MODEL 760
Automatic
G RO U N D FAU LT ANALYZE R

READ THIS MANUAL THOROUGHLY BEFORE OPERATING

A. DESCRIPTION OF OPERATION

The Model **760 AUTOMATIC GROUND FAULT ANALYZER** is designed to detect and locate accidental ground faults on energized or de-energized single phase, three phase, and DC grounded or ungrounded power systems: The Model 760 will automatically determine which phase is grounded and enable the operator to locate the exact location of the fault .

An audible tracing signal is superimposed on the energized / de-energized faulted circuit at the distribution panel. The signal tone is traced with a portable Exploring Probe to the fault point where the signal is no longer detectable. The Exploring Probe has a battery powered amplifier that enables the operator to trace the signal on circuits buried in the earth or concrete, or overhead conduits without having to place the Probe directly on the circuit.

The automatic fault detection principle of the Model 760 is based on the voltage from any phase to ground. Normally with no fault present, the voltage from phase to ground on a three phase delta system is 58% of the phase to phase voltage. On a 480 volt system, the normal phase to ground voltage is 277 volts. The 760 is designed to respond to approximately 72 % of this voltage. Therefore, when the phase to ground voltage decreases to 200 volts or less, the signal generator will automatically be activated on the faulted phase.

When no faults are present, all three phase lights will be lit with equal intensity. A faulted phase will extinguish its associated light. For single phase use, the "C" light will always remain lit and either the "A" or the "B" light will be extinguished.

B. CONTROL FUNCTIONS AND INDICATORS

a. **POWER** Switch: 120 VAC 60 Hz power ON/OFF switch.

b. **POWER INDICATOR** Light: Indicates bright red when the 120 V power is "ON".

c. **VOLTAGE** Switch: Selects phase-to-phase (line) or phase-to-ground (fault) voltage.

d. **VOLTAGE** Panel Meter: Indicates the line or fault voltage up to 600 volts.

e. **PHASE SELECTOR** Switch: Selects the phase voltage to be measured.

f. **SIGNAL TEST** Switch: Activates the signal generator test.

g. **SIGNAL CURRENT** Meter: Indicates the signal output current.

h. **SIGNAL INDICATOR** Light: This light is activated during signal output.

NOTE: Replace only with a type #1891 bulb. A spare is in the Fuse/Bulb Kit.

i. **1 PHASE / 3 PHASE** Switch: Selects either single or three phase operation.

j. **PULSE RATE** Switch: Adjusts the output rate of the tracing signal.

k. **CHIRP** Switch: Frequency modulates the 1 kHz signal.

l. **PHASE INDICATOR** Lights: Indicates the fault status of A, B, or C phase.

C. PANEL COMPONENTS

a. **SIGNAL** Jack: Connects the red Signal Cable.

b. **GROUND** Jack: Connects the black Ground Cable.

c. **3 Phase Power Inlet:** Connects the Three Phase Power Cord to the system.

d. **120 Volt Power Inlet:** Connects the 120 VAC 60 Hz Power Cord.

e. **FUSES:** **3.0 Amp:** Three phase line fuses.
1.0 Amp: Power supply fuse.
0.5 Amp: Power supply fuse.

WARNING: Do not use "slow-blow" type fuses

D. INITIAL SET-UP PROCEDURES

The Model 760 is capable of performing many functions including voltage measurements, fault tracing, cable tracing, and self-testing:

WARNING

ALWAYS connect the **Ground Cable** to **earth** ground **before** connecting the **Three Phase Cable.**

NEVER use the **Three Phase Cable** and **Signal Cable** simultaneously.

NEVER ground the **Signal Cable**.

NEVER attempt to conduct tests on systems that exceed 600 volts.

(a) SIGNAL GENERATOR TESTS

Connect the Power Cord to a 120V 60 Hz power source. Turn the **Power Switch** "ON". Adjust the **Pulse Rate** to "SLOW". Press the **Signal Test** button. The ammeter should read 2.5 Amp. This reading verifies the proper operation of the 1 kHz signal generator.

Turn the **Chirp** switch "ON". The signal will now be modulated, and should produce a chirping sound. Adjust the **Pulse Rate** to "FAST". The pulsed signal should increase in rate.

The pulse rate and the chirp features are optional settings and are selected according to operator preference.

(b) VOLTAGE MEASUREMENTS

Phase-to-phase (line) or phase-to-ground (fault) measurements aid the operator in determining the actual line voltage and the severity of the fault. A 'dead short will read zero volts on the faulted phase.

First, connect the **Ground Cable** to a good **earth ground**, then connect the **Three Phase Cable** to the power system. To read the **line voltage**, place the **Voltage** switch to the "**Line**" position. Select the desired phase, then read the phase-to-phase voltage on the left side of the switch.

To read the ground **fault voltage**, place the toggle switch in the "**Fault**" position. Select the desired phase, then read the voltage on the right side of the switch.

Note: These voltage measurements do not require a 120V power source.

(c) AUTOMATIC OPERATION SET- UP

All AC power systems may be tested in the automatic mode if the fault voltage is less than approximately 42% of the phase-to-phase voltage. In the case of a 480 volt system, this would be 200 volts.

For **three phase** systems, set the **Phase Switch** to the 3 phase position. Connect the **Ground Cable** to earth ground, and the **Three Phase Cable** to each of the phases.

Warning
Do <u>not</u> use the Signal Cable and the 3 Phase Cable simultaneously.

For a **single phase** system, set the Phase Switch to 1 phase, connect the Ground Cable to earth ground, and connect to the system using the "A" and "B" phase alligator clips.

