

Quantum LX Motor Current Testing



Frick
BY JOHNSON CONTROLS

Johnson
Controls 

Quantum LX

Motor Current Testing




- The Quantum LX control panel is capable of reading external analog devices, such as Current transformers (CT) or other external devices, such as a VFD. It uses these input signals for the purpose of monitoring and control of the motor current.
- The Quantum LX will accept one or the other of these two different input signals on two separate analog board input connectors.
- Refer to the Quantum LX Analog board wiring diagram for detailed wiring and connections.
- Review the following instructions in their entirety before beginning the testing. Example Quantum LX screens and pictorials are provided for your reference.

Quantum LX

Motor Current Testing



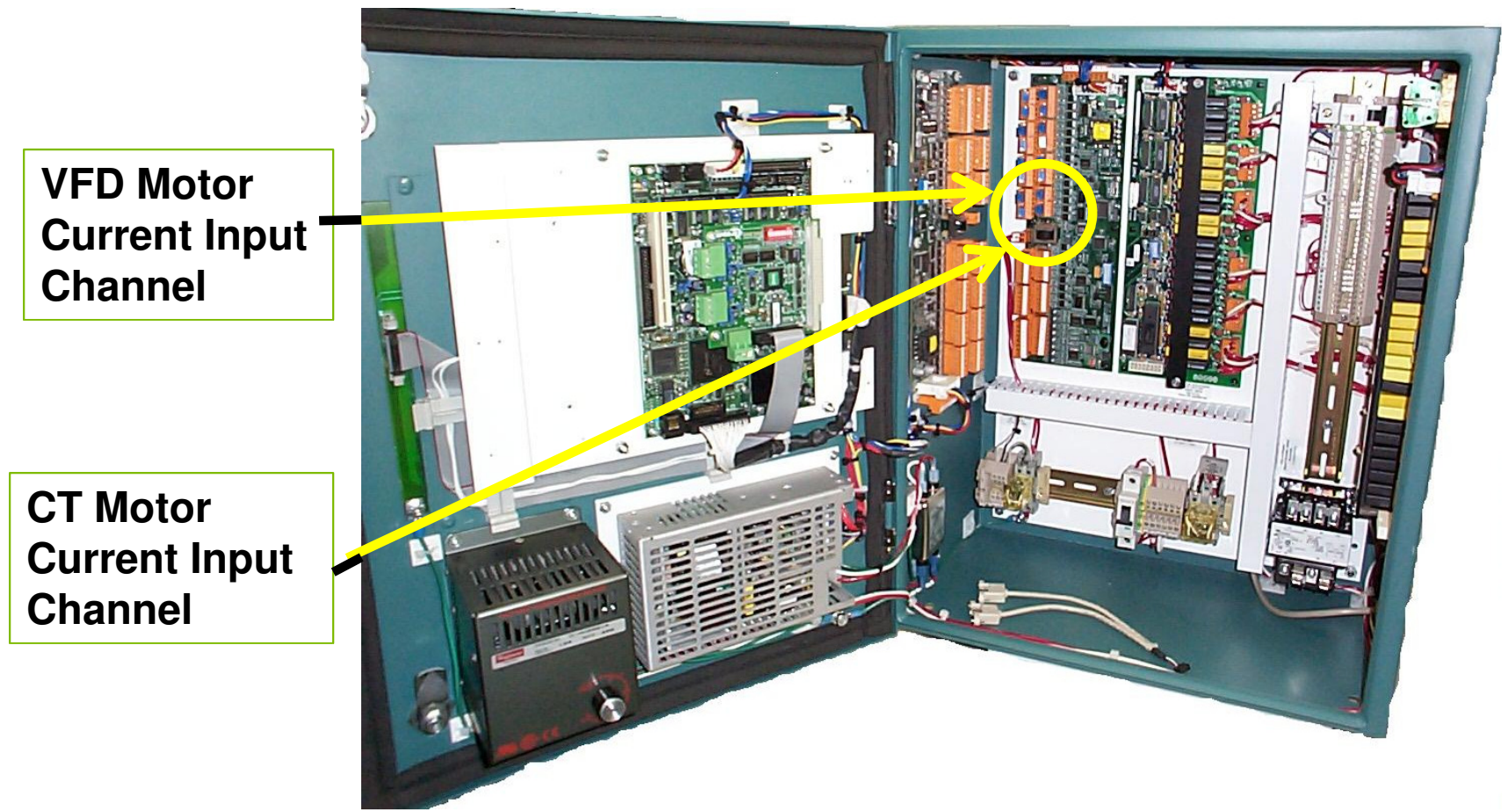
Motor Current from a CT or other external device

