Section 8

PROGRAMMING THE IQ-1000 II AND SET POINT DESCRIPTION

8.0 General — This section contains information needed by an application engineer to organize the setpoint values for a specific IQ-1000 II so that they may be easily entered. Thirty-eight separate functions are provided. (See Table 8.A which acts as a quick locator alphabetized listing.) It is strongly recommended that **all** the setpoints be determined, recorded and verified **before** any entry is begun. For assistance, a Set Point Record Sheet is included to act as a permanent record of the set point values for an individual application (see Table 8.B). Copies of it should be made and stored in a number of locations, including the enclosure containing the IQ-1000 II.

Not all setpoint functions and associated values or settings may be required by a given IQ-1000 II application. In such cases, make one of the following notations on the Record Sheet.

- Place N/A or some other notation in the space if the function/value has no effect on operation. (For example, winding temperature, when there is no RTD Module.)
- Write in the value required to disable the function. (Specific instructions on disabling set point functions are given in the following descriptions.)

A copy of a correctly filled-in Set Point Record Sheet must be given to the individual responsible for value entry. The IQ-1000 II displays its setpoint functions in a fixed sequence that is duplicated on the Set Point Record Sheet. Thus, the sheet minimizes programming time. (Specific entry procedures are described in Paragraph 4.3.)

> NOTE
>
> Unless specifically stated otherwise, it can be assumed that when operating conditions are greater than the user-selected setpoint, the function is initiated.

8.1 Start and Run Delays — Start and run delays are used with many of the protection functions of the IQ-1000 II to aid in starting and keeping the motor running. Attention should be paid to the units of different delays due to the varying requirements for different types of protection.

8.1.1 Start Delays — Start delays (start lockout delays) disable their related protection functions to prevent transient motor conditions during the motor inrush period from creating a trip.

All start delays are tied to the transition cycle in one respect **only**. The beginning of most start delays are initiated by the IQ-1000 II declaring a start; the only exceptions are the instantaneous overcurrent and ground fault functions which react in line cycles instead of seconds. Once a start is declared, start delays may time out before or after the IQ-1000 II has transitioned to the run state depending on the type of protection. If a trip condition during a start is maintained past the end of the start delay, a trip may occur, never allowing the IQ-1000 II to transition to the run mode. See section 7.2 for a description of start, run and stop cycles.

The start delays provided in the IQ-1000 II are as follows:

- Ground Fault Start Delay — in line cycles
- Instantaneous Overcurrent Start Delay — in line cycles
- Jam Start Delay — in seconds
- Underload Start Delay — in seconds

8.1.2 Run Delays — Run delays are used to provide a time-based filter on transient trip conditions which might cause nuisance tripping.

The run delay is initiated by a transient trip condition occurring after the associated start delay has timed out. Once the run delay has begun, the trip condition must be maintained for the full length of the run delay. If at any time the condition goes away and then returns, the run delay is reset. The trip condition must remain present for the full length of the run delay time to initiate a trip.

The fastest response for a function with both start and run delays is found by adding the two programmed delays together. This would be the response time if the trip condition were detected at any point during the start delay.

The run delays provided in the IQ-1000 II are as follows:

- Ground Fault Run Delay — in cycles
- Jam Run Delay — in seconds
- Underload Run Delay — in seconds
- Phase Unbalance Alarm Run Delay — in seconds

8.2 Setpoint Item 1, Operating Modes — One of two different operating modes may be selected by the user. One mode is used when the IQ-1000 II is protecting a motor or being tested using a three-phase current source. A second mode is used when the IQ-1000 II is being tested or programmed using a single-phase current source.

In all cases where three-phase current is being monitored by the IQ-1000 II, the three-phase mode must be selected. The three-phase mode is displayed in the Program mode as:

3 PHASE

When in the Program mode, pressing either the Raise or Lower pushbutton causes the display to toggle between "3 PHASE" and "1 PHASE" messages.

In cases where the IQ-1000 II is to be tested, and the only available test method is using a single-phase current source, then the single-phase test mode must be selected. The single-phase test mode is displayed in the Program mode as:

1 PHASE

When the single-phase test mode is selected, most of the IQ-1000 II protective features can be tested. The Phase Unbalance alarm and trip features, however, can only be tested with a three-phase current source. In single-phase test mode, the phase unbalance protection feature is disabled.

When the operating mode function is displayed, it will toggle between the following two messages:

3 PHASE 1 PHASE

This menu item is numbered 1 in Table 8.B.

8.3 Setpoint Item 2, RTD Monitoring — Assuming that optional RTDs are used, and the optional RTD Module is installed, the IQ-1000 II is capable of monitoring the operating temperatures at three key motor locations. Both trip and alarm setpoints are available for the three placement areas. These are the motor's:

- Stator windings
- Motor bearings
- Load bearings

If the optional RTD Module is not used with the IQ-1000 II, there is no need to enter these values.

If the RTD Module is installed with no RTDs connected, the IQ-1000 II will display a "–" for each RTD. This same display is used for shorted or open RTDs. However, all unused RTD Module terminals should be jumpered, as described in Paragraph 5.3.2. All valid RTD readings will display a numeric value.

NOTE

If an RTD Module is not connected or is connected improperly, all RTD information will be removed from the metering display.

Setpoint item 2 determines whether the temperatures displayed from the RTDs are in degrees F or degrees C. Pressing either the Raise or Lower pushbutton causes the display to toggle between the following messages:

RTD IN F
RTD IN C

The temperature range displayed is from 32-390°F, and from 0-199°C. The IQ-1000 II software calculates all temperatures using degrees C and then displays the value in degrees C or degrees F, depending on setpoint item 2. When degrees C is selected, displayed RTD values are incremented in one degree steps. If degrees F is selected, RTD values increment in either one or two degree steps (this is due to rounding off the conversion calculations for display purposes; accuracy of the RTD setpoints is not affected).

8.3.1 Setpoint Items 3 and 7, Stator Winding Temperature —The IQ-1000 II is capable of monitoring the temperature of a motor's stator windings and using this data to determine the motor protection curve.

Table 8.A

ALPHABETIZED FUNCTION LISTING

Function	Paragraph
Anti-backspin delay	8.17
Auxiliary temperature (alarm)	8.3.4
Auxiliary temperature (trip)	8.3.4
Current transformer ratio	8.28
Differential trip on remote input	8.22
Frequency (50/60 Hz)	8.19
Full-load amperes	8.18
Ground fault run delay	8.4.3
Ground fault start delay	8.4.2
Ground fault trip level	8.4.1
Incomplete sequence	8.16
Instantaneous overcurrent enable/disable	8.5.1
Instantaneous overcurrent start delay	8.5.3
Instantaneous overcurrent % FLA	8.5.2
I^2T alarm level	8.8
I^2T reset	8.9
Jam alarm level	8.10.1
Jam run delay	8.10.4
Jam start delay	8.10.3
Jam trip level	8.10.2
Locked-rotor current	8.6.1
Locked-rotor time (stall time)	8.6.2
Load bearing temperature (alarm)	8.3.3
Load bearing temperature (trip)	8.3.3
Manual reset	8.9
Motor bearing temperature (alarm)	8.3.2
Motor bearing temperature (trip)	8.3.2
Motor stop on remote input	8.22
Operating modes	8.2
Operations count reset	8.14.3
Phase unbalance alarm	8.12.1
Phase unbalance run delay	8.12.2
Phase unbalance trip	8.13
Reset on remote input	8.22
Reset Disable	8.22
Reversing/Non-Reversing	8.21
Run time reset	8.14.4
Starts allowed	8.14.1
Time (for starts) allowed	8.14.2
Transition current level	8.15.1
Transition time	8.15.2
Trip/transition on time out	8.15.3
Trip relay mode 1	8.20.1
Trip relay mode 2	8.20.2
Trip on remote input	8.22
Ultimate trip	8.7
Underload alarm level	8.11.1
Underload run delay	8.11.4
Underload start delay	8.11.3
Underload trip level	8.11.2
Winding temperature (alarm)	8.3.1
Winding temperature (trip)	8.3.1

Individual setpoint values can be selected for both trip and alarm conditions. These settings apply to all winding RTDs. The function is displayed in the program menu as:

WD T xxx
WD A xxx

Here the letters T and A represent trip and alarm, respectively. The letters xxx represent the user-chosen value. These program menu items are numbered 3 and 7 in Table 8.B.

The ranges of available setpoint values are:

Trip:	0-199°C / 32-390°F (in 1°C increments)
Alarm:	0-199°C / 32-390°F (in 1°C increments)

8.3.2 Setpoint Items 4 and 8, Motor Bearing Temperature — The IQ-1000 II is capable of monitoring two motor bearing RTDs.

Individual setpoints can be selected and entered for both trip and alarm conditions. The function is displayed in the program menu as:

MB T xxx
MB A xxx

Here the letters T and A represent trip and alarm, respectively. The letters xxx represent the user-chosen value. These menu items are numbered 4 and 8 in Table 8.B.

The ranges of available setpoint values are:

Trip:	0-199°C / 32-390°F (in 1°C increments)
Alarm:	0-199°C / 32-390°F (in 1°C increments)

8.3.3 Setpoint Items 5 and 9, Load Bearing Temperature — The IQ-1000 II is capable of monitoring two of the motor's load bearing temperatures.

Individual setpoints can be selected and entered for both trip and alarm conditions. The function is displayed in the program menu as:

LB T xxx
LB A xxx

Here the letters T and A represent trip and alarm, respectively. The letters xxx represent the user-chosen value. These menu items are numbered 5 and 9 in Table 8.B.

