Section 9

TROUBLESHOOTING

9.0 General — This section is designed to assist maintenance personnel carry out troubleshooting procedures. It is divided into three general areas of information:

- Operator Panel monitoring procedures (Par. 9.1)
- Troubleshooting monitored equipment (Par. 9.2)
- Troubleshooting the IQ-1000 II (Par. 9.3)

DANGER

All maintenance procedures **must** be performed only by qualified personnel who are familiar with the IQ-1000 II and its associated motor and machines. Failure to observe this warning can result in serious or fatal personal injury and/or equipment damage.

All correspondence with Westinghouse, whether verbal or written, should include the software version number which appears as the first display on the program menu (item 0 in Table 8.B).

9.1 Panel Operations — The Operator Panel performs the following operations:

- System status message reporting (Par. 9.1.1)
- Programming setpoint values (Par. 9.1.2)
- Reviewing setpoint values (Par. 9.1.3)
- Monitoring electrical characteristics (Par. 9.1.4)

9.1.1 System Status Messages — The Display Window provides a reporting function during the normal operation of the IQ-1000 II. This group of messages is referred to as the system status messages. Table 9.A lists the normal operation reporting messages.

9.1.2 Programming Setpoints — The Operator Panel, its controls and the keyswitch are used to enter setpoint values. See Paragraph 4.3 for a detailed procedure to enter or modify setpoint values.

9.1.3 Reviewing Setpoints — All 52 setpoints can be reviewed while the IQ-1000 II is in the Run mode – even when the motor is actually running.

To review setpoints in the Run mode, press the Set Points pushbutton once to enable the Program menu. At this time the Step Up or Step Down pushbuttons can be used to step through the Program menu in either direction to the desired IQ-1000 II function. (The program menu is listed as Table 8.B)

9.1.4 Monitoring Characteristics — The run-monitor menu allows maintenance personnel/operators to observe selected operating parameters associated with the motor and motor starter. A listing and description of these electrical characteristics is contained in Table 9.B.

The metering functions are averaged over time to give stability to the readings presented. As a result, the retained metering function data may be data which occurred up to one second before the trip occurred. This is in contrast to the instantaneous response of certain trip conditions such as:

- Instantaneous overcurrent
- Ground fault

Because the instantaneous overcurrent function is actuated within one line cycle of the trip condition occurring, the frozen trip values for the phase currents will not reflect the actual current value that caused the trip.

Table 9.A

SYSTEM STATUS MESSAGES
(Normal Operational Reporting)

Display	Complete Help Message	Description
READY -- X	READY TO START MOTOR – READY -- 1 SINGLE PHASE MODE READY -- 3 THREE PHASE MODE	Indicates motor can be started.
START	ATTEMPTING TO START MOTOR	Displayed during motor start cycle.
RUN	MOTOR IS RUNNING	Indicates normal condition when motor is running with no alarm or trip condition. This message is displayed after a transition has occurred.

Table 9.B

RUN-MONITOR MENU DISPLAYS

Display	Complete Help Message	Description
I_A XXX	PHASE A CURRENT IN AMPS	Actual AC line motor current
I_B XXX	PHASE B CURRENT IN AMPS	
I_C XXX	PHASE C CURRENT IN AMPS	
I_G XX	GROUND FAULT CURRENT IN AMPS	Actual ground current
% I_A XXX	PERCENT FULL LOAD CURRENT PHASE A	The percents of the actual monitored current (in amps)
% I_B XXX	PERCENT FULL LOAD CURRENT PHASE B	
% I_C XXX	PERCENT FULL LOAD CURRENT PHASE C	
*WT1 XXX	WINDING TEMP 1 IN DEGREES	Reading from RTD connected to terminals 1, 2, 3
*WT2 XXX	WINDING TEMP 2 IN DEGREES	Reading from RTD connected to terminals 4, 5, 6
*WT3 XXX	WINDING TEMP 3 IN DEGREES	Reading from RTD connected to terminals 7, 8, 9
*WT4 XXX	WINDING TEMP 4 IN DEGREES	Reading from RTD connected to terminals 10, 11, 12
*WT5 XXX	WINDING TEMP 5 IN DEGREES	Reading from RTD connected to terminals 13, 14, 15
*WT6 XXX	WINDING TEMP 6 IN DEGREES	Reading from RTD connected to terminals 17, 18, 19
*MBT1 XXX	MOTOR BEARING TEMP 1 IN DEGREES	Reading from RTD connected to terminals 20, 21, 22
*MBT2 XXX	MOTOR BEARING TEMP 2 IN DEGREES	Reading from RTD connected to terminals 23, 24, 25
*LBT1 XXX	LOAD BEARING TEMP 1 IN DEGREES	Reading from RTD connected to terminals 26, 27, 28
*LBT2 XXX	LOAD BEARING TEMP 2 IN DEGREES	Reading from RTD connected to terminals 29, 30, 31
*AUXT XXX	AUXILIARY TEMP IN DEGREES	
OCNT XX	OPERATION COUNT	The number of motor starts logged since unit went into service, or since the counter has been reset
RT X	RUN TIME IN HOURS	Total motor run time, as accumulated by the IQ-1000 II, to date from the first time AC power was applied, or since the counter has been reset
RMST XX	REMAINING STARTS	Number of starts remaining before motor will not be allowed to start. This is the remainder of OCNT minus actual starts.
OST XXX	TIME LEFT ON OLDEST START IN MINUTES	This is the remaining time allowed for count (in minutes) function (program menu item 34). If the motor starts/time is exceeded, this is the time which must elapse before a restart is possible.
IMX XXXX	HIGHEST PHASE CURRENT SINCE LAST RESET	Highest phase current monitored by IQ-1000 II since last reset (see setpoint item 50, Table 8.B)
WTMX XXX	HIGHEST WINDING TEMP SINCE LAST RESET	Highest winding temperature monitored by IQ-1000 II since last reset (see set-point item 50, Table 8.B)