- The input signal from the CT enters the analog board on channel 16, directly from the CT.
-  When working with the CT, do not have the CT wires disconnected while the motor is running. High voltage will be present when the CT has no load.
- Always ensure that one side of the motor CT is grounded in the motor starter panel. The wire to the control panel terminal #2 is the only one grounded.
- The input from an external source, such as a 4-20 mA input from a VFD, enters the analog board on channel 16, directly from the VFD.

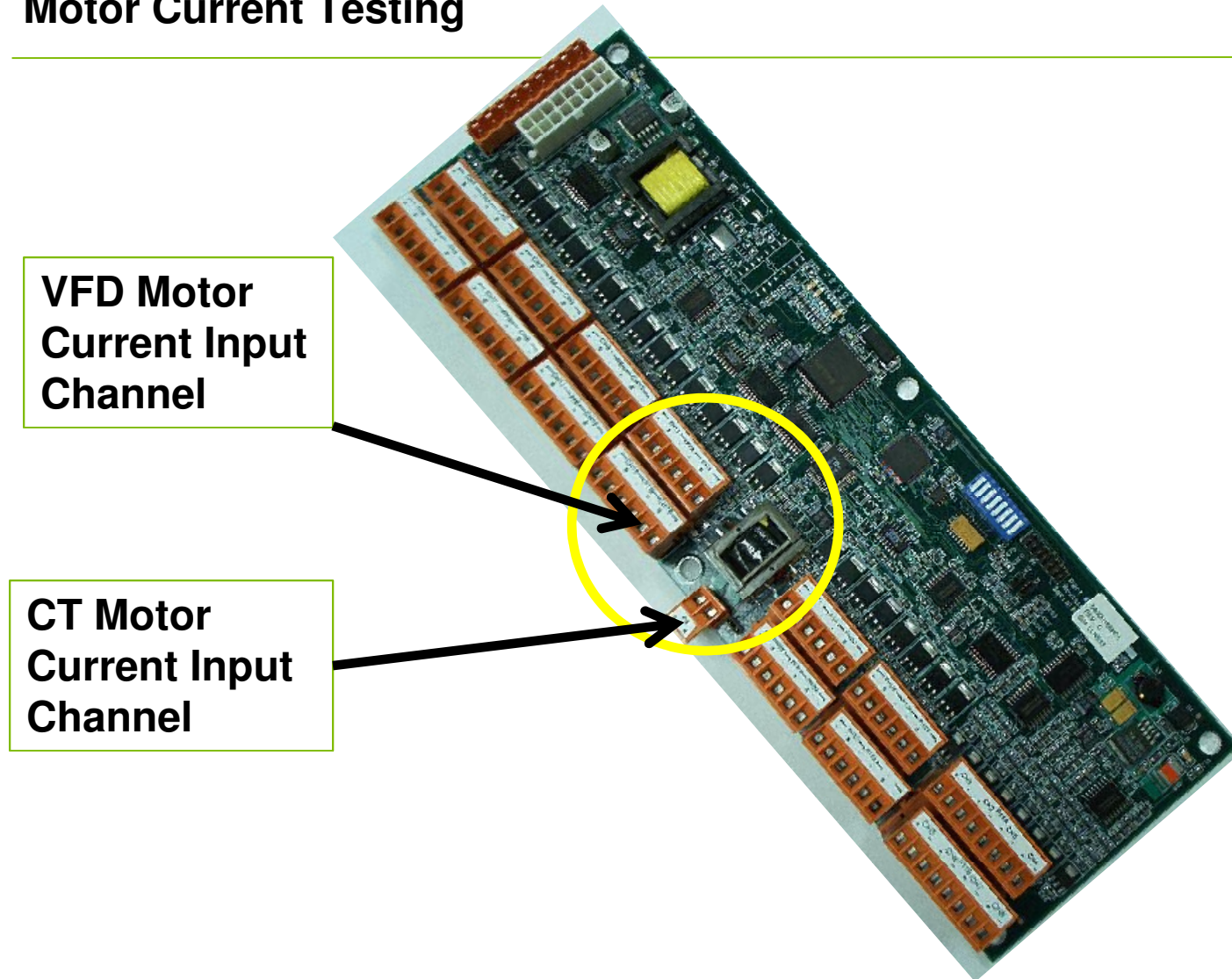
Analog Boards

- Channel 16 of the Analog Board #1 is dedicated to reading motor amps, either directly from a CT, or from an external DC mA or voltage device, such as from a VFD.
- When reading motor amps directly from a CT, the connection is at the P8 connector.
NOTE: The input signal cannot exceed 5 amps or the analog board will be damaged.
- If you are using an external DC mA or voltage device, such as from a VFD, the connection is at the connector P7B.
- The 0-5 amp input signal from the CT or the 4-20 mA input signal from the VFD can be viewed on the Quantum LX Service screen as a 0-5 vdc reading.