The ranges of available setpoint values are:

Trip:	0-199°C / 32-390°F (in 1°C increments)
Alarm:	0-199°C / 32-390°F (in 1°C increments)

8.3.4 Setpoint Items 6 and 10, Auxiliary Temperature — The IQ-1000 II is capable of monitoring one auxiliary temperature.

Individual setpoints can be selected and entered for both trip and alarm conditions. The function is displayed in the program menu as:

AX T xxx
AX A xxx

Here the letters T and A represent trip and alarm, respectively. The letters xxx represent the user-chosen value. These menu items are numbered 6 and 10 in Table 8.B.

The ranges of available setpoint values are:

Trip:	0-199°C / 32-390°F (in 1°C increments)
Alarm:	0-199°C / 32-390°F (in 1°C increments)

The auxiliary RTD can be used to monitor a separate temperature, such as motor case temperature.

8.4 Ground Fault — The IQ-1000 II's ground fault function provides protection against excessive ground leakage currents. Use of this function requires an external 50:5 ground fault current transformer to be installed in the application. The turns ratio assumed by the IQ-1000 II is always 50:5. This setpoint function can only be applied to a grounded system, as described in Paragraph 7.1.6.

There are three distinct setpoints associated with this function. These are:

- Trip level (in primary amperes)
- Start delay (in cycles)
- Run delay (in cycles)

Assuming a ground fault transformer is being used, all three of these setpoint functions must be "used" in the IQ-1000 II. The delay functions can be defeated by setting the start delay to 1 line cycle and the run delay to 0 line cycles. If no ground fault current transformer is connected, these setpoints are ignored and no ground fault protection is provided.

NOTE

If the run delay is set to 0, trips may occur at a lower current level than specified due to the sampling used in maintaining the high speed response of this function.

8.4.1 Setpoint Item 11, Ground Fault Trip Level — The IQ-1000 II has a selectable ground fault trip level above which a trip will occur after the specified start and run delays. The set point is defined in amperes. The ground fault trip level is displayed in the program menu as:

GF xx

Here the letters xx represent the user-determined current level above which a trip condition occurs. This menu item is numbered 11 in Table 8.B.

The range of available setpoint values is:

Trip:	1-12 amperes (in 1 ampere increments)

8.4.2 Setpoint Item 12, Ground Fault Start Delay — The IQ-1000 II provides a start lockout delay to allow the ground current that can be generated by power factor correction capacitors during starting to clear. The application of a start delay is described in Paragraph 8.1.1.

The ground fault start delay function is displayed in the program menu as:

GFSD xx

Here the letters xx represent the user-determined delay, which, when reached, allows a trip condition to be initiated. This menu item is numbered 12 in Table 8.B.

The range of available set point values is:

Start delay: 1-20 AC line cycles
(in 1 cycle increments)

8.4.3 Setpoint Item 13, Ground Fault Run Delay — The IQ-1000 II provides a run delay to prevent momentary disturbances in the system from causing a nuisance trip. The application of a run delay is described in Paragraph 8.1.2.

The ground fault run delay function is displayed in the program menu as:

GFRD xx

Here the letters xx represent the user-determined delay, which, when reached, allows the trip condition. This menu item is numbered 13 in Table 8.B.

The range of available setpoint values is:

Run delay: 0-10 AC line cycles
(in 1 cycle increments)

** Disable setting for GFRD — 0 cycle **

8.5 Instantaneous Overcurrent Protection — The IQ-1000 II's instantaneous overcurrent function monitors motor current on a continuous basis. It requires no more than two line cycles to detect a trip condition. Because of the magnitudes of current that can be seen in an instantaneous overcurrent, no run delay is provided.

There are three distinct setpoints associated with this function. These are:

- Instantaneous overcurrent enable/disable
- Instantaneous overcurrent trip level (in percent of **peak** full-load amperes)
- Instantaneous overcurrent start delay (in cycles)

(Paragraph 7.1.3.1 details those application conditions involved in selecting the appropriate value.)

8.5.1 Setpoint Item 14, Instantaneous Overcurrent Enable/Disable — The instantaneous overcurrent (IOC) can be disabled for applications where current in excess of 1600% of full-load amps can occur in normal operation.

The display will toggle between the following two messages:

IOC ON   IOC OFF

If the IOC OFF message is displayed when leaving Program mode, the IOC set points will be ignored and an IOC trip will never be acknowledged. This menu item is numbered 14 in Table 8.B.

8.5.2 Setpoint Item 15, Instantaneous Overcurrent Trip

NOTE

When IOC OFF is selected, the IOC trip level (menu item 15) and IOC start delay value (menu item 16) will have a "–" displayed next to them in the Program Display.

Level in % Full-load Amperes — The IQ-1000 II provides an instantaneous overcurrent trip level in percent of the **peak** full-load amps. This provides the fastest response possible when a fault condition occurs.

NOTE

The chosen setpoint value **must** be equal to, or higher, than 1.6 times the locked-rotor current ratio (provided by the motor manufacturer).

NOTE

For the IOC trip level to be effective, set it below your fuse interrupting rating *or* your contactor withstand rating.

The instantaneous overcurrent function, in percent of full-load amperes, is displayed in the program menu as:

IOC xxxx

Here the letters xxxx represent the user-determined level, which, when reached, allows a trip condition. This menu item is numbered 15 in Table 8.B.

The range of available setpoint values is:

Trip: 300-1600%
of full-load amperes
(in 1% increments)

NOTE

When IOC OFF (setpoint item 14) is selected, the IOC trip level will have a "–" displayed next to it in the Program Display.

NOTE

When IOC trips occur, the displayed metered values will normally not reflect the actual fault current. This is due to the averaging used to calculate the display value.

8.5.3 Setpoint Item 16, Instantaneous Overcurrent Start Delay — The IQ-1000 II provides a start delay to allow the unit to ride through the first cycles of inrush current during starting. The application of a start delay is described in Paragraph 8.1.1. (For more details on the motor's start and stop cycles, refer to Paragraph 7.2.)

The instantaneous overcurrent start delay setpoint function is displayed in the program menu as:

IOCSD xx

Here the letters xx represent the user-determined delay.

This menu item is numbered 16 in Table 8.B.

The range of available setpoint values is:

Delay: 1-20 AC line cycles
(in 1 cycle increments)

8.6 Locked-Rotor Protection — Two IQ-1000 II functions operate together to specify a point on the motor damage curve. These trip condition components are:

- Locked-rotor current (in percent of full-load amperes)
- Locked-rotor time or stall time (in seconds)

This current level and time, when reached, create a locked-rotor trip condition

(More information on how these setpoint functions affect the motor protection curve is contained in Paragraphs 7.1.3.2 and 7.1.4.)

NOTE

The locked-rotor current and the maximum allowable stall time values must be obtained from the motor manufacturer.

CAUTION

The rotor temperature protection algorithm uses the locked-rotor current and the maximum allowable stall time values to calculate the rotor protection curve. Incorrectly chosen set point values for these functions can result in excessive rotor temperatures and eventual motor damage.

8.6.1 Setpoint Item 17, Locked-Rotor Current — The locked-rotor current value specified by the motor manufacturer is the current a motor will draw if the rotor is stalled. This set point along with the stall time defines the thermal capacity of the motor.

The locked-rotor current function is displayed in the program menu as:

LRC xxxx

Here the letters xxxx represent the level determined by the motor manufacturer. This menu item is numbered 17 in Table 8.B.

The range of available setpoint values is:

Current: 300-1200%
of full-load amperes
(in 1% increments)

8.6.2 Setpoint Item 18, Locked-Rotor Time (Stall Time) — The maximum allowable stall time function specifies the amount of time a locked-rotor condition can be maintained before damage is done to the motor. This value is supplied by the manufacturer and is used in conjunction with the locked-rotor current.

The stall time setpoint function is displayed in the program menu as:

LRT xx

Here the letters xx represent the maximum allowable time determined by the motor manufacturer. This menu item is numbered 18 in Table 8.B. The range of available setpoint values is:

Time: 1-60 seconds
(in 1 second increments)

8.7 Setpoint Item 19, Ultimate Trip — The ultimate trip function defines the current level above which a trip will eventually happen. This value represents an asymptotic line on the motor damage curve below which the motor will never be damaged.

This setpoint is used when RTDs are not employed to define the level above which the I^2T accumulator will start to migrate toward a trip. If a service factor is supplied with the motor, it can be multiplied times the full-load amp rating to give the maximum ultimate trip level. For example, a motor with a 1.25 service factor can use an ultimate trip level of 125 percent of full load. (Paragraph 7.1.3.3 describes application considerations related to value selection.)

Some possible reasons for using a conservative approach to set the ultimate trip below 100% are:

- When ambient temperatures above 40°C are anticipated and the optional RTD Module is **not** used in the application. (Environmental temperature considerations are discussed in Paragraph 7.1.3.6.)
- When the motor is properly rated, yet additional safety is critical for the application.

CAUTION

If the ultimate trip set point value is **above** 100% and the motor does **not** have a service factor rating higher than 1, motor damage can result.

The ultimate trip function is displayed in the program menu as:

UTC xxx

Here the letters xxx represent the user-determined percent of full-load amperes for the ultimate trip level. This menu item is numbered 19 in Table 8.B.