Table 9.B (cont'd)

RUN-MONITOR MENU DISPLAYS

Display		Complete Help Message	Description
I^2T	XX	NUMBER OF I^2T TRIPS SINCE LAST RESET	Number of respective trips since last reset (see setpoint item 49, Table 8.B).
IOC	XX	NUMBER OF IOC TRIPS SINCE LAST RESET	
UL	XX	NUMBER OF UL TRIPS SINCE LAST RESET	
JAM	XX	NUMBER OF JAM TRIPS SINCE LAST RESET	
GF	XX	NUMBER OF GF TRIPS SINCE LAST RESET	
RTD	XX	NUMBER OF WINDING TEMP TRIPS SINCE LAST RESET	
ICM	XXX	ADDRESS ON THE INCOM NETWORK	Address of device if on IMPACC communications network
% I^2T	XXX	PERCENT OF I^2T TRIP LEVEL	Percent of I^2T trip level as calculated by the IQ-1000 II. At 100%, the IQ-1000 II will initiate an I^2T trip.

*Values in the shaded area are not displayed if the Universal RTD Module is not connected or is improperly connnected.

9.2 Troubleshooting IQ-1000 II Monitored Equipment — If the monitored equipment malfunctions, certain troubleshooting information can be used to assist in localizing the problem. When a malfunction occurs, the Operator Panel displays specific messages relating to alarm or trip conditions. The unit's monitoring abilities provide valuable information, which are divided into two categories:

- Alarm conditons (Par. 9.2.1)
- Trip conditons (Par. 9.2.2)

9.2.1 Alarm Conditions — An alarm condition occurs when one of the electrical characteristics exceeds its programmed setpoint value. Note, however, that some alarm characteristics must exceed the setpoint value for a programmed time value **before** the alarm condition occurs.

When this condition happens, the red Alarm LED lights, and a message appears in the Display Window to assist with the isolation process.

DANGER

Troubleshooting procedures at times involve working in equipment areas where potentially lethal voltages are present. Personnel must exercise extreme caution to avoid injury, including possible fatal injury.

External devices connected to the IQ-1000 II's Alarm relay can be used to give additional warning.

Alarm conditions all have the following in common:

- The IQ-1000 II's Alarm relay is energized when the condition occurs.
- The form C relay contacts (available at terminals 17, 18, and 19) are brought out from the Alarm relay.
- The condition is automatically cleared if the characteristic causing the condition falls to or below the setpoint. At this time the Alarm LED and Alarm relay reset.

NOTE

The Alarm relay will change state when any alarm condition is detected by the IQ-1000 II.
The Trip relay will change state when any trip condition is detected by the IQ-1000 II.
The Auxiliary Trip relay will only change state when the programmed trip state condition(s) has/have been detected by the IQ-1000 II (see Paragraph 8.24).
The Trip relay on the IQ-1000 II will always change state at the same time that the Auxiliary Trip relay changes state.

All possible alarm conditions are listed in Table 9.C. Related probable causes and solutions are also shown.

