Introduction to Maintenance Procedures

The Series One and Series One Plus PCs are designed to provide trouble-free operation. However, occasionally situations requiring corrective action do occur and it is important to be able to quickly identify the source of such situations and correct them. Many times the need for corrective action originates outside of the PC.

Troubleshooting Aids

The advantages provided by the Series One and Series One Plus PC design are indicators and built-in aids to troubleshooting not only the PC, but also the overall control system. The main diagnostic tool is the programmer that can be easily attached to the PC. The programmer provides great insight to the status of the overall control system. When troubleshooting a Series One or Series One Plus PC based control system, make a habit of having a programmer with you.

Basic Troubleshooting Procedure

The following questions should be asked and appropriate action taken to negative answers. At the end of the list of questions are step by step procedures to be followed to replace various modules in a Series One or Series One Plus PC. All major corrective action can be accomplished by replacing modules. No special hand tools are required except for a screw driver and voltmeter. There is no requirement for an oscilloscope, highly accurate voltage measurements (digital voltmeters), or specialized test programs. Refer to figure 7.1 for location of the referenced indicators.

1. Is PWR (Power) light ON? If not, measure power at the input voltage terminals (98-126 V ac or 195-252 V ac as appropriate) on racks using an AC source of power. For racks requiring a DC power source, measure the DC voltage between the +24 and O V terminals. If the appropriate AC or DC power is not present, locate the source of the problem external to Series One or Series One Plus PC. If the AC or DC power levels are correct but the PWR light is off, fuses should be checked, then replacement of the CPU rack if necessary.
2. Is CPU light OFF? If ON, check which error code is displayed, refer to table 4.1 for error code definitions and take appropriate action.
3. Is RUN light ON? If not, check for the cause such as the programmer in the PRG or LOAD position or programming errors. If RUN light is OFF and a programmer is not connected, or the programmer in in the RUN mode without an error code being displayed, replace the CPU module.
4. Is the BATT light ON? If yes, replace the battery. Since the BATT light is only a warning level, the program may be unaltered even if the battery is low. After replacing the battery, examine the program or test the PC operation. If a fault is located reload the program from tape recorded at the completion of initial system programming.
5. In multiple rack systems if the CPU is operating, the RUN relay can be very useful in verifying operation of the other power supplies. If the RUN relay is not closed (high resistance) check the AC or DC power supply as in step 1 above. Adequate AC or DC power and an open relay requires replacement of the rack.

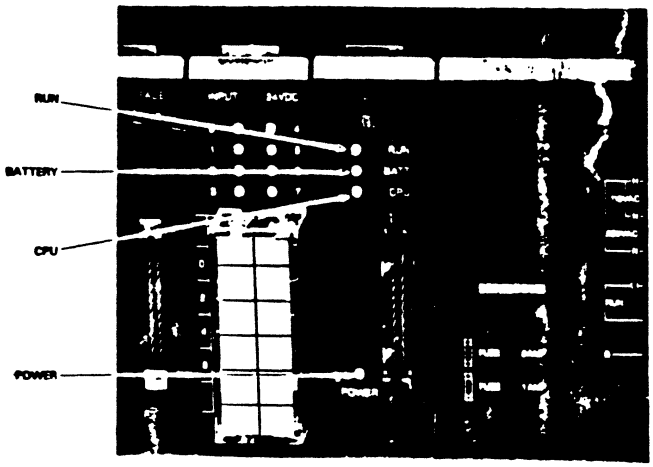

Figure 7-1. Troubleshooting Indicators

General Troubleshooting Procedure

Additional procedures depend upon knowledge of the logic installed by the user. The following steps are more general in nature and should be modified or adjusted as necessary to meet your specific application. There are no better troubleshooting tools than common sense and experience. First plug in the programmer and place it in the RUN mode, then follow these steps:

1. If the Series One or Series One Plus PC has stopped with some outputs energized or basically in mid-stream, locate the signal (input, timer, coil, sequencer, etc.) that should cause the next operation to occur. The programmer will display ON or OFF condition of that signal.
2. If the signal is an input, compare the programmer state with the LED on the input module. If they are different, replace the input module. If multiple modules in an expansion rack appear to require replacement, verify the I/O cable and its connection before replacing any modules.
3. If input state and LED on the input module agree, compare the LED status and the input device (pushbutton, limit switch, etc.). If they are different, measure the voltage at the input module (refer to Chapter 6 for typical I/O wiring). If the voltage indicates a problem, replace the I/O device, field wiring, or power source; otherwise; replace the input module.
4. If the signal is a coil wired to a field device, compare its status to the LED on the output module. If they are different, verify the source of field power to ensure excitation voltage is available. If field power is not present, examine the power source and its wiring. If the proper field power is available, but the status is wrong at the I/O module's output terminal, replace the output module or verify that the rack is providing the proper power to the module.
5. If the signal is a coil and either there is no output module or the output is the same as the coil state, examine the logic driving the output with the programmer and a hard copy of the program. Proceeding from right towards left, locate first contact that is not passing power that is otherwise available to it from immediate left. Troubleshoot that signal per steps 2 and 3 above if it is an input, or 4 and 5 if it is a coil. Ensure that Master Control Relays are not affecting operation of the logic.

6. If the signal is a timer that has stopped at a value below 9999, other than 0000, replace the CPU module.
7. If the signal is the control over a counter, examine the logic controlling the reset first and then the count signal. Follow steps 2 through 5 above.

Replacement of Components

The following procedures provide details on procedures to be followed when replacing components of a Series One or Series One Plus PC system.

Replacing a Rack

1. Turn OFF power and remove the programmer (if installed).
2. Remove the plastic cover and disconnect power wiring from the terminal board on the lower right side of the rack.
3. Remove all I/O modules. I/O wiring does not have to be disturbed if service loop was provided during the original installation. Note the position of each module in the rack for proper reinstallation.
4. Remove CPU module (if installed) and any filler modules. Place them aside in a safe location for later reinstallation.
5. Remove bottom two bolts holding the rack in place. Loosen but do not remove the top bolts.
6. Slide base unit up and then pull forward to clear the top mounting bolts. Set the rack aside.
7. Reinstall the new rack onto the top mounting bolts.
8. Insert bottom bolts and tighten all four mounting bolts.
9. Install the I/O modules in the same slots from which they were removed.

WARNING

Placing a module in the wrong slot can cause incorrect and dangerous operation of the control system.

10. Install the CPU and any filler modules that were removed.
11. Reconnect power wiring to the terminals on the right side of the rack. Reinstall the plastic cover over the power terminals.
12. Verify proper power wiring and then turn power ON. Carefully check operation of the entire system to ensure that all I/O modules are in their proper locations and the program is not altered.

Replacing a CPU Module

1. Turn OFF power and remove the programmer (if installed).
2. Squeeze the CPU module at the front, top and bottom to release securing tabs.
3. Pull the module straight out from its slot.
4. If PROM memory had been installed in the CPU, remove the PROM and install it in the new CPU.

5. Insert the new CPU module by first aligning the printed circuit boards into the bottom board guide.
6. Rotate the module upwards slightly to engage the top board guide.
7. Push the CPU module into the rack until both tabs snap into place.
8. Reinstall the programmer and reapply power.
9. Reload the program from tape recorded after initial system programming. Check operation of entire system.

Replacing I/O Modules

1. Turn OFF power from both the rack and the I/O system.
2. Remove the plastic cover from over the terminals on the I/O module to be replaced. Only field wiring on the defective module needs to be removed.
3. Disconnect field wiring from I/O terminals, detach the removable connector, or remove the connector to the I/O Interface cable, as applicable according to the type of module. Label each wire or note installed wire marking for future reconnection.
4. Squeeze the I/O module at the front, top and bottom to release securing tabs.
5. Pull the I/O module straight out.
6. Insert the new I/O module, aligning printed circuit boards first into the bottom board guide.
7. Rotate the module slightly upwards to engage the top board guide.
8. Push the module into the rack until both tabs snap into place.
9. Reconnect all field wiring, replace the removable connector board or replace the connector, then replace the plastic cover.
10. Reapply power to the CPU, then to the I/O system. Check operation of the system, especially the I/O module that was replaced.