Quantum LX Motor Current Testing



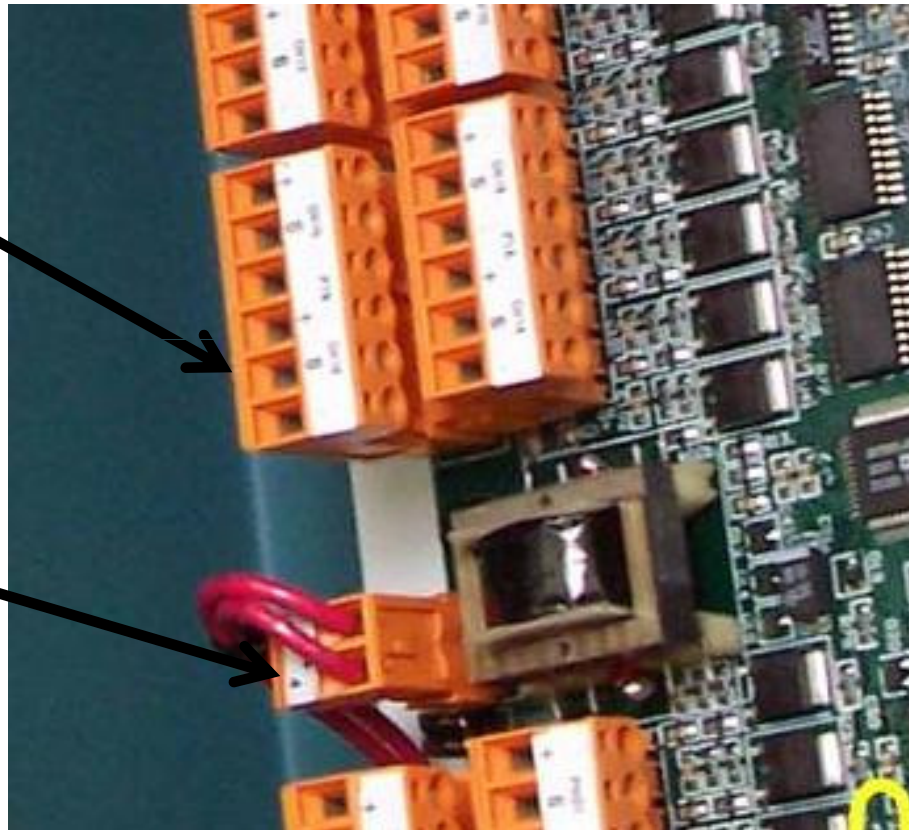
Quantum LX Motor Current Testing