9.2.2 Trip Conditions — A trip condition is a situation that changes the state of the Trip relay and, in some cases, the Auxiliary Trip relay, thereby causing the main contactor to open and the motor to stop running. These conditions fall into two groups:

- When the selected characteristics are greater than the programmed setpoint values (including, in some cases, a time setpoint), a trip condition occurs. The red Trip LED lights, and a message appears in the display window to assist the operator.
- The IQ-1000 II may also detect a malfunction. These may be external to the control — such as a broken report-back signal wire from the machine or process. There also are conditions which may be internal to the control — such as an opto-coupler failure (see Paragraph 9.3).

NOTE

The STEX alarm is conditional. While the motor is running, it is an alarm. If the motor is stopped, it becomes a trip.

Trip conditions have these characteristics in common:

- A picture of the metering functions just prior to the occur-

rence of a trip is stored in memory and can be recalled by pressing the Step Up or Step Down pushbuttons to step through the run-monitor menu. The order of the electrical characteristics displayed is identical to the listing in Table 9.B.

- The display window automatically alternates between the last run-monitor menu or program menu item displayed and the trip condition's cause. If two trip conditions occur at the same time, the display alternates between the menu item and the cause of each trip.
- The internal Trip (and, in some cases, Auxiliary Trip) relay is actuated when the condition occurs.
- The form C relay contacts (terminals 11, 12, and 13) are brought out from the Trip relay. (Auxiliary Trip relay contacts are terminals 14, 15 and 16; see Figure 9.1).
- The trip condition must be manually reset by using the Reset pushbutton. The remote reset input (terminal 8), REMOTE INPUT, or INCOM command can also be used to reset the trip condition.

NOTE

The picture of the metering function data is retained by the IQ-1000 II, as described in Paragraph 9.1.4. Pressing the Reset pushbutton clears the electrical characteristics stored when the trip condition occurred. If, after depressing the Reset pushbutton, the LRC/I^2T (locked rotor or thermal overload) or STEX (starts per allowed time exceeded) message appears, wait for the trip to reset itself.

Trip conditions which are not the result of a possible internal malfunction are listed in Table 9.D. Related probable causes and solutions are also shown.

NOTE

If the Program menu is being examined while the IQ-1000 II is in the Run mode and a trip condition occurs, the run-monitor menu will not be automatically displayed. Press the Set Points pushbutton to display the protection-monitor menu (Table 9.B).

9.3 Troubleshooting the IQ-1000 II Unit — Troubleshooting the IQ-1000 II is straightforward. If the Operator Panel is inoperative (either the LEDs and display window are off, or they are not responding properly), use the procedures listed in Table 9.E. When doing so, keep in mind that the most probable problems or the simplest to verify are listed first. For this reason, always follow the order of the table's suggestions.

DANGER

If the IQ-1000 II is replaced, it is necessary to reprogram all setpoint values that apply to the specific IQ-1000 II application. **Do not** attempt to restart the motor until all values are entered and validated. (Use the application's Set Point Record Sheet and Paragraph 4.3.) Damage to equipment and/or personnel injury may occur if this procedure is not followed.

The IQ-1000 II performs continuous internal diagnostic checks. If a malfunction is detected during a diagnostic check, one of

Table 9.C

ALARM CONDITIONS

Display	Complete Help Message	Probable Cause	Solution
I^2TA	I SQUARED T ALARM LEVEL	The monitored rotor temperature exceeded the alarm level setpoint (60 to 100% of max. temp.).	Monitor electrical characteristics to further isolate the malfunction to an area such as the incoming AC line, or motor/load.
STEX	ALLOWED STARTS EXCEEDED, WAIT IN MINUTES	All of the allowed starts have been used	Wait the number of minutes shown on display or reset by entering program mode.
WD AA	WINDING TEMP ALARM	In each case the actual electrical value monitored is equal to or greater than the alarm setpoint value for the function displayed.	With each of the 6 different displays (at left), perform a monitoring function to further isolate the malfunction. Note: If the actual temperature of one or more of the RTDs does not correspond to the reading in °C, suspect the RTDs, RTD wiring, or the RTD Module.
MB AA	MOTOR BEARING ALARM		
LB AA	LOAD BEARING ALARM		
PU AA	PHASE UNBALANCE ALARM		
JAMA AA	JAM ALARM		
ULA AA	UNDERLOAD ALARM		