The range of available setpoint values is:

Trip: 85-125%
of full-load amperes
(in 1% increments)

8.8 Setpoint Item 20, I^2T Alarm — The I^2T alarm function refers to the current-squared multiplied-by-time algorithm discussed at Paragraph 3.2.2. The accumulated I^2T is directly proportional to the rotor temperature. The I^2T trip is a level selected in percent of the I^2T trip value. This gives the user some idea of how close to a trip the IQ-1000 II is since the I^2T trip point is derived from the programmed motor parameters and maintained internally. (The maximum rotor temperature trip point is explained in Section 3.)

This function also determines when the I^2T trip condition can be reset, as described in Paragraph 8.9. The closer to 100% the alarm is set, the sooner the motor can be restarted; however, the motor inrush may create another trip if the motor has not been allowed to cool.

The I^2T alarm function is displayed in the program menu as:

I^2TA xxx

Here the letters xxx represent the user-entered percent, at which level the alarm condition is initiated. This menu item is numbered 20 in Table 8.B.

The range of available setpoint values is:

Alarm: 60-100%
of the I^2T trip level
(in 1% increments)

** Disable setting for I^2TA — 100% of trip **

The I^2T alarm level is explained on the Help screen as I^2T ALARM LEVEL IN % I^2T TRIP. The actual trip level is calculated by the IQ-1000 II internally, as discussed in Paragraph 3.2.2.

NOTE

The I^2T accumulator is cleared every time the IQ-1000 II is placed in Program mode. This can be used to clear an I^2T trip without waiting for the motor to cool.

8.9 Setpoint Item 21, I^2T Reset Function — The reset function allows either manual or automatic resetting from a locked rotor or an I^2T trip. In the automatic mode, the IQ-1000 II will reset an I^2T trip after the I^2T accumulator has cooled below the I^2T alarm level discussed in Paragraph 8.8 or is cleared in Program mode.

In the manual mode, an I^2T trip must be reset by the user in one of three ways **after** the I^2T accumulator has cooled below the I^2T alarm level. One is to push the Reset button on the IQ-1000 II operator's panel. The second is to set the remote input setpoint to the reset mode (menu item 46) and apply 120 VAC across terminals 8 and 9 on the back of the IQ-1000 II. The third way to reset an I^2T trip is to issue a command over the communications port from a host computer.

With this function, either MAN RST or AUTO RST **must** be selected for every application. Pressing either the Raise or Lower pushbutton causes the display to toggle between the two following messages:

MAN RST AUTO RST

This menu item is numbered 21 in Table 8.B.

8.10 Jam Functions — The IQ-1000 II provides a jam function for initiating an alarm or a trip for mechanical failures in a driven load. (More information on the jam functions is given in Paragraph 7.1.3.5.)

There are four distinct setpoints associated with the jam function. These are:

- Alarm level (in % FLA)
- Trip level (in % FLA)
- Start delay (in seconds)
- Run delay (in seconds)

8.10.1 Setpoint Item 22, Jam Alarm Level — The jam alarm level set point function specifies the current level above which an alarm condition is initiated (this level is measured as a percent of full-load amperes).

The jam alarm level setpoint function is displayed in the program menu as:

JMA xxxx

Here the letters xxxx represent the user-entered percent of full-load amperes. This menu item is numbered 22 in Table 8.B.

The range of available setpoint values is:

Alarm: 100-1200%
of full-load amperes
(in 1% increments)

** Disable setting for JMA — 1200% **

If the jam alarm level is not disabled, it should be set at a value below the jam trip level (setpoint item 23).

8.10.2 Setpoint Item 23, Jam Trip Level — The jam trip level set point function specifies the current level above which a trip condition is initiated (this level is measured as a percent of full-load amperes).

The jam trip level setpoint function is displayed in the program menu as:

JMT xxxx

Here the letters xxxx represent the user-entered percent of full-load amperes. This menu item is numbered 23 in Table 8.B.

The range of available setpoint values is:

Trip: 100-1200%
of full-load amperes
(in 1% increments)

** Disable setting for JMT — 1200% **

8.10.3 Setpoint Item 24, Jam Start Delay — The IQ-1000 II provides a start delay to allow high inertia loads to be accelerated over a long period of time without a nuisance trip. The application of a start delay is described in Paragraph 8.1.1. The jam start delay function is displayed in the program menu as:

JAMS xx

Here the letters xx represent the number of seconds selected to block out the jam function. This menu item is numbered 24 in Table 8.B.

The range of available setpoint values is:

Start delay: 0-60 seconds
(in 1 second increments)

** Disable setting for JAMS — 0 seconds **

8.10.4 Setpoint Item 25, Jam Run Delay — The IQ-1000 II provides a jam run delay to allow for heavy loads which are loaded and unloaded, such as a conveyer belt drive. The application of a run delay is described in Paragraph 8.1.2.

The jam run delay function is displayed in the program menu as:

JAMR xxx

Here the letters xxx represent the user-selected delay, at which time the trip occurs. This menu item is numbered 25 in Table 8.B.

Table 8.B

SET POINT RECORD SHEET

Program Date ______________________ **Control Schematic** ______________________

Unit ID/Starter Type ______________________ **W. Order #** ______________________

Motor HP __________ **Mfgr.** __________ **Serial** __________ **Volts** __________

FLA __________ **LRA** __________ **Stall Time** __________ **Accel Time** __________

SF __________ **RTD Type** __________ **Other** __________

Item No.	Program Menu Display[1, 2]	Selected Value	Set Point Ranges Selection	Set Point Disable Value
0	S VER XX SOFTWARE VERSION NUMBER[3]	N/A	N/A	
1	X PHASE SINGLE PHASE TEST MODE OR THREE PHASE PROTECTION MODE		Toggles between 1 PHASE and 3 PHASE	
2	RTD IN X RTD TEMP IN DEGREES F OR DEGREES C		Toggles between RTD IN F and RTD IN C	
3	WD T XXX WINDING TEMP TRIP IN DEGREES		0-199°C / 32-390°F (1° incre.)	
4	MB T XXX MOTOR BEARING TRIP IN DEGREES		0-199°C / 32-390°F (1° incre.)	
5	LB T XXX LOAD BEARING TRIP IN DEGREES		0-199°C / 32-390°F (1° incre.)	
6	AX T XXX AUXILIARY TRIP IN DEGREES		0-199°C / 32-390°F (1° incre.)	
7	WD A XXX WINDING TEMP ALARM IN DEGREES		0-199°C / 32-390°F (1° incre.)	
8	MB A XXX MOTOR BEARING ALARM IN DEGREES		0-199°C / 32-390°F (1° incre.)	
9	LB A XXX LOAD BEARING ALARM IN DEGREES		0-199°C / 32-390°F (1° incre.)	
10	AX A XXX AUXILIARY ALARM IN DEGREES		0-199°C / 32-390°F (1° incre.)	
11	GF XX GROUND FAULT TRIP LEVEL IN AMPS		1-12 amps (1 amp. incre.)	12
12	GFSD XX GROUND FAULT START DELAY IN CYCLES		1-20 AC cycles (1 cycle incre.)	
13	GFRD XX GROUND FAULT RUN DELAY IN CYCLES		0-10 AC cycles (1 cycle incre.)	0
14	IOC XX ENABLE OR DISABLE INSTANTANEOUS OVERCURRENT FUNCTION		Toggles between IOC ON and IOC OFF displays	IOC OFF
15	IOC XXXX INSTANTANEOUS OVERCURRENT IN % FLA[5]		300-1600% (1% incre.)	

Table 8.B

SET POINT RECORD SHEET (Cont'd)

Item No.	Program Menu Display[1,2]	Selected Value	Set Point Ranges Selection	Set Point Disable Value
16	IOCSD XX INSTANTANEOUS OVERCURRENT START DELAY IN CYCLES		1-20 cycles (1 cycle incre.)	
17	LRC XXXX LOCKED ROTOR CURRENT IN % FLA		300 to 1200% (1% incre.)	
18	LRT XX MAXIMUM ALLOWABLE STALL TIME IN SECONDS		1-60 sec. (1 sec. incre.)	
19	UTC XXX ULTIMATE TRIP CURRENT IN % FLA		85-125% (1% incre.)	
20	I^2TA XXX I^2T ALARM LEVEL IN % I^2T TRIP		60-100% (1% incre.)	100
21	MAN RST[4] AUTO RST[4] AUTO OR MANUAL I^2T RESET		Toggles between MAN RST and AUTO RST displays	
22	JM A XXXX JAM ALARM LEVEL IN % FLA		100-1200% (1% incre.)	1200
23	JM T XXXX JAM TRIP LEVEL IN % FLA		100-1200% (1% incre.)	1200[6]
24	JAMS XX JAM START DELAY IN SECONDS		0-60 sec. (1 sec. incre.)	
25	JAMR XXX JAM RUN DELAY IN SECONDS		0-240 sec. (1 sec. incre.)	240
26	UL A XX UNDERLOAD ALARM LEVEL IN % FLA		0-90% (1% incre.)	0
27	UL T XX UNDERLOAD TRIP LEVEL IN % FLA		0-90% (1% incre.)	0
28	ULSD XXX UNDERLOAD START DELAY IN SECONDS		0-100 sec. (1 sec. incre.)	
29	ULRD XX UNDERLOAD RUN DELAY IN SECONDS		1-10 sec. (1 sec. incre.)	1
30	PU A XX PHASE UNBALANCE ALARM LEVEL		10-50% (1% incre.)	50[6]
31	PURD XXX PHASE UNBALANCE ALARM RUN DELAY IN SECONDS		0-240 sec. (1 sec. incre.)	
32	I^2T TRIP[4] 2 SEC[4] 2 SECOND DELAY OR I^2T TRIP ON PHASE UNBALANCE		Toggles between I^2T TRIP and 2 SEC displays	
33	ST/T XX STARTS PER TIME ALLOWED		1-10 starts/ time (incre. of 1)	1

