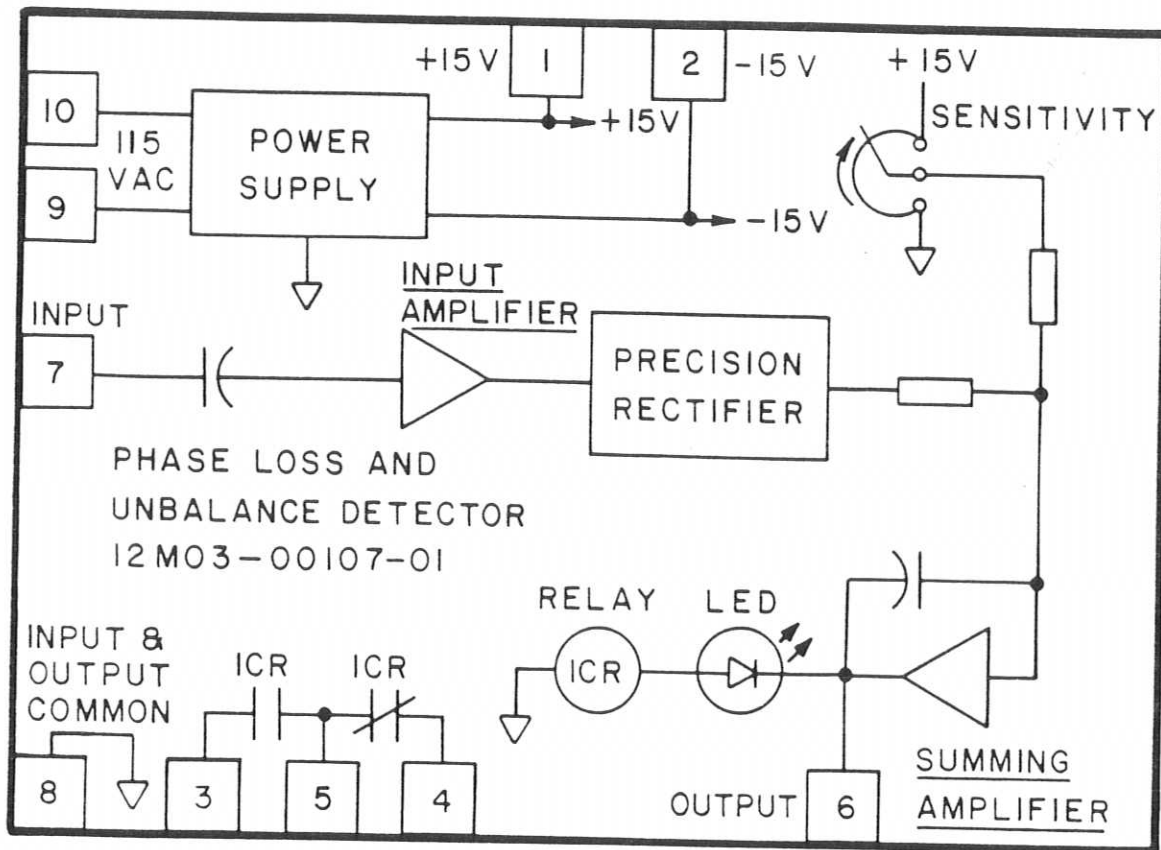


FIGURE 1. SIMPLIFIED SCHEMATIC

I. SPECIFICATIONS

SUPPLY:

- 120V 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 REFLEX® 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).

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|--------------------|------------------------|
| 1. Power Supply | 3. Precision Rectifier |
| 2. Input Amplifier | 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 1IC(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 1IC(A) is rectified by a Precision Rectifier, 1IC(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, 1IC(C), pin 9, where it is compared to the positive signal from the reference "Sensitivity" potentiometer, 1P.

4. **Summing Amplifier** — The amplifier 1IC(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 1 CR, as indicated by a light emitting diode, 1LED.

The "Sensitivity" potentiometer, 1P, provides a positive bias current to the input of 1IC(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 #12M03-00107-01

Symbol	Part #	Description (Acceptable Substitute) *	Symbol	Part #	Description (Acceptable Substitute) *
1T	04P01-00001	Transformer - 120V AC PRI, two 10V AC SEC @ 220mA (Signal-PC20-220)	3C	03P07-10410-00	Capacitor - 0.1MF, 100V, Film
1REC	05P01-00003	Rectifier Bridge - 50V, 1A (EDI-PF50)	4C	03P03-10503-00	Capacitor - 1.0MF, 35V, Tantalum
1-6D	05P02-00001	Diode - Signal, 50 mA, 200 PIV (1N4148)	5C	03P06-10305-00	Capacitor - 0.01MF, 50V, Ceramic
1LED	07P04-00003	Diode - Light Emitting (Litronix-RL-4403)	1R	01P01-10300-02	Resistor - 10K, ¼W, 5%
1 IC	05P08-00001	Quad Op-Amp (National LM324)	3R	01P02-10031-01	Resistor - 100K, ½W, 1%
1P	02P04-10301-00	Potentiometer - 10K, ½W (Beckman 72XR10K)	2R, 4R	01P02-10021-01	Resistor - 10K, ½W, 1%
1CR	06P01-00002	Relay - 12V, DPDT (Potter Brumfield R10E1Y2S)	5R	01P01-15300-02	Resistor - 15K, ¼W, 5%
1C, 2C	03P01-47102-01	Capacitor - 470MF, 25V, Electrolytic	6R	01P02-49921-01	Resistor - 49.9K, ½W, 1%
			7R	01P01-47500-02	Resistor - 4.7 MEG, ¼W, 5%
			8R	01P01-10500-02	Resistor - 1 MEG, ¼W, 5%
			9R	01P01-47200-02	Resistor - 4.7K, ¼W, 5%
* OR EQUAL					