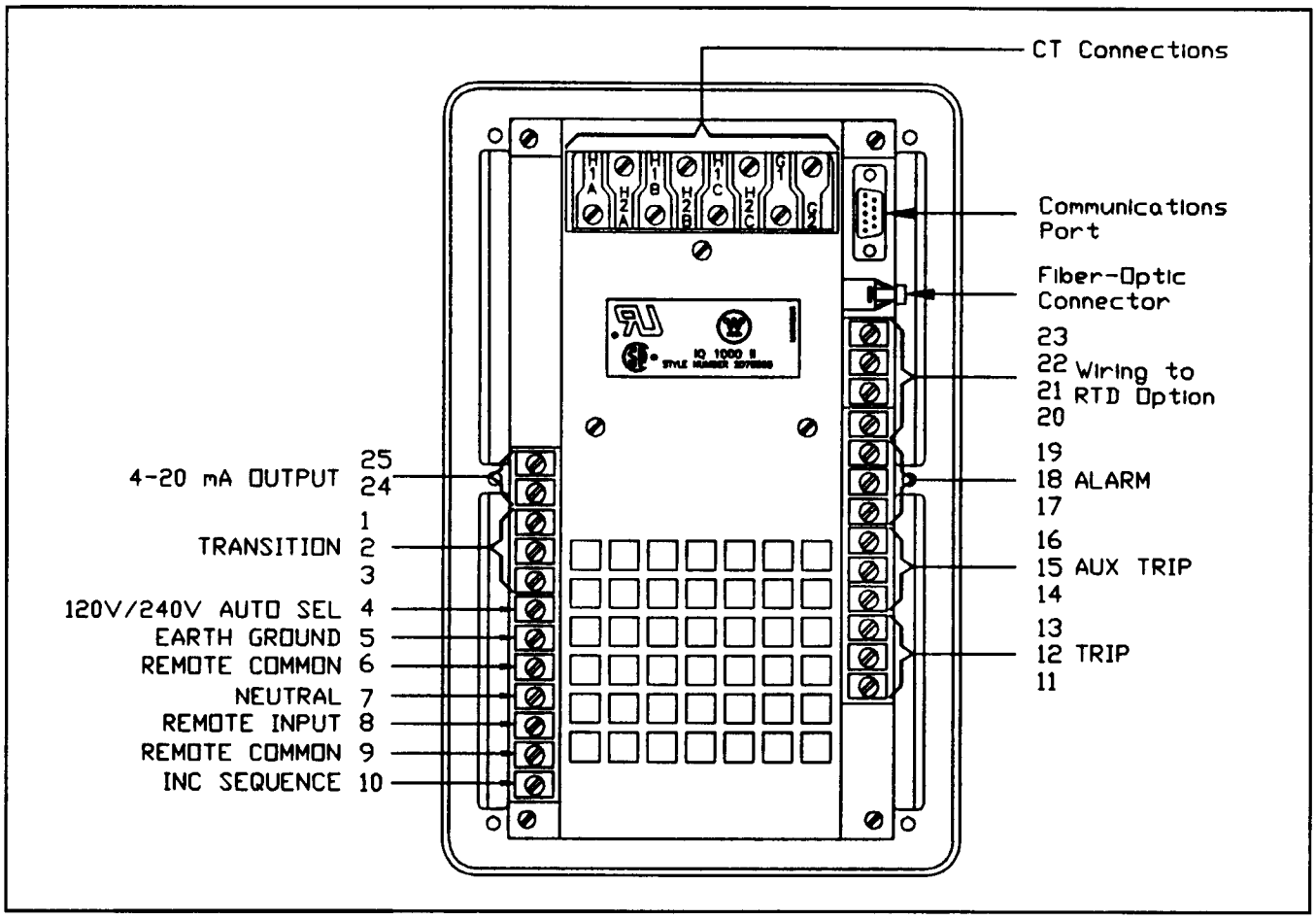

Figure 9.1 — IQ-1000 II Rear Terminals

the messages listed in Table 9.F is displayed. In each case, if any of the failure messages listed in the table occurs, a trip condition is initiated. The following actions should be taken:

- Press the Reset pushbutton to clear the display, if possible.
- Try to restart the motor.

If the same display occurs again, the IQ-1000 II is malfunctioning, and the unit should be replaced.