Table 8.B

SET POINT RECORD SHEET
(Cont'd)

Item No.	Program Menu Display[1, 2]	Selected Value	Set Point Ranges Selection	Set Point Disable Value
34	T/ST X TIME ALLOWED FOR STARTS COUNT IN MINUTES		0 to 240 minutes duration (1 minute incre.)	0
35	OP COUNT[4] RST OCNT[4] RESET FOR OPERATIONS COUNTER		Toggles between OP COUNT and RST OCNT	OP COUNT
36	RUN TIME[4] RST RT[4] RESET FOR RUN TIME		Toggles between RUN TIME and RST RT displays	RUN TIME
37	TRNC XXX MOTOR START TRANSITION CURRENT LEVEL IN % FLA		50-150% (1% incre.)	150
38	TRNT XXX MOTOR START TRANSITION TIME IN SECONDS		0-240 sec. (1 sec. incre.)	0
39	TRN TOUT[4] TRP TOUT[4] TRANSITION OR TRIP ON TIME OUT		Toggles between TRN TOUT and TRP TOUTdisplays	TRN TOUT
40	INSQ XX INCOMPLETE SEQUENCE REPORT BACK TIME IN SECONDS		1-60 sec. (1 sec. incre.)	
41	ABKS XXX ANTI-BACKSPIN DELAY TIME IN SECONDS		0-600 sec.	0
42	FLA XXXX FULL-LOAD AMPS		10-3000 amps (1 amp incre.)	
43	FREQ 50[4] FREQ 60[4] 50 OR 60 HERTZ LINE FREQUENCY		Toggles between FREQ 50 and FREQ 60 displays	
44	MODE 1[4] MODE 2[4] TRIP MODE 1 — TRIP RELAY ENERGIZES ON TRIP CONDITION[4] TRIP MODE 2 — TRIP RELAY ENERGIZES ON POWER UP AND DE-ENERGIZES ON TRIP CONDITION[4]		Toggles between MODE 1 and MODE 2	
45	NON REV[4] REV[4] REVERSING OR NONREVERSING STARTER		Toggles between REV and NONREV displays	

Table 8.B

SET POINT RECORD SHEET
(Cont'd)

Item No.	Program Menu Display[1, 2]	Selected Value	Set Point Ranges Selection	Set Point Disable Value
46	REM RST[4] REM TRIP[4] DIF TRIP[4] MTR STOP[4] RST DBL[4] REMOTE INPUT — RST FOR REMOTE RESET — TRIP FOR REMOTE TRIP — DIF TRIP FOR DIFFERENTIAL TRIP — MTR STOP FOR MOTOR STOP DETECTION — RST DBL FOR RESET DISABLE		Toggles between REM TRIP, REM RST, DIF TRIP, MTR STOP	
47	MAX XXX[4] 4-20 MA MAX OUTPUT — 100 FOR 100 PERCENT FLA — 125 FOR 125 PERCENT FLA — %I2T FOR PERCENT I2T TRIP — WRTD FOR MAXIMUM WINDING RTD TEMP		Toggles between MAX100, MAX125. MAX%I2T and MAXWRTD displays	
48	AUX XXXX TRIP STATE FOR AUX TRIP RELAY		Toggles between ALL, IOC, I2T, GFLT, JAM, UL, MBT, LBT, WT and REV displays[4]	
49	TRIP XXX RESET FOR NUMBER OF TRIPS		Toggles between TRIP CNT and TRIP RST displays[4]	TRIP CNT
50	MAX XXX RESET FOR MAXIMUM VALUES		Toggles between MX R-EBL, MX RESET and MX R-DBL displays[4]	MX R-DBL
51	XXX PGM ENABLE UNIT TO BE PROGRAMMED WHILE MOTOR IS RUNNING		Toggles between RUN PGM and STOP PGM	
52	X/5 XXXX CT RATIO — X TURNS TO 5		Available CT turns:5 ratios are: 10, 20, 25, 40, 50, 75, 100, 125, 150, 200, 250, 300, 400, 500, 600, 800, 1000, 1200, 1500, 2000, 2500, 3000, 4000	

NOTES:

1. The letters X used here represent the setpoint variables.
2. Press the Help pushbutton to initiate the help display of the complete message shown here. The display scrolls right to left.
3. The software version number is used by Westinghouse. There is no selection associated with it. All correspondence with Westinghouse should refer to the specific software version number installed in the IQ-1000 II.
4. One of these choices must be selected.
5. IOC trip setting should be lower than your Fuse Interrupting Rating *or* your Contactor Withstand Rating.
6. Set start and run delays to maximum values to disable trip/alarm functions.

The range of available setpoint values is:

Run delay: 0- 240 seconds
(in 1 second increments)

8.11 Underload Functions — The IQ-1000 II's underload functions initiate an alarm or a trip condition if the motor's driven load drops **below** a selected value for a selected time. (More information about underload is given in Paragraph 7.1.3.4.)

There are four distinct setpoints associated with the underload function. These are:

- Alarm level (in % FLA)
- Trip level (in % FLA)
- Start delay (in seconds)
- Run delay (in seconds)

8.11.1 Setpoint Item 26, Underload Alarm Level — The underload alarm level function specifies the current level at which the IQ-1000 II alarm contacts change state because of a reduced current.

The underload alarm level setpoint function is displayed in the program menu as:

ULA xx

Here the letters xx represent the alarm level in percent of full-load amperes. This menu item is numbered 26 in Table 8.B.

The range of available setpoint values is:

Alarm: 0-90%
of full-load amperes
(in 1% increments)

** Disable value for ULA — 0% of full-load amps **

If the underload alarm level is not disabled, it should be set at a value above the underload trip level (setpoint item 27).

For example, if the underload trip level is set at 80% of full load amperes, the underload alarm level should be set to some value between 81% to 90% of full load amperes. This ensures that an alarm indication will be present before a trip condition is reached.

8.11.2 Setpoint Item 27, Underload Trip Level — The underload trip level function specifies the current level at which the IQ-1000 II assumes the motor lost its load and trips the motor off line.

The underload trip level setpoint function is displayed in the program menu as:

ULT xx

Here the letters xx represent the trip level in percent of full-load amperes. This menu item is numbered 27 in Table 8.B.

The range of available setpoint values is:

Trip: 0-90%
of full-load amperes
(in 1% increments)

** Disable value for ULT — 0% of full-load amps **

8.11.3 Setpoint Item 28, Underload Start Delay — The IQ-1000 II provides a start delay to allow a motor to be started while unloaded and to reach full speed before the load is applied. The application of a start delay is described in Paragraph 8.1.1.

The underload start delay function is displayed in the program menu as:

ULSD xxx

Here the letters xxx represent the user-selected delay, at which time the trip occurs. This menu item is numbered 28 in Table 8.B.

The range of available setpoint values is:

Delay: 0-100 seconds
(in 1 second increments)

8.11.4 Setpoint Item 29, Underload Run Delay — The IQ-1000 II provides a run delay for varying loads such as a power factor corrected motor which is run at very light loads intermittently. The application of a run delay is discussed in Paragraph 8.1.2.

The underload run delay function is displayed in the program menu as:

ULRD xx

Here the letters xx represent the underload run delay. This menu item is numbered 29 in Table 8.B.

The range of available setpoint values is:

Run delay: 1-10 seconds
(in 1 second increments)

8.12 Phase Unbalance Functions — The IQ-1000 II's phase unbalance functions monitor the AC line for a possible phase unbalance condition of the actual motor currents.

There are two distinct setpoints associated with this function. These are:

- Alarm level (in % unbalance)
- Run delay (in seconds)

Exceeding these two setpoints, however, does not cause a trip condition. (The functions described in Paragraph 8.13 control the phase unbalance trip condition.)

(Keep in mind that unbalance-detection factors are also incorporated into the I^2T protection algorithm. Should the calculated negative sequence current become too high due to a combination of excessively high current levels and/or a phase unbalance condition, the IQ-1000 II will trip as a locked-rotor trip.)

8.12.1 Setpoint Item 30, Phase Unbalance Alarm Level — The phase unbalance alarm level specifies the point where an out-of-balance phase condition initiates an alarm condition. The alarm level is in percent of unbalance, calculated by comparing the ratio of the negative sequence current to the positive sequence current (see Paragraph 3.2.2 for more details). If the negative sequence is 10% of the positive sequence, there is a 10% unbalance between I_A, I_B, and I_C.

The phase unbalance alarm setpoint function is displayed in the program menu as:

PU A xx

Here the letters xx represent the phase unbalance alarm level above which an alarm condition exists. This menu item is numbered 30 in Table 8.B.

The range of available setpoint values is:

Alarm: 10%-50%
of unbalance
(in 1% increments)

** Disable setting for PU A — 50% unbalance **
(Same level as a phase loss trip; see Paragraph 8.13.)

NOTE

If a phase unbalance alarm is active and the unbalance condition is removed, the alarm is reset automatically.

8.12.2 Setpoint Item 31, Phase Unbalance Alarm Run Delay —The IQ-1000 II provides a run delay to allow for power system voltage variations which could cause short term unbalance conditions. The application of a run delay is described in Paragraph 8.1.2.

The phase unbalance alarm run delay function is displayed in the program menu as:

PURD xxx

Here the letters xxx represent the user-selected delay, at which time the alarm is initiated. This menu item is numbered 31 in Table 8.B.

