CHAPTER 7
MAINTENANCE

INTRODUCTION

The Series One Junior PC is designed to provide trouble-free operating during its lifetime. 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. The overall control system must be evaluated, since many times the need for corrective action originates outside of the Series One Junior.

TROUBLESHOOTING AIDS

The advantages provided by the Series One Junior 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 Series One Junior. The programmer is an excellent tool for monitoring the status of the overall control system. When troubleshooting a Series One Junior 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 parts of the Series One Junior. All major corrective action can be accomplished by replacing either the basic unit or I/O 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 the PWR (Power) light ON? If not, measure power at the AC terminals (98-126 Vac or 195-253 Vac as appropriate) on basic units using an AC power source. For units requiring a DC power source, measure the DC voltage between the +24 V dc and 0 V terminals. If the appropriate AC or DC power is not present, locate the source of the problem external to the Series One Junior. Adequate AC or DC power but no PWR light requires verification of fuses, then replacement of the basic unit if necessary.

2. Is the 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 the RUN light ON? If not, check for cause such as the programmer in the PRG or LOAD position or programming errors. If the RUN light is OFF and the programmer is not connected, or the programmer is in the RUN mode without an error code being displayed, replace the basic unit.

4. Is 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 Series One Junior operation. If a fault is located reload the program from tape which was recorded at the completion of initial system programming.

5. If an expansion rack is included in the system, and the CPU is operating, the RUN relay on the expansion rack can be very useful in verifying operation of the expansion rack power supply. If the RUN relay is not closed (high resistance) check the AC or DC power supply as in step 1. Adequate AC or DC power and an open relay is an indication that the expansion rack should be replaced.

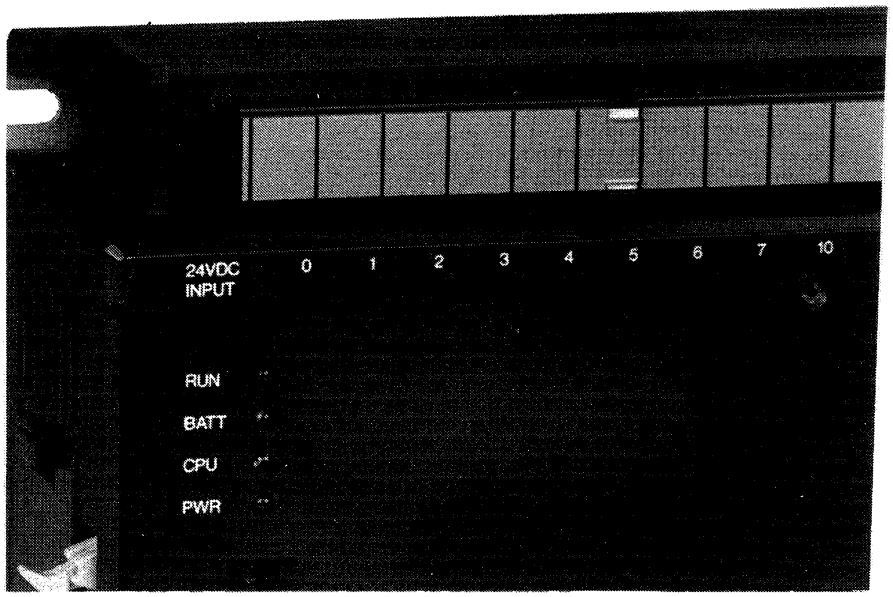

Figure 7.1 SERIES ONE JUNIOR TROUBLESHOOTING INDICATORS

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 attach the programmer and place it in the RUN mode, then follow these steps:

1. If the Series One Junior 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. When attached, the programmer will display the ON or OFF condition of that signal.

2. If the signal is an input, compare the programmer state with the LED on either the basic unit or on the input module in the expansion rack. If they are different, replace the basic unit or the input module as applicable.

3. If the input state and the LED on the basic unit or input module agree, compare the LED status and the input device (pushbutton, limit switch, etc.). If they are different, measure voltage at the input module (refer to Chapter 6 for typical I/O wiring). If voltage so indicates, replace the I/O device, field wiring, or power source; otherwise, replace the basic unit or the input module in the expansion rack.

4. If the signal is a coil wired to a field device, compare its status to the LED on the basic unit or the output module. If they are different, verify the source of field power to ensure that 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 status is wrong at the basic unit output terminal or the output module in the expansion rack, replace the basic unit or the output module, as applicable.

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 logic driving the output with the programmer and a hard copy of the program. Proceding from right towards left, locate the first contact that is not passing power that is otherwise available to it from the 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 impacting operation of the logic.

6. If multiple modules in the expansion rack appear to require replacement, verify that the I/O Expansion cable is connected properly at the Series One Junior and at the I/O Expansion module. If there is a problem in the connection between the basic unit and the I/O Expansion module, an error code will be generated and displayed on the programmer. Compare the error code with the error codes listed in Table 4.1 and take the appropriate action.