Table 9.D

TRIP CONDITIONS

Display	Complete Help Message	Probable Cause	Solution
IOC	INSTANTANEOUS OVERCURRENT TRIP	In each case the actual electrical value monitored is greater than the trip setpoint value for the function displayed.	Monitor the associated electrical characteristics (as listed in Table 9.B) to further isolate the problem.
GND FLT	GROUND FAULT TRIP		
JAM	LOAD JAM TRIP		If the actual temperature of one or more of the RTDs does not correspond to the reading (in °C), suspect the RTDs, RTD wiring, or the RTD Module.
UNDER L	UNDERLOAD RUN TRIP		
MB TEMP	MOTOR BEARING OVER TEMPERATURE TRIP		
LB TEMP	LOAD BEARING OVER TEMPERATURE TRIP		
WD TEMP	STATOR WINDING OVER TEMPERATURE TRIP		
LRC/I^2T	LOCKED ROTOR/THERMAL OVERLOAD TRIP	The rotor winding temperature storage, as directed by the IQ-1000 II's motor temperature algorithm, has exceeded the maximum allowable value of the I^2T protection curve (motor overload curve).	Monitor the electrical characteristics associated with the motor current to further isolate a problem to areas such as the AC line or motor overload.
INC SEQ	INCOMPLETE SEQUENCE TRIP	The INC SEQUENCE input (terminal 10) was not energized within the incomplete sequence time after a transition has taken place.	Monitor terminal 10 after a transition to the run mode. Check circuits connected to terminal 10, such as incomplete sequence, field loss, pull-out protection, etc.
REMOTE	REMOTE TRIP	The REMOTE INPUT (terminal 8), used to initiate the remote trip, was energized.	Check wiring to terminal 8 to determine external cause of trip.
DIF TRIP	DIFFERENTIAL TRIP	The REMOTE INPUT (terminal 8), used to initiate the differential trip, was energized	Check status of external differential relay
PH UNBAL	PHASE UNBALANCE TRIP	Single phasing of motor.	Monitor the incoming AC line.
PH REVRS	PHASE REVERSAL TRIP	During initial startup a phase reversal condition exists.	Rotate two of the incoming power leads L1, L2, or L3. Check for proper motor rotation. Alternately, change the IQ-1000 II current transformer wiring by rotating the current transformer wiring terminal H1B with H1C. Clearly mark the new wiring and update the drawings for future reference.

Table 9.D

TRIP CONDITIONS (cont'd)

Display	Complete Help Message	Probable Cause	Solution
T BYPASS	TRIP BYPASS (JUMPER BYPASS OF IQ-1000 II TRIP RELAY)	A trip condition is active, yet the IQ-1000 II still monitors motor current. This indicates Trip relay's contacts have been "bypassed."	Examine wiring of Trip relay's contacts and remove bypass condition.
INCOM	INCOM REMOTE TRIP	The INCOM communication option has initiated a trip condition.	Determine and correct cause of remote trip external to the IQ-1000 II.
STEX	MAX # STARTS PER TIME REACHED, WHILE RUNNING ALARM ONLY, IF STOPPED BECOMES TRIP	Too many starts were used in the allowed period of time.	Wait for the starts to be returned or clear starts by entering Program mode.
TRANSIT[1]	LOW TO HIGH VOLTAGE TRANSITION ERROR TRIP	IQ-1000 II did not transition on current before the transition time was complete.	Reset trip, check reason for slow start and restart motor.

1. This trip is initiated only if program menu item 39 is selected for the trip on time out function (TRP TOUT) and the motor current remained too high during the motor's start cycle. Paragraph 8.15 describes transition timing.

Table 9.E

TROUBLESHOOTING: OPERATOR PANEL MALFUNCTIONING

Symptom	Probable Cause	Solution
All LEDs and display windows are off or unintelligible.	Incoming AC deficient.	Verify that 120 or 240 VAC (±15%) exists between terminals 4 and 7. (Refer to the electrical drawings to further isolate a deficient AC line.)
	IQ-1000 II malfunctioning	Verify that all connections to the terminal blocks are secure. Turn keyswitch to the Program position for 5 seconds, then return to the Protection position. If all connections are secure and the Operator Panel is still inoperative, then replace the IQ-1000 II.
OPTO ERR message	Optocoupler failure trip	Check frequency setting
Metered readings too low	Incorrect CT's — secondary amps not within 2.5–5 amps	Match CT's, CT ratio to deliver 2.5–4 amps secondary

Table 9.F

INTERNAL DIAGNOSTIC FAILURE MESSAGES

Display	Complete Help Message
A/D ERR	A/D CONVERTER ERROR TRIP
RAM ERR	RAM ERROR TRIP
ROM ERR	ROM ERROR TRIP
OPTO ERR	OPTO COUPLER FAILURE TRIP[2]
X — CTR	THE RATIO OF FLA TO CT RATIO EXCEEDED 5. PLEASE REDUCE FLA SETTING OR INCREASE CT RATIO.[1] Note: This help message may be different on some of the early production units.
ZRAM ERR	NON VOLATILE MEMORY ELE MENT SHOULD BE REPLACED

NOTES:
1. The current transformer ratio (item 39) and/or full load ampere (item 32) setpoint values are incorrectly selected. Verify that the setpoints for these menu items on the application's Set Point Record Sheet are entered correctly.
2. Refer to Table 9.E.