The range of available setpoint values is:

Delay: 0-240 seconds
(in 1 second increments)

8.13 Setpoint Item 32, Trip/Delay Phase Unbalance Function — A phase unbalance trip condition is defined as the negative sequence being equal to half of the positive sequence or a 50% phase unbalance (see Section 3 for more details).

The phase unbalance protection function provides a choice between (1) initiating a trip 2 seconds after the phase unbalance level is reached and (2) disabling this function to wait on an I^2T trip. The set 2-second delay on phase unbalance is necessary to prevent nuisance tripping associated with momentary disturbances in the system.

Waiting on the I^2T trip allows the motor to run until the last possible minute before tripping for critical applications where the motor must keep running as long as possible. One such application would be a chemical process which, if stopped, would ruin the material in the process.

With this function, one of these two choices **must** be selected for every application. Pressing either the Raise or Lower pushbutton causes the display to toggle between the two following messages:

I^2T TRIP 2 SEC

This menu item is numbered 32 in Table 8.B.

8.14 Starts, Time Functions — Two separate setpoint functions control the number of motor starts allowed within a given period of time. These are:

- Starts (number of starts per time period allowed)
- Time period allowed (for those starts)

Should the user-specified number of motor starts exceed the set point within the specified time period, any further start cycles are prevented until the oldest start is returned.

These functions must be "used" in the sense that the user must always make a set point entry for both. However, by following the procedures described below, they can, in effect, be disabled.

NOTE

The number of starts is cleared every time the IQ-1000 II is placed in the Program mode. This can be used to clear a starts/exceeded trip.

8.14.1 Setpoint Item 33, Starts Allowed — The starts (per time) allowed setpoint function specifies the maximum number of motor starts permitted (within a given period). If this set point is reached, an alarm condition will appear with the message "STEX XXX" on the display. STEX stands for "starts exceeded" and the XXX is the number of minutes the user must wait before the oldest start is restored. If the motor is stopped while this message is on the screen, the alarm will become a trip and the motor cannot be started until the oldest start is returned.

All starts, including aborted starts, are counted by this function.

The starts allowed setpoint function is displayed in the program menu as:

ST/T xx

Here the letters xx represent the user-selected maximum number of allowed starts. This menu item is numbered 33 in Table 8.B.

The range of available setpoint values is:

Starts: 1-10 starts
(within the time period)

This function can be indirectly disabled, thereby permitting an unlimited number of starts (see Paragraph 8.14.2 for details). If this function is indirectly disabled, any entry (1 thru 10) would be acceptable.

8.14.2 Setpoint Item 34, Time Allowed — The time allowed (for starts) setpoint function specifies the duration in which the maximum number of starts may occur. Each start has a "life span" equal to the time allowed setpoint. This means every start that is used will not be returned until it has been logged for the duration of this setpoint. This function works like a sliding window and will return starts in the same pattern they were used.

The setpoint is programmed in minutes in the Program mode. In the Protection mode, the display indicates the minutes remaining in the time period.

The time allowed setpoint function is displayed in the program menu as:

T/ST x

Here the letter x represents the user-selected time period in which the maximum number of starts is allowed. This menu item is numbered 34 in Table 8.B.

The range of available setpoint values is:

Time: 0-240 minutes
(in 1 minute increments)

** Disable setting for T/ST — 0 minutes **

By entering 0 minutes, the time allowed function is, in effect, disabled. Additionally, this entry disables the starts allowed function (item 33), thereby permitting an unlimited number of starts over any time period.

NOTE

When the time per allowed starts is set to 0, items 21 and 22 in Table 4.A will be displayed as "—" to denote this function is disabled.

8.14.3 Setpoint Item 35, Operations Counter Reset — The operations counter can be reset to zero while the IQ-1000 II is in the Program mode. If RST OCNT is the last message displayed while in Program mode, the operations counter will be set to zero when the keyswitch is placed in the Protection mode.

The display will toggle between the following two messages:

OP COUNT RST OCNT

As an example, this feature is useful for resetting the operations count after preventive maintenance has been performed on the motor.

This menu item is numbered 35 in Table 8.B.

8.14.4 Setpoint Item 36, Run Time Reset — The run time can be reset to zero while the IQ-1000 II is in the Program mode. If RST RT is the last message displayed while in the Program mode, the run time will be set to zero when the keyswitch is placed in the Protection mode.

The display will toggle between the following two messages:

RUN TIME RST RT

This feature is useful for resetting the run time after, for example, preventive maintenance has been performed on the motor.

This menu item is numbered 36 in Table 8.B.

8.15 Motor Start Transition — The IQ-1000 II provides a relay which can be set to energize on certain current levels or timing delays. User-programmmed setpoints are required for the transition current level (item 37), the transition time (item 38), and action to take on transition time out (item 39). This transition relay can be used to control:

- Soft-start type motor starts
- Low- and high-voltage reduced voltage motor starters
- Any type of clutch between the motor and the driven load. (The clutch will be engaged after the motor attains the desired speed.)

8.15.1 Setpoint Item 37, Motor Start Transition (Current Level) — The motor start transition (current level) function specifies the current level below which the IQ-1000 II's transition relay will be energized. The current level is measured as a percent of full-load amperes.

The primary transition function is based on current. The transition time (item 38) is used as a backup in case the motor stalls during starting. When 30% of full load is detected in any phase by the IQ-1000 II, a start is declared. The normal inrush currents of a motor (even a solid-state starter with the voltage phased back) will exceed any of the allowable transition current levels immediately. If the current in any phase falls below the transition level within the transition time, the transition relay is energized and will remain so until a stop or trip condition occurs (see Figure 8.1). Once a start has occurred, the current must go above the transition level within 8 line cycles or an immediate transition may be initiated.

The motor start transition setpoint function is displayed in the program menu as:

TRNC xxx

Here the letters xxx represent the user-selected current level below which point the transition relay will be energized. This menu item is numbered 37 in Table 8.B.

The range of available setpoint values is:

Current: 50-150%
of the full-load amperes rating
(in 1% increments)

If the transition relay is not used, the transition current should be set to the maximum setting of 150%

8.15.2 Setpoint Item 38, Motor Start Transition (Time) — The motor start transition (time) specifies the maximum duration, in seconds, of the motor's start or transition cycle. The transition time is used as a backup timer only when the IQ-1000 II has not transitioned on current. If this happens, the IQ-1000 II will force a transition or create a transition trip depending on the trip/transition set point (item 39).

(For more details on the motor's start and run cycles, refer to Paragraph 7.2.)

The motor start transition (time) setpoint function is displayed in the program menu as:

TRNT xxx

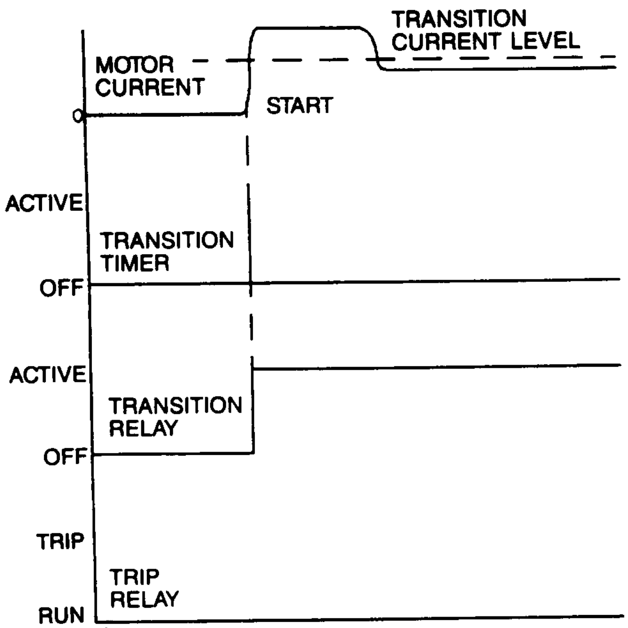
Here the letters xxx represent the user-selected duration of the start or "transition" cycle. This menu item is numbered 38 in Table 8.B.

The range of available setpoint values is:

Time: 0-240 seconds
(in 1 second increments)

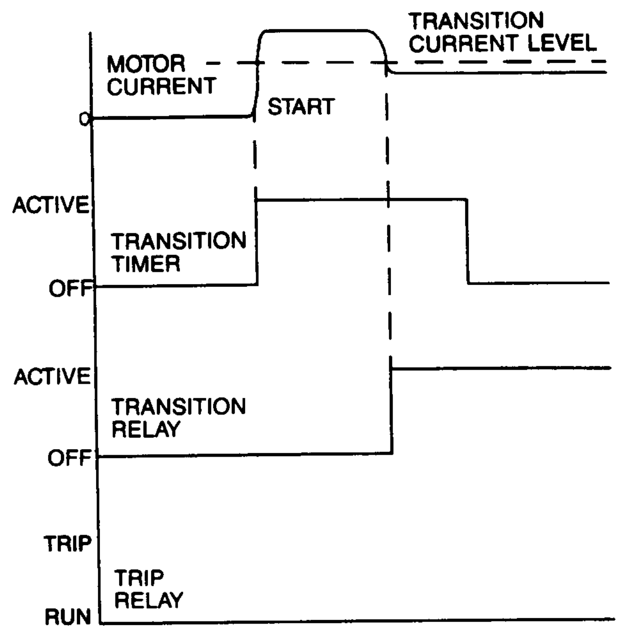
** Disable setting for TRNT — 0 seconds **

If the transition relay is not used (as in across the line starts), the transition current (item 37) should be set to a maximum (150%) and the transition time to 0 seconds to force an immediate transition (see Figure 8.1). However, if the transition current setpoint is set to a minimum to force the IQ-1000