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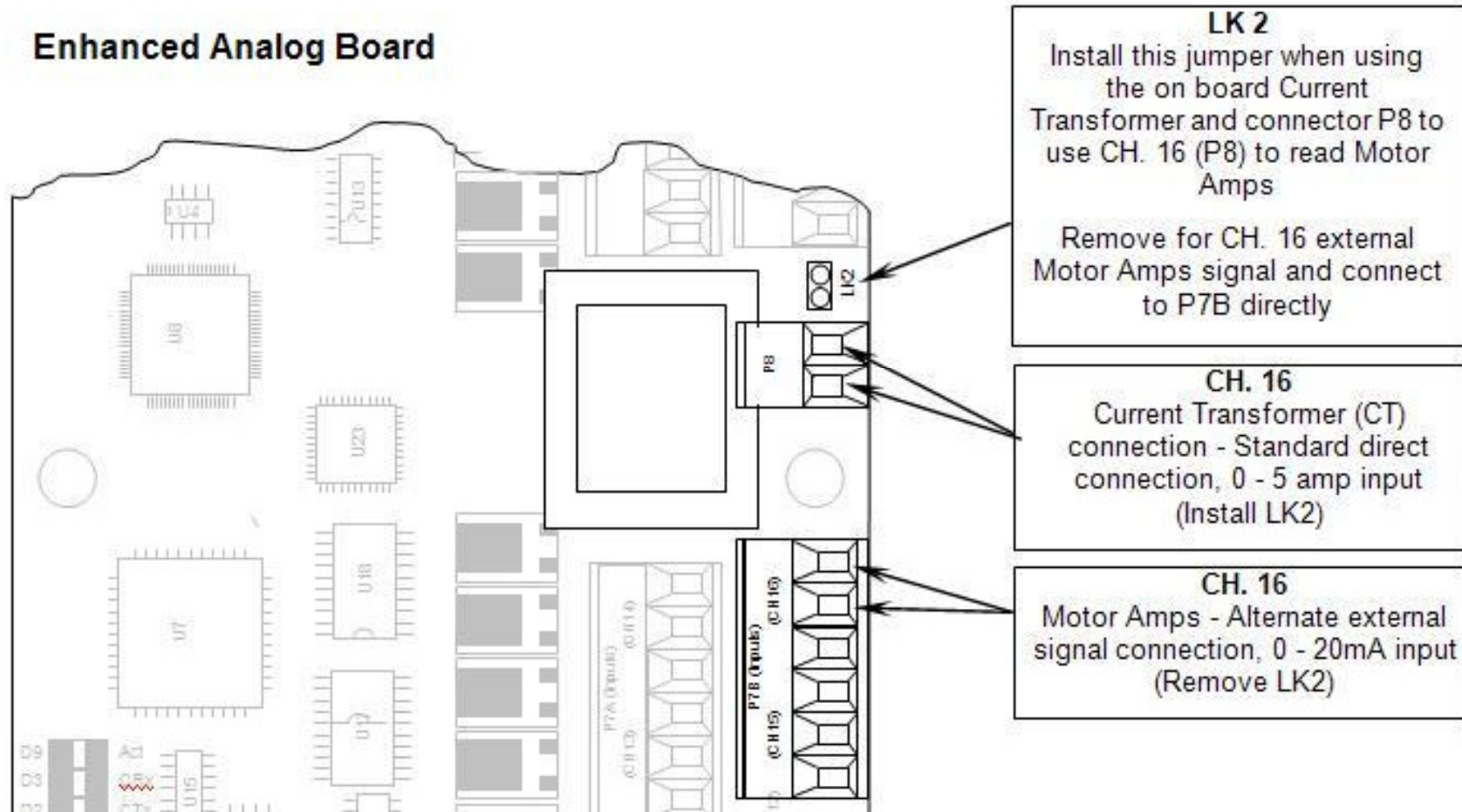
VFD Motor
Current Input
Channel