Replacing the Battery

If the CMOS memory back-up battery requires replacement, refer to the following procedures. Figure 7.2 shows the battery location on the CPU, location of the battery connector and the battery tie-down straps.

a40289

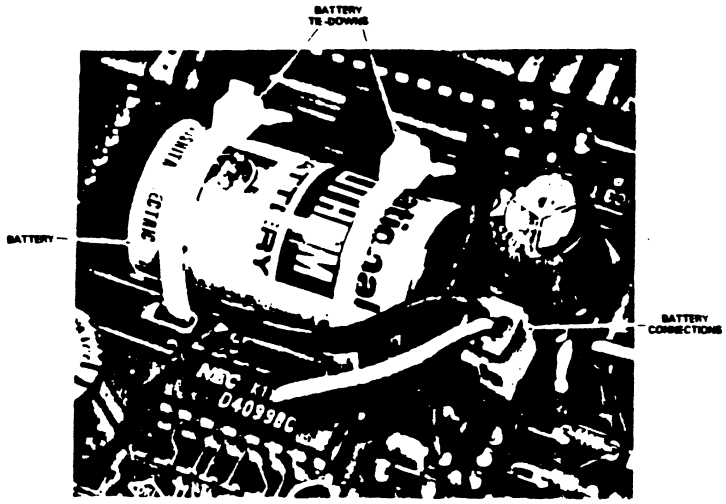

Figure 7-2. Battery Location and Connection

1. Remove the CPU following the previous instructions.
2. Cut the plastic tie down straps that secure the battery to the board.
3. Disconnect the battery. There is sufficient capacitance in the system to retain the CMOS memory contents even without the battery for about 20 minutes.

WARNING

The lithium battery should be handled with care. DO NOT discard the battery in fire. DO NOT attempt to recharge the battery. DO NOT short the battery. If these precautions are not followed, the battery may burst, burn or release hazardous materials.

4. Connect the new battery (catalog no. IC610ACC150) and place it in its proper position on the printed circuit board.
5. Secure with new tie downs or insulated wire.
6. Reinstall the CPU module.
7. Verify that the BATT light is OFF. If necessary, reload the CPU from a tape made after initial system programming. Then, check operation of the entire system.
8. If the two printed circuit boards that make up the CPU are separated, ensure that they are reconnected, installed in a rack, and powered up. Otherwise, logic may lock into a high current drain mode and prematurely drain the battery.

Adding Memory

The following procedure should be followed when adding memory to a Series One or Series One Plus PC. Either CMOS RAM memory can be added to increase memory capacity from 700 words to 1724 words or non-volatile PROM memory can be installed that contains a program previously entered into the PROM.

GEK-90842

a40290

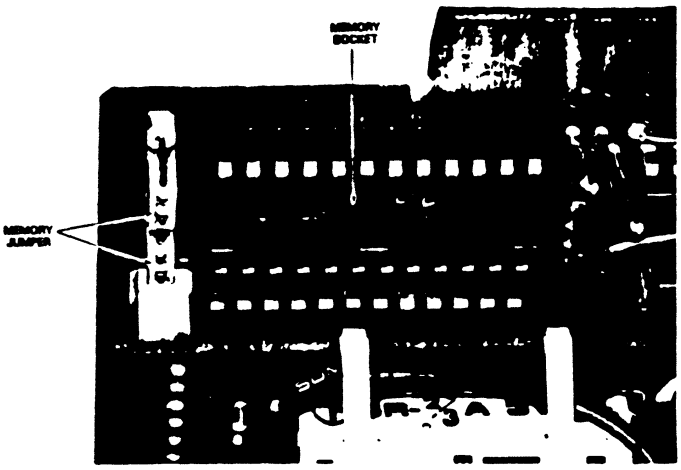

Figure 7-3. Location of Extra Memory Socket

1. Before installing additional memory, it is recommended that any program currently in memory be recorded on tape. If this is not done, the program will be lost after memory is added and a Clear All Memory operation is performed.
2. Remove the CPU following previous instructions.
3. Locate spare memory socket at the rear of the larger printed circuit board in the CPU.
4. Obtain the required memory IC either type 6116LP for Series One or 6264LP-15 for a Series One Plus, 2K x 8 bit CMOS RAM (or equivalent). If adding PROM memory, obtain an Intel type 2732A-2 for Series One or a 27256-25 for a Series One Plus (or equivalent PROMs). Ensure that the CMOS RAM or PROM is correct for your PC.

CAUTION

When handling CMOS memory ICs, always handle by the case and not leads. Static electricity on leads can damage internal circuits. This damage may not be apparent for several days or weeks of operation.