7. If the signal is a timer that has stopped at a value below 999.9, other than 0000, replace the basic unit.

8. 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 the steps to be followed when replacing various components of the system.

REPLACING A BASIC UNIT OR I/O EXPANSION UNIT

1. Turn OFF AC or DC power source, as applicable, and remove the programmer (if installed).

2. Remove the plastic covers from over the top and bottom terminal strips.

3. Disconnect power source wiring from terminals on the bottom right.

4. Disconnect field wiring from input terminals at top of unit and output terminals at the bottom of the unit. Disconnect the I/O Expansion cable, if used.

5. Remove bottom two bolts holding the basic unit in place. Loosen but do not remove the top bolts.

6. Slide the basic unit up and then pull forward to clear top mounting bolts.

7. Install the new basic unit onto the top mounting bolts.

8. Insert bottom bolts and tighten all four mounting bolts.

9. Reconnect the field wiring to the same top or bottom terminals from which it was removed.

11. Reconnect power wiring to terminals on the right. Reinstall the plastic cover over the top and bottom terminals. Reconnect I/O Expansion cable, if used.

12. Verify proper operation of the entire system to ensure that the new basic unit is operating properly and the program is not altered.

REPLACING EXPANSION RACK I/O MODULES

1. Turn OFF power to both the basic unit and the expansion rack.

2. Remove the plastic cover from over the terminals on the I/O module to be replaced. Only field wiring on the faulty module needs to be removed.

3. Disconnect field wiring from all I/O module terminals. Label each wire or otherwise note the position of the installed wire for later reconnection.

4. Squeeze I/O module at the front, top and bottom to release the 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 tracks.

7. Rotate the module upwards slightly to engage the top tracks.

8. Firmly push the I/O module into the rack until both tabs snap into place.

9. Reconnect field wiring and replace the plastic cover.

10. Reapply power to the basic unit, then to the expansion rack. Check operation of system, especially the I/O module that was just replaced.

REPLACING AN EXPANSION RACK

1. Turn OFF power and remove the programmer (if installed).
2. Remove the plastic cover and disconnect power wiring from the terminal strip on the right side of the rack. Disconnect the I/O Expansion cable.
3. Remove all I/O modules and filler modules, if any are installed. I/O wiring does not have to be disturbed if a service loop was provided during the original installation. Note the position of each module for proper reinstallation.
4. Remove the bottom two bolts holding the expansion rack in place. Loosen but do not remove the top bolts.
5. Slide the expansion rack up and then pull forward to clear the top mounting bolts. Set the unit aside.
6. Install the new expansion rack by placing the 2 top mounting holes onto the top mounting bolts.
7. Insert the 2 bottom bolts and tighten all four mounting bolts.
8. Install I/O modules in exactly 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. HOWEVER, IT WILL NOT DAMAGE THE MODULE.

9. Reconnect power wiring to terminals on the right. Reinstall the plastic cover over the power terminals. Reconnect the I/O Expansion cable.
10. Verify proper power wiring and then turn power ON. Carefully check operation of entire system to ensure that the I/O modules are in their proper locations and the program is not altered.

REPLACING THE LITHIUM BATTERY

1. If the BATT light is ON or blinking, the lithium battery should be replaced, since it will not properly maintain the CMOS memory during a power loss condition.
2. To access the battery, remove the battery access cover (refer to Figure 7.2) located on the left side of the Series One Junior. The cover is easily removed by pressing down on the tab until the access cover pulls away from the unit.
3. Remove the battery by depressing the connector tab on the unit side of the connector, and at the same time pull the battery side of the connector towards you until the 2 parts are separated. There is sufficient capacitance in the system to retain the CMOS memory contents even without the battery for 20 minutes.

Figure 7.2 BATTERY LOCATION

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. THE BATTERY MAY BURST, BURN OR RELEASE HAZARDOUS MATERIALS.

4. Remove the battery from the retaining clips

5. Insert the new battery, catalog no. IC610ACC150, into the retaining clips by placing the battery over the clips and pressing down firmly on the battery until it snaps into place.

6. Connect the battery by sliding the battery side of the connector into the basic unit's side of the connector until it snaps into place.

7. Replace the battery access cover.

8. Verify that the BATT light is OFF, and that the program is intact and operating properly. If necessary, reload the system from a tape recording of the program made after initial system programming.

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FUSING INFORMATION

Each of the Series One Junior basic units has built-in fuse protection to prevent damage to the output circuitry. Fuses are installed in the units in one of two ways, either mounted in clips or soldered into the circuit. The circuit illustrations for each unit in Chapter 6, show how the fuses are connected in each of the output circuits. The current rating and fuse type used in each of the basic units is as listed in Table 7.1.