CT Motor
Current Input
Channel



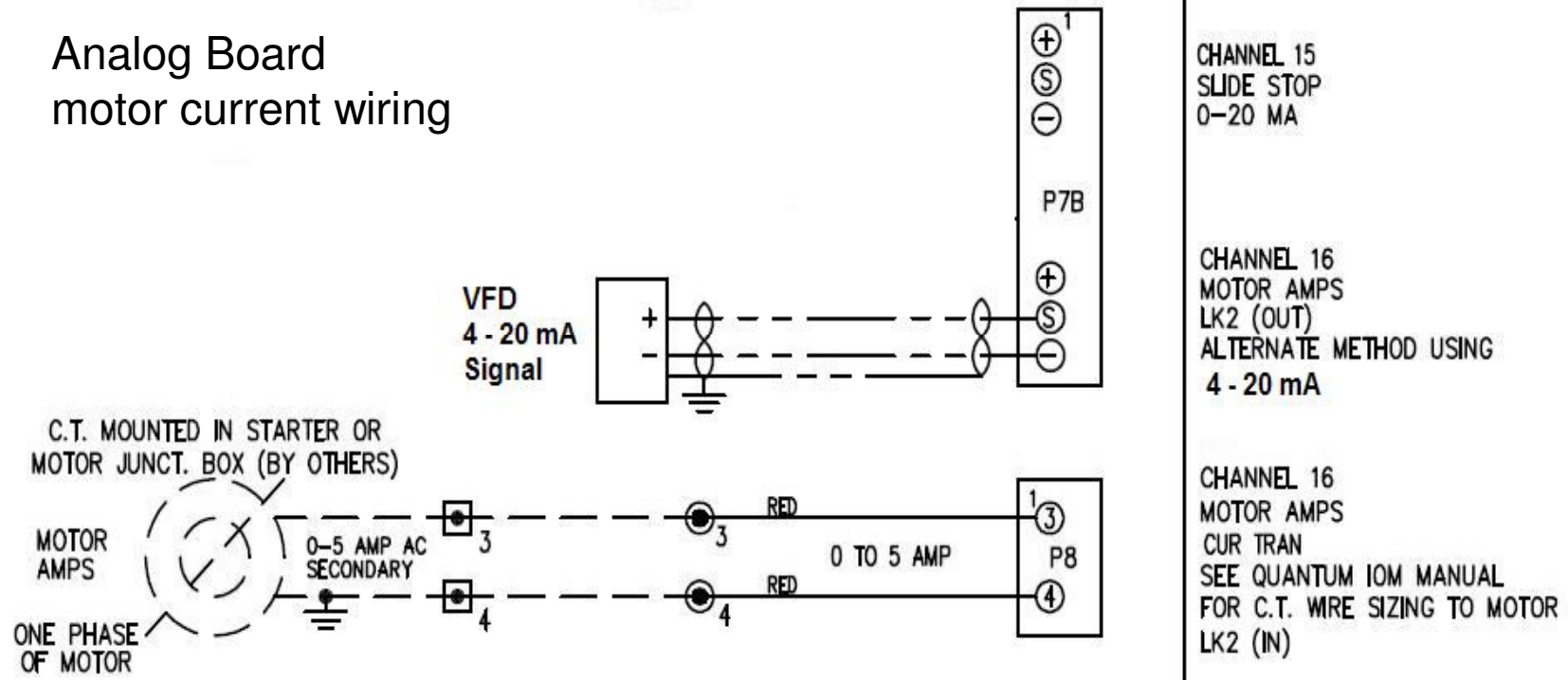
Quantum LX Motor Current Testing

Enhanced Analog Board



Quantum LX Motor Current Testing

Analog Board motor current wiring



Quantum LX

Motor Current Testing



Motor Current from a CT

- The motor CT is rated by its CT Factor. This is the ratio of the current transformer. The CT Factor of the motor CT must match the CT Factor programmed in the Quantum LX motor setpoint configuration.
- An example of a CT Factor is 300:5 (or a 300:5 ratio). This means with a 300 amp input (primary) to the CT, it will output (secondary) a 5 amp signal.
- A proper CT Factor is determined by the calculation of the FLA (full load amps) and the SF (service factor) of the motor.
- For example: $FLA \times SF \times 1.1 = \text{Recommended CT Factor (ratio)}$.
- $FLA (182) \times SF (1.15) \times 1.1 = 230.23$ or 300 (round up to the nearest 100th).
- So you would use a CT with a ratio of 300:5.
- Typically the CT will have the ratio printed on the side of the CT.

Quantum LX Motor Current Testing



**Motor
Setpoint
Data**



09:52:33
Apr 02 2010

Motor

Name Plate 0 AMPS

Motor Amps	182 AMPS
Volts	480
Service Factor	1.15
Horse Power	100
CT Factor	300

Recycle Delay: 20 MIN

Current Value: 00.00

Clear Recycle Delay

High Motor Amps

Load Inhibit	100 AMPS	
Force Unload	105 AMPS	Delay
Warning	110 AMPS	5 SEC
Shutdown	115 AMPS	5 SEC

Low Motor Amps Delay

Shutdown	25 AMPS	30 SEC
Confirmed Running Motor Amps	20 AMPS	
Starting Motor Amps Ignore Period	5 SEC	

Quantum LX