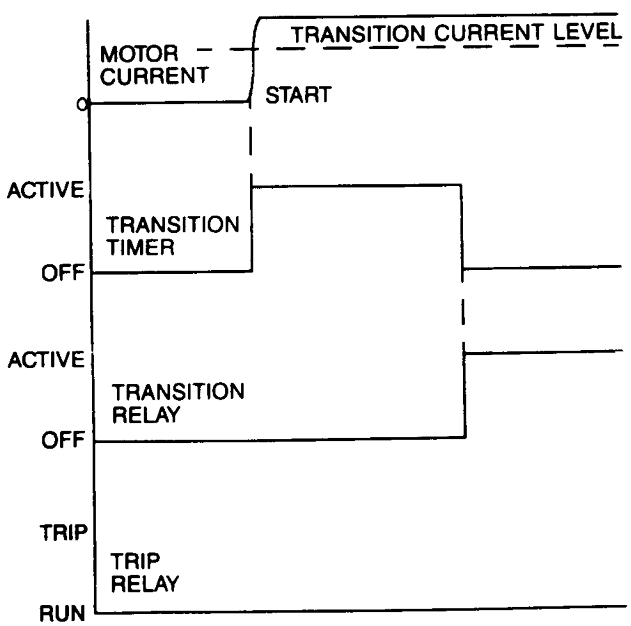
FULL VOLTAGE START (ACROSS-THE-LINE)

TRANSITION CURRENT (ITEM 37) = N/A
TRANSITION TIME (ITEM 38) = 0 SEC
TRIP/TRANSITION (ITEM 39) = TRANS



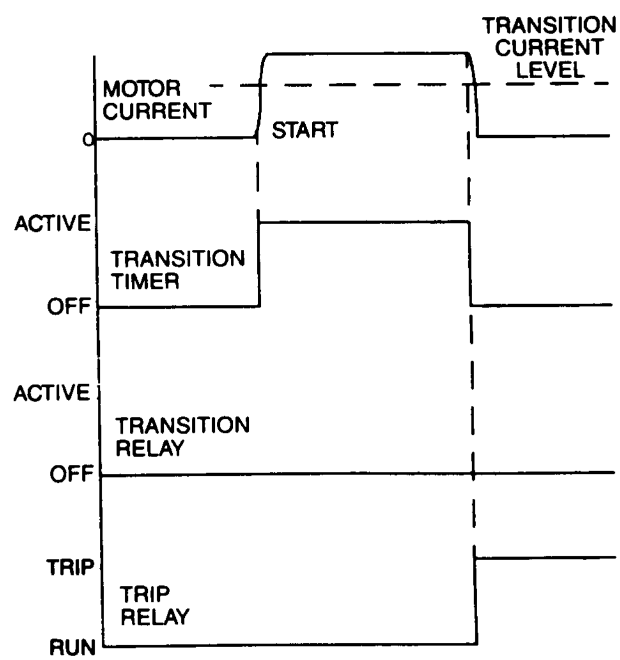
LOW-HIGH VOLTAGE TRANSITION

TRANSITION CURRENT (ITEM 37) ≥ NORMAL LOAD
TRANSITION TIME (ITEM 38) ≥ START TIME
TRIP/TRANSITION (ITEM 39) = USER'S CHOICE



FORCED TRANSITION ON TIME

TRANSITION CURRENT (ITEM 37) ≥ NORMAL LOAD
TRANSITION TIME (ITEM 38) ≥ START TIME
TRIP/TRANSITION (ITEM 39) = TRANS



FORCED SHUTDOWN ON TIME

TRANSITION CURRENT (ITEM 37) ≥ NORMAL LOAD
TRANSITION TIME (ITEM 38) ≥ START TIME
TRIP/TRANSITION (ITEM 39) = TRIP

Figure 8.1 — Transition /Trip on Time Out Timing

II to transition on time, the transition relay can be used as a generic timer controlled by the transition time. Care must be taken to insure the current will never fall below 50% (minimum transition current level setpoint) before the transition time elapses.

8.15.3 Setpoint Item 39, Trip/Transition on Time Out Function — The IQ-1000 II allows the user two alternatives when the transition time (item 38) expires before a transition on current is made. One alternative is to force the transition and energize the transition relay as shown in Figure 8.1. The other is to create a transition trip to shut down the motor as in Figure 8.1. A transition trip will generate a message of "TRANS" on the display.

With this function, pressing either the Raise or Lower pushbutton causes the display to toggle between the messages:

TRN TOUT   TRP TOUT

This menu item is numbered 39 in Table 8.B.

8.16 Setpoint Item 40, Incomplete Sequence Time — The incomplete sequence time (in seconds) operates in conjunction with the incomplete sequence terminals on the rear of the IQ-1000 II (terminals 9 and 10, see Figure 8.3). As the IQ-1000 II enters the RUN mode, the incomplete sequence timer starts its count. If the timer runs out (i.e., the time programmed at menu item 40 expires) before 120 VAC has been received across terminals 9 and 10, then the IQ-1000 II will generate a trip condition and will display the message "INC SEQ." If 120 VAC is received at terminals 9 and 10 before the timer runs out, the IQ-1000 II will acknowledge the signal, and the 120 VAC is no longer monitored. The timing cycle of events is shown in Figure 8.2.

One common use of this report back is with auxiliary contacts on a contactor to make sure that it closed. For example, it could be used in a conveyer belt line, where two motors are controlling segments in the conveyer line. If using an IQ-1000 II on the first motor, a signal could be input into the IQ-1000 II to ensure that the second motor on the conveyer line has started (i.e., the contactor has closed).

In another example, the report-back timer could be used in an application having an oil pump and a compressor. By wiring the oil pump control circuit into the incomplete sequence contacts, the IQ-1000 II can verify that the pump is running when the compressor is running. If the report-back contacts do not see 120 VAC from the pump before the timer runs out, the compressor will be shut off.

The incomplete sequence report-back function is displayed in the program menu as:

INSQ xx

Here the letters xx represent the incomplete sequence timer duration. This menu item is numbered 40 in Table 8.B.

The range of available setpoint values is:

Time: 1-60 seconds
(in 1 second increments)

> **NOTE**
> This function is disabled from the factory with jumpers from terminals 4 to 10 and 6 to 9. If using this function, remove the two jumpers.

8.17 Setpoint Item 41, Anti-backspin Delay — The anti-backspin delay function prevents a motor restart for the duration of the user-specified time.Timing begins concurrently with a trip or stop condition. This function guards against any attempt to start the motor while it is rotating in a reverse direction, as may be caused with certain types of loads. A typical example is the backspin of a pump and motor caused by the descent of a column of water after pumping is terminated.

The anti-backspin delay feature can also be used for special motors that must sit idle for a time before being restarted. For example, many air-conditioning motor manufacturers recommend that their motors not be restarted for one minute after