Table 7.1 SERIES ONE JUNIOR FUSE LIST

SERIES ONE JUNIOR CATALOG NUMBER	TYPE OF FUSE USED	CURRENT RATING	CIRCUIT CONNECTION
IC609SJR100	pico, fast blow	2 A (all ckts)	soldered
IC609SJR101 (1)	pico, fast blow	2 A (all ckts)	soldered
IC609EXP101 (2)	pico, fast blow	2 A (all ckts)	soldered
IC609SJR110	miniature, normal blow	2 A (C1) 5 A (C2, C3)	fuse clips
IC609SJR114	miniature, normal blow	2 A (C1) 5 A (C2, C3)	fuse clips
IC609SJR120	miniature, normal blow	2 A (C1) 5 A (C2, C3)	fuse clips
IC609SJR121	miniature, normal blow	2 A (C1) 5 A (C2, C3)	fuse clips
IC609SJR124	miniature, normal blow	2 A (C1) 5 A (C2, C3)	fuse clips
IC609EXP110	fast blow	5 A (C1, C2)	fuse clips
IC609EXP120	normal blow	5 A (C1, C2)	fuse clips
IC609EXP121	normal blow	5 A (C1, C2)	fuse clips

(1). UL listed basic unit
(2). UL listed expansion unit

The IC609SJR100 unit has 9 fuses, with each circuit being individually fused. Each of these is a fast blow pico fuse and is soldered in place. Each fuse is rated at 2 amps. These fuses are physically located in each output line, between the output circuitry and the output terminal (17 through 27). The other units each have 3 fuses, which are miniature, normal blow glass fuses. Each of these fuses is mounted in a fuse holder located on a printed circuit board inside of each unit. One fuse is in each common line, between the common terminals, C1, C2, C3 and the output circuitry. The fuse in the C1 line for the isolated circuit is rated at 2 amps and the fuses in the C2 and C3 lines (1 fuse for each group of 4 circuits) are rated at 5 amps each. The fuses in all of these units are for protection of the output circuitry and should be replaced by a qualified person in the event that a fuse does blow. The DC I/O Expansion units have two 5 amp fuses, one in the C1 line and one in the C2 line.

NOTE

Although fuses are built into each Series One Junior, as a convenience, it is recommended that external fusing be installed by the user in series with the output circuits. The external fuse should have a lower current rating than the internal fuse. For example, the internal fuse current rating for the IC609SJR100 is 2 amps; use 1.5 amp fuses externally. In this manner, if a surge should occur, it would blow the external fuse. The external fuse could then be quickly replaced, without the requirement of disturbing the field wiring, dismounting the Series One Junior and removing the rear cover plate in order to gain access to the internal fuses.

REPLACING A FUSE

If an internal fuse should blow in one of the circuits in a Series One Junior, use the following procedure to access and replace the fuse.

1. Turn OFF the AC or DC power source, as applicable, and remove the programmer (if installed).
2. Remove the plastic covers from over the top and bottom terminal strips.
3. Disconnect power source wiring from terminals on the bottom right.
4. Disconnect field wiring from input terminals at top of unit and output terminals at the bottom of the unit.
5. Remove bottom two bolts holding the basic unit in place. Loosen but do not remove the top bolts.
6. Slide the basic unit up and then pull forward to clear the top mounting bolts.
7. Place the unit on a work bench so that the bottom metal cover plate is accessible.
8. Remove the 4 largest phillips-head screws. One of these screws is located in each of the 4 corners of the cover plate. These screws fasten the cover plate to the black plastic cover.
9. The circuit boards, terminal strips and other hardware items are physically attached to the metal bottom cover plate. The black plastic cover plate must now be detached from the rest of the unit.

10. Turn the unit up so that the front of the unit is facing you. The black plastic cover can now be removed by gently pulling the cover away from the rest of the unit. The battery compartment access cover must be loosened so that it can be pulled through the cutout into which it is placed. Ensure that the top and bottom terminal strips and the I/O expansion connector do not interfere with removal of the cover.

11. After the top cover has been removed, access to the fuses is then possible. The fuses in each of the units are physically located on the bottom circuit board in the lower left of the unit (near the programmer connector).

12. If any of the glass fuses in one of the DC units is blown it can be removed by carefully pulling the defective fuse up and out of its retaining clip.

13. If one of the pico fuses in an AC unit is blown, it should be replaced by a qualified person. These fuses must be desoldered for removal. To do this, the bottom cover plate must be completely detached from the lower printed circuit board by removing the remaining phillips-head screws. The fuse leads must be desoldered carefully, since the unit could be damaged by excessive heat.

14. After replacing the defective fuse, replace the bottom cover plate and the black plastic cover. Then remount the unit and reconnect field and power wiring. Your unit is then ready for normal operation.