(d) MANUAL OPERATION SET-UP

Any AC power system with a ground fault voltage greater than 42% of the phase-to-phase voltage must be tested in the manual mode. The Signal Cable and the Ground Cable are used for this application. First, connect the Ground Cable to earth ground, then connect the Signal Cable to the faulted phase. Note: **Do <u>not</u> use the Three Phase Cable.**

All **de-energized** systems and all **energized DC systems** must be tested in the **manual mode**. Use the **Ground and Signal Cables** only. Connect the **Signal Cable** to the known faulted phase.

For **cable tracing, de-energize** the cable. "**Ground**" one end of the cable to be traced, then connect the **Signal Cable** to the other end of the cable. Next, connect the **Ground Cable** to earth ground. Follow the operating procedures as outlined for normal fault locating.

(e) USING THE EXTENSION POLE

To avoid damage to the Extension Pole assembly, proceed as follows:

(1) Mount the Gooseneck /Collar Assembly to the threaded insert in the Pole.

(2) Mount the **Exploring Probe** (FM6973) in the collar. Tighten the set screw with the 1/4" Allen wrench. **Do not over-tighten.**

(3) Plug the Extension Pole Cable into the Exploring Probe.

(4) Adjust the Probe to any position desired.

NOTE: Place both hands on the gooseneck only when making adjustments to avoid damage to the Probe or the threaded insert in the Extension Pole.

E. OPERATING PROCEDURES

The Model 760 is normally connected at the main distribution panel when the fault location is unknown. In cases where the general fault location is known, use secondary distribution centers closer to the fault to save time. **Always insure that the Ground Cable is connected to a solid earth ground**. Do not proceed until all of the initial set-up procedures have been completed.

(1) Connect the Headset to the Exploring Probe.

(2) Turn on the Exploring Probe amplifier. **Note: Always turn off the Probe when not in use to avoid discharging the 9 volt battery.**

(3) Place the Exploring Probe near the Ground Cable of the Model 760. The 1 kHz signal should be audible, indicating the signal generator is functioning properly and the Exploring Probe battery is satisfactory. The operator may elect at this time to vary the pulse rate or chirp feature to optimize the audible signal.

Note: The Probe is highly directional. A much stronger signal is received when the U-shaped pick-up coil is at right angles (not parallel) to the conduit carrying the signal. Rotate the Probe to maximize the signal volume.

(4) Apply the Exploring Probe to each circuit to determine which bus is faulted. All circuits may carry a faint signal, but the faulted line should definitely have a much stronger signal in comparison with other stray signals.

Due to the proximity of the Ground Cable and the outgoing signal tone at the distribution panel, there may be confusing signals on all the circuits in the vicinity of the panel. It may be necessary to move the Exploring Probe some distance away from the panel in order to distinguish exactly on which line the fault has occurred.

Disregard any signal that may carry over to the 120 volt lighting system. The neutral leg will often carry some portion of the ground return signal. Follow only power line signals, and disregard all other system wiring.

(5) Holding the prongs of the Exploring Probe at right angles to the direction of the cable or conduit, follow the **loudest** signal along the distribution system using the Extension Pole where required.

(6) As successive panels or junctions are reached, be guided by the loudest signal path. At junctions, do not be misled by secondary weak signals in the vicinity. The signal will soon become very faint when "off the track". Return to the point where the signal was strong and follow the feeder with the strongest intensity.

Note: Infrequently a "dead spot" will occur. It may be necessary to move beyond this section of conduit a short distance to pick up the signal again.

(Cont'd)

(7) When the Probe passes the fault, the signal intensity drops off significantly. To pinpoint the fault location, it may be advantageous to rotate the Probe to reduce the signal strength. Where the fault occurs, the tracing signal will begin to return to the Model 760 on a "ground return" path. This path may be part of the building structure such as a steel beam, the metal conduit, the safety ground strap, etc. In these cases the signal may be slightly audible in many portions of the system grounding network.

F. REPAIR

The most common repairs consist of replacing the indicator bulbs, the fuses, and the circuit board assembly. A spare Fuse/Bulb Kit is supplied with all new units. Do not attempt to repair the printed circuit board; return it to the factory.

The front panel of the Model 760 is held in place by four locking tabs that rotate when each of the corner screws are turned. When removing the panel, these tabs must be aligned with the clearance slots in the corners.

To remove the front panel, follow these steps:

(1) Turn the corner screws counter-clockwise until a faint "click" is heard.
Note: The tabs should be touching the cabinet wall.

(2) Turn the screws 1/8 turn clockwise.

(3) Lift up the panel using caution not to damage any components or wiring on the back of the panel.

G. REPAIR PARTS

DESCRIPTION	**PART NUMBER**
Fuse, AGC 0.5	FP-158012
Fuse, AGC 1.0	FP-158005
Fuse, KTK-3	FP-158015 **
Lamp, 14 volt, #1891	FP-211006
Lamp, 120 V, #120PSB	FP-211005

** For models with serial number suffixes "G" or 'G20 and after. All other models use AGC-3 (FP-158011)

G. REPAIR PARTS - CONT'D

DESCRIPTION	PART NUMBER
Meter, AC, 3A	FP-105007
Meter, AC, 600V	FP-105009
Printed Circuit Assembly	FC6958
Transformer, Meter	FS7014
Transformer, Power, 120V	FP-296028
Transformer, Signal	FS6966

H. ACCESSORIES

Cable, Ground	FS6979
Cable, Signal	FS6980
Cable, 3 Phase	FM6634-1
Exploring Probe, Amplified	FM6973
Extension Pole Assembly	FM6637
Headset	FP-173002
Kit, Fuse/Bulb	FS6969
Manual, Instruction, 760	B760MAN
Power Cord, 120V (Rect. Inlet)	FP-129005