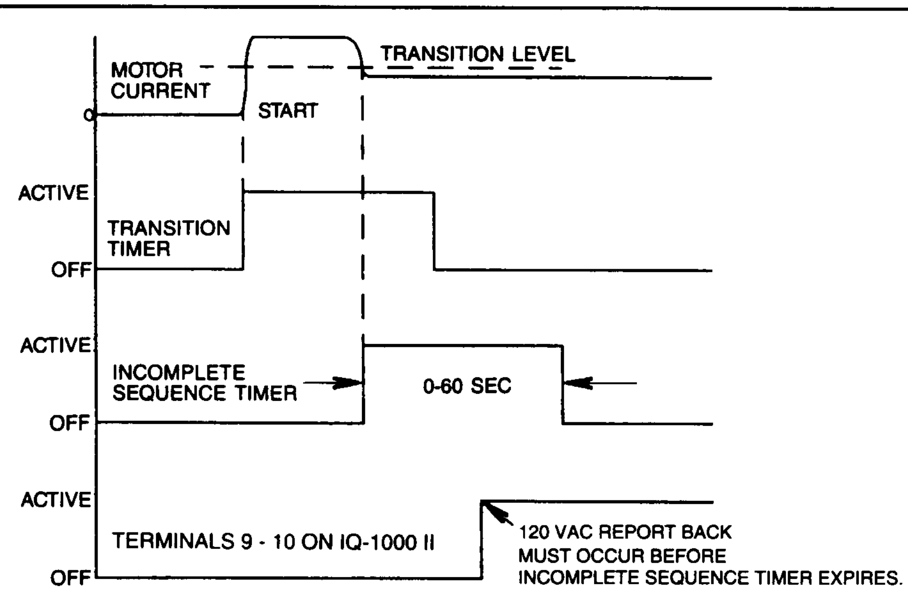


Figure 8.2 — Incomplete Sequence Timing

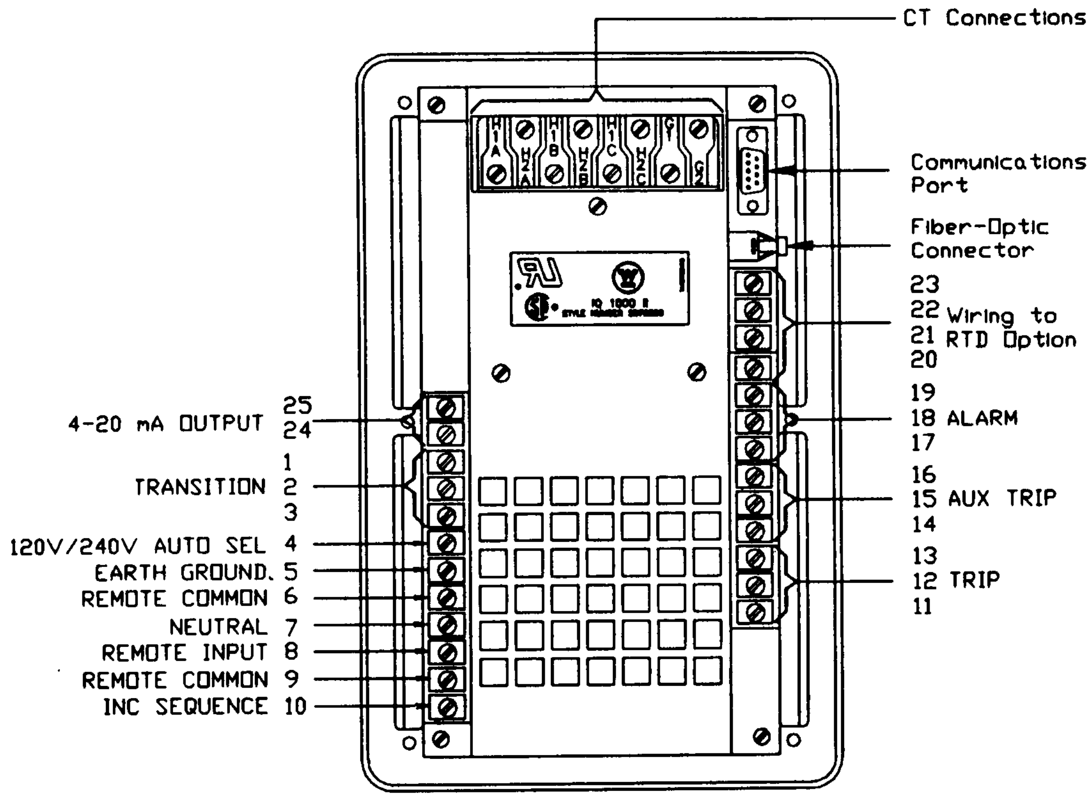


Figure 8.3 — IQ-1000 II Terminals

they have been turned off, to ensure that the motor has stopped. In a case like this, the IQ-1000 II could be programmed for 60 seconds to prevent the motor from being restarted until the timer runs out.

The anti-backspin delay function is displayed in the program menu as:

ABKS xxx

Here the letters xxx represent the user-specified duration. This menu item is numbered 41 in Table 8.B.

The range of available setpoint values is:

Time: 0-600 seconds
(in 1 second increments)

** Disable setting for ABKS — 0 seconds **

8.18 Setpoint Item 42, Full-load Amperes — The full-load amperes function specifies the maximum continuous RMS current that can be permitted in a motor stator.This value is determined by the motor manufacturer's full-load ampere rating at unity service factor.

Proper performance of the IQ-1000 II is directly dependent upon this user-entered variable. The full load ampere function is used in conjunction with the current transformer ratio (item 39) to scale the incoming currents into a per unit basis for calculation and then again to display metered values of current.

CAUTION

Many of the IQ-1000 II's protection functions, including the motor temperature protection algorithm, use the full-load ampere setpoint value to calculate trip points. If the user enters an incorrectly determined setpoint, motor damage can result.

NOTE

When in the run mode, the run-monitor percent of full-load current (monitor menu items % I_A, %I_B, % I_C) is established by the full-load amperes setpoint function.

The full-load amperes function is displayed in the program menu as:

FLA xxxx

Here the letters xxxx represent the manufacturer's recommended full-load amperes specification for the motor. This menu item is numbered 42 in Table 8.B.

The range of available setpoint values is:

Current: 10-3000 amperes
(in 1 ampere increments)

This function **must** be programmed into the IQ-1000 II.

8.19 Setpoint Item 43, Frequency — The IQ-1000 II may operate from either a 60 Hz or 50 Hz AC line. A selection must be made by means of the 50/60 Hz line frequency function. There are no hardware settings necessary.

The 50/60 Hz line frequency function is displayed in the program menu as:

FREQ 50 FREQ 60

With either of these two displays showing, pressing either the Raise or Lower pushbutton causes the other to appear.

This menu item is numbered 43 in Table 8.B.

NOTE

Selecting the wrong frequency can create an opto error trip if voltage is applied to the Remote Input terminal (8) or the Incomplete Sequence terminal (10).

8.20 Setpoint Item 44, Trip Relay Modes — One of two different Trip Relay reaction modes may be selected by the user in response to a number of operating conditions. These are:

Mode 1: Trip Relay is de-energized normally and energizes during a trip condition

Mode 2: Trip Relay is energized normally and de-energizes during a trip condition or loss of AC control power

One of these two selections must be made for each application. The selection depends on the desired effect of an AC power loss on an application, as described in Paragraphs 8.20.1 and 8.20.2.

8.20.1 Mode 1 — When Trip Mode 1 function is selected, the Trip and Auxiliary Trip Relays will energize only on a trip and auxiliary trip condition, respectively. The Trip/Auxiliary Trip Relays are in the de-energized state when any of the following conditions occur:

- When AC line power to the IQ-1000 II is lost or interrupted
- When certain IQ-1000 II hardware — such as a blown fuse or failed power supply — experiences an internal failure
- During normal motor run operations
- During the normal AC power-up sequence

The Trip/Auxiliary Trip Relays are only energized when a trip/auxiliary trip condition(s) is/are detected. The user should tie to the **normally-closed** contacts for normal operation.

The advantage of this setting is that the application's motor can continue to operate even though the IQ-1000 II has shut down.This situation could occur in those cases where the continuation of the process or running of the machine is more important than the immediate protection of the motor.

NOTE

It is the application engineer's responsibility to choose the NO/NC pair of Trip Relay and Auxiliary Trip Relay contacts to properly enable the motor contactor.

The Trip Mode 1 function is displayed in the program menu as:

MODE 1

In this case, pressing either the Raise or Lower pushbutton causes the MODE 2 display to appear.

This menu item is numbered 44 in Table 8.B.

8.20.2 Mode 2 — When Trip Mode 2 function is selected, the Trip and Auxiliary Trip Relays energize after power up initialization (approximately 6 seconds) and de-energize on a trip/auxiliary trip condition. The Trip/Auxiliary Trip Relays are in the energized state when any of the following conditions occur:

- After the normal AC power-up sequence
- During normal motor run operations

The Trip/Auxiliary Trip Relay(s) is/are de-energized when a trip/auxiliary trip condition is/are detected. The user should tie to the **normally-open** contacts for normal operation.

The advantage of this setting is that the application's motor is turned off when the IQ-1000 II stops operating. Here the continuation of the process or running of the machine is seen to be less valuable than the protection of the motor.

NOTE

It is the application engineer's responsibility to choose the NO/NC pair of Trip Relay and Auxiliary Trip Relay contacts to properly enable the motor contactor.

The Trip Mode 2 function is displayed in the program menu as:

MODE 2

In this case, pressing either the Raise or Lower pushbutton causes the MODE 1 display to appear.

This menu item is numbered 44 in Table 8.B.

8.21 Setpoint Item 45, Reversing/Non-reversing Starter — The reversing/non-reversing starter function specifies the type of starter actually used in the application.

The reversing/non-reversing starter is displayed as one of the following in the program menu:

REV NON REV

With either of these two displays showing, pressing either the Raise or Lower pushbutton causes the other to appear. This menu item is numbered 45 in Table 8.B.

This function **must** be properly selected and entered according to application requirements. If non-reversing is selected and the motor is reversed, a phase reversal trip will occur and the message "PH REVRS" will be displayed.

8.22 Setpoint Item 46, Trip/Reset/Differential Trip/Motor Stop on Remote Input — The trip/reset/differential trip on remote input function specifies which one of three available ways the REMOTE INPUT (terminal 8 on the back of the IQ-1000 II) will function. The remote input **must** be a **120 VAC** signal.

In the **trip** (REM TRIP) mode, the IQ-1000 II will generate a trip and display the message "REMOTE" on the display. If the Reset button is pushed or a reset command sent over INCOM, the trip will reset only if voltage has been removed from terminal 8.

When this function is placed in the **reset** (REM RST) mode, the IQ-1000 II will perform a reset according to the present mode of the unit. For example, if the unit is in the Program mode, it will return to the top of the program list. If the unit is in the Protection mode, it will display the status of the motor. This reset function will react in the same manner as pushing the Reset pushbutton.

In the **differential trip** (DIF TRIP) mode, the IQ-1000 II will generate a trip and display the message "DIF TRIP" on the display. If the Reset button is pushed or a reset command sent over INCOM, the trip will reset only if voltage has been removed from terminal 8.

In this case, the normally open relay of a separate, external differential relay should be wired to the REMOTE INPUT (terminal 8) on the rear of the IQ-1000 II. When the external relay detects a trip, the normally open relay will close, applying 120 VAC across terminals 8 and 9 on the back of the IQ-1000 II. At this time, the IQ-1000 II's trip relay will activate and the message "DIF TRIP" will be displayed.

When the **motor stop** (MTR STOP) function is selected, the IQ-1000 II will exit the "RUN" mode only when 120 VAC has been removed from terminal 8. This feature is primarily designed for applications using synchronous motors, when the motor is used for power factor correction. In these applications, motor current can drop to zero, causing the IQ-1000 II to enter the "READY -- 3" mode. When the IQ-1000 II enters the "READY -- 3" mode, the anti-backspin timer is initiated and all protection features (except for RTD temperature protection) are disabled.