5. Orient the IC so that the notch at one end matches the notch in the memory socket.
6. For clearance when installing memory ICs, it may be necessary to lift the smaller printed circuit board 1/8" (3mm). Do not separate the boards. After the memory IC is installed, reseat the smaller board.
7. Insert the IC into the socket carefully and evenly so as not to bend any leads. Visually inspect to ensure that all leads are in place and then push down to firmly seat the IC. If necessary, readjust the jumpers and/or switch 2 as shown in table 3.2.
8. If the two printed circuit boards that make up the CPU are separated ensure that they are reconnected, installed in a base unit, and powered up. Otherwise, logic may lock into a high current drain mode and prematurely drain the battery.
9. Reinstall the CPU module following previous instructions.

10. Power-up the CPU, place the mode switch in the PRG position and perform a Clear All Memory operation (CLRSHF348DELNXT). The entire memory will now be entirely clear of data. Any program previously recorded on tape can now be loaded into the CPU from tape or a new program can be entered.

Spare Parts and Components

To support the Series One or Series One Plus PC, an Accessory Kit is available (IC610ACC120). This kit includes commonly needed components that may get damaged or lost in the normal course of operation. For a complete list of accessories for the Series One Family of programmable controllers, refer to GEP-762. Rather than attempting to place orders for plastic covers, fuses, audio cables, screws, etc., this kit can be ordered and provides sufficient material to support 3-5 CPUs depending upon their I/O count. Included in the kit are the following items:

ITEM	QTY.	ITEM	QTY.
Cable, Programmer to Tape Recorder	1	Fuses, 2A SB (Spiral Element)	3
Cable, Programmer to Peripheral	1	Fuses, 3A FB	5
Cover, CPU Connector	1	Fuses, 3A SB	5
Cover (large), DCU, PROM Writer, Printer Interface	2	Fuses, 4A SB	3
		Fuses, 5A FB	3
Cover (small), DCU, PROM Writer, Printer Interface	1	Fuses, 10A SB	5
		Key, Hand-Held Programmer	1
Cover, I/O Terminal	4	Screws, PH (M3x5)	10
Cover, Power Supply Terminal	2	Screws, PH (M3x7)	10
Cover, Rack Dust	1	Screws, PH (M3x16)	10
Fuses, 1A SB	5	Spacer	3
Fuses, 2A SB	3		

When supporting a Series One or Series One Plus installation, it is recommended that spare modules be available on site. These are in addition to the Accessory Kit previously discussed. As a guide to your requirements, the following percentages are presented. As a minimum, one each of all modules is recommended. Depending upon a number of application related conditions (location, average weekly hours of operation, cost of downtime, etc.) more units may be justified.

UNIT	% SPARES
Base with Power Supply	15
CPUs	15
Input Modules (each type)	10
Output Modules (each type)	15
Programmers	10
Cables	10
Peripheral Devices	10

Figure 7-4. Accessory Kit for Series One/One Plus

Fuse List

Table 7.1 is a list of fuses used in Series One I/O modules.

Table 7-1. I/O Module Fuse List

I/O MODULE CATALOG NUMBER	CURRENT RATING (AMPS)	QUANTITY	CIRCUIT CONNECTION	TYPE OF FUSE
IC610MDL103	3 Amps	1	soldered	pico fb
IC610MDL104	10 Amps	1	fuse clip	miniature sb
IC610MDL115	3 Amps	2	fuse clips	miniature sb
IC610MDL151	3 Amps	2	soldered	pico
IC610MDL153	5 Amps	4	fuse clips	miniature fb
IC610MDL154	5 Amps	4	fuse clips	miniature fb
IC610MDL155	3 Amps	2	soldered	pico
IC610MDL156	3 Amps	4	soldered	pico
IC610MDL157	3 Amps	2	soldered	pico
IC610MDL158	5 Amps	2	soldered	pico
IC610MDL175	5 Amps	2	soldered	pico fb
IC610MDL176	3 Amps	4	fuse clips	miniature fb
IC610MDL180	10 Amps	2	fuse clips	miniature sb
IC610MDL181	5 Amps	1	fuse clip	miniature
IC610MDL182	2 Amps	2	fuse clip	miniature sb
IC610MDL185	5 Amps	2	soldered	pico