In order to operate in applications similar to the one described above, a normally open auxiliary contact on the motor starter or contactor should be connected to terminals 8 and 9 on the IQ-1000 II. When the contactor opens, 120 VAC will be removed from these terminals. The IQ-1000 II will only exit the "RUN" mode after it has received a signal from the Remote Input terminal.

In the **reset disable** (RESET DBL) mode, the Reset pushbutton on the faceplate of the IQ-1000 II is disabled following a trip condition. When this mode is selected, the only way to reset the unit following a trip is by applying 120 VAC to terminal 8 of the IQ-1000 II. This feature can be used to prevent unauthorized personnel from resetting the unit and restarting the motor after a trip. This could be accomplished, for example, by connecting a pushbutton with padlock attachment between terminals 8 and 9. Only personnel with a key to the padlock would be able to reset the unit. The faceplate reset will operate as long as a trip or alarm is not present — as soon as trip or alarm is present faceplate reset will be disabled.

When this function is displayed, it will toggle between the following five messages:

RST DBL REM TRIP REM RST DIF TRIP MTR STOP

This menu item is numbered 46 in Table 8.B.

8.23 Setpoint Item 47, 4-20 mA Output Signal — The IQ-1000 II provides a 4-20 mA analog output signal at terminals 23 and 24 on the rear of the IQ-1000 II (see Figure 8.3). This signal can be input into an ammeter or programmable controller for external manipulation of parameters monitored by the IQ-1000 II.

If an input device to receive the analog signal is not present, there is no need to enter these values.

The 4-20 mA analog output is proportional to a user-selected parameter that is measured by the IQ-1000 II. The following parameters can be selected:

(1) 100% of Full Load Amps — the 4-20 mA signal is proportional to the average of the three-phase current values, with 100% of FLA equal to 20 mA. The 100% FLA analog output function is displayed in the program menu as:

MAX 100

(2) 125% of Full Load Amps — the 4-20 mA signal is proportional to the average of the three-phase current values, with 125% of FLA equal to 20 mA. The 125% FLA analog output function is displayed in the program menu as:

MAX 125

(3) Percent I^2T Trip Level — the 4-20 mA signal is proportional to the percent I^2T trip level, with 100% of the I^2T trip level equal to 20 mA. The percent I^2T trip analog output function is displayed in the program menu as:

MAX %I^2T

(4) Winding Temperature — the 4-20 mA signal is proportional to the maximum winding RTD temperature if RTDs are used. The winding RTD trip level (setpoint item 3) is equal to 20 mA. The winding temperature analog output function is displayed in the program menu as:

MAX WRTD

When this function is used, it will toggle between the following four messages:

MAX 100

MAX 125

MAX %I^2T

MAX WRTD

In the Program mode, pressing either the Raise or Lower pushbutton causes the display to step through the items displayed above.

This menu item is numbered 47 in Table 8.B.

8.24 Setpoint Item 48, Trip State for Auxiliary Trip Relay — The IQ-1000 II has one programmable form-C relay, the Auxiliary Trip relay. This relay can be programmed to activate only on certain trip conditions. This relay is labeled as terminals 14, 15 and 16 on the rear of the IQ-1000 II (see Figure 8.3). The following trip states can be programmed for the Auxiliary Trip relay:

AUX ALL — Auxiliary trip relay will change state for any trip condition detected by the IQ-1000 II.

AUX IOC — Auxiliary trip relay will change state only when the IQ-1000 II detects an Instantaneous Overcurrent trip condition (see Paragraph 8.5).

AUX I^2T — Auxiliary trip relay will change state only when the IQ-1000 II detects an I^2T trip condition (see Paragraph 8.8).

AUX GFLT — Auxiliary trip relay will change state only when the IQ-1000 II detects a Ground Fault trip condition (see Paragraph 8.4).

AUX JAM — Auxiliary trip relay will change state only when the IQ-1000 II detects a Jam trip condition (see Paragraph 8.10).

AUX UL — Auxiliary trip relay will change state only when the IQ-1000 II detects an Underload trip condition (see Paragraph 8.11).

AUX MBT — Auxiliary trip relay will change state only when the IQ-1000 II detects a Motor Bearing trip condition (see Paragraph 8.3.2).

AUX LBT — Auxiliary trip relay will change state only when the IQ-1000 II detects a Load Bearing trip condition (see Paragraph 8.3.3).

AUX WT — Auxiliary trip relay will change state only when the IQ-1000 II detects a Winding trip condition (see Paragraph 8.3.1).

AUX REV — Auxiliary trip relay will change state only when the IQ-1000 II detects a Motor Reversal trip condition (see Paragraph 8.21).

When this function is displayed in the Program mode, the following messages can be scrolled through using the Raise and Lower step buttons:

AUX ALL	AUX UL
AUX IOC	AUX MBT
AUX I^2T	AUX LBT
AUX GFLT	AUX WT
AUX JAM	AUX REV

This menu item is numbered 48 in Table 8.B.

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.
The Trip relay on the IQ-1000 II will always change state at the same time that the Auxiliary Trip relay changes state.

8.25 Setpoint Item 49, Reset Number of Trips — The IQ-1000 II is capable of storing the number of trips for most trip conditions. It will store the following:

- Number of Locked Rotor Current/I^2T trips
- Number of Instantaneous Overcurrent trips
- Number of Underload trips
- Number of Jam trips
- Number of Ground Fault trips
- Number of RTD trips

Each of these items can be reset to zero while the IQ-1000 II is in the Program mode. If the RST TRIP message is displayed last while in the Program mode, all trip counter values will be reset to zero when the keyswitch is placed in the Protection mode.

The display will toggle between the following two messages:

TRIP CNT   TRIP RST

This menu item is numbered 49 in Table 8.B.

8.26 Setpoint Item 50, Reset Maximum Values — The IQ-1000 II is capable of storing the following maximum values:

- Maximum phase current (in "RUN" cycle)
- Maximum winding RTD temperature

Both of these items can be reset to zero while the IQ-1000 II is in either the Protection or Program mode. The maximum value reset feature is displayed as one of the following in the program menu:

MX R–DBL   MX RESET   MX R–EBL

These items can be displayed individually by pressing the Raise or Lower pushbutton.

If the **max reset disable** (MX R–DBL) setpoint is selected, the IQ-1000 II will **not** reset any of the maximum values stored in the IQ-1000 II's non-volatile memory when the keyswitch is returned to the Protection mode.

If the **max reset** (MX RESET) setpoint is selected, the IQ-1000 II will reset all of the maximum values to zero when the keyswitch is returned to the Protection mode.

If the **max reset enable** (MX R–EBL) setpoint is selected, the IQ-1000 II will **not** reset any of the maximum values stored in the IQ-1000 II's non-volatile memory when the keyswitch is returned to the Protection mode. However, each maximum value can be reset to zero individually while it is being displayed on the faceplate of the IQ-1000 II. This menu selection allows values to be reset while the motor is running.

The display will toggle between the following three messages:

MX R–DBL   MX RESET   MX R–EBL

This menu item is numbered 50 in Table 8.B.

8.27 Setpoint Item 51, Run Program/Stop Program — This setpoint provides the user with two options when programming setpoints in the IQ-1000 II. This setpoint is displayed in the Program menu as:

RUN PGM
STOP PGM

Pressing the Raise or Lower pushbutton toggles the display between these two options.

If RUN PGM is selected, the motor may be started and/or run while programming the IQ-1000 II.

CAUTION

If setpoint 51 is set to RUN PGM, the motor may be started and/or run while programming the IQ-1000 II. When entering setpoints in the RUN PGM mode, all IQ-1000 II motor protection features are disabled and the motor is unprotected until the keyswitch is returned to the Protection position.

If STOP PGM is selected, the motor must be stopped in order to program setpoints into the IQ-1000 II. Placing the keyswitch to the Program position will not initiate the Program mode if the motor is running.

This menu item is numbered 51 in Table 8.B.

8.28 Setpoint Item 52, Current Transformer Ratio — The current transformer ratio function specifies the turns ratio of the application's current transformers.

CAUTION

Be careful when determining CT turns ratio. An improper value can cause the IQ-1000 II to receive incorrect motor current data. Motor damage could result.

Only the first factor of the ratio is entered for this setpoint. Thus, the entry of 250 represents 250:5. This value is used internally by the IQ-1000 II.

Available CT turns ratio setpoint values are:

10:5	100:5	400:5	1500:5
20:5	125:5	500:5	2000:5
25:5	150:5	600:5	2500:5
40:5	200:5	800:5	3000:5
50:5	250:5	1000:5	4000:5
75:5	300:5	1200:5	

The CT turns ratio function is displayed in the program menu as:

X/5 xxx

Here the letters xxx represent the digit/digits that appear in front of the ratio in the list above.

This item is numbered 52 in Table 8.B.

For setpoint entry purposes, refer to the application's wiring plan drawings for the correct CT ratio. Use the following criteria to select a current transformer:

- For optimum metering accuracy at low loads, select a unit which, at 100% full-load amperes, delivers from 3.5 to 4 amperes at the secondary. A CT which delivers 2.5 to 4 secondary amperes at 100% FLA is also adequate for reliable motor protection.
- Select the CT which supplies as close to 3.75 amperes as possible at 100% full-load amperes.

For example, assuming an application where the motor starter delivers 300 full-load amperes, a 400:5 primary-to-secondary ratio will deliver:

$$300 \times \frac{5}{400} = 3.75 \text{ amperes}$$

This is within the recommended range of 3.5 to 4.0 amperes. The CT ratio for this example would be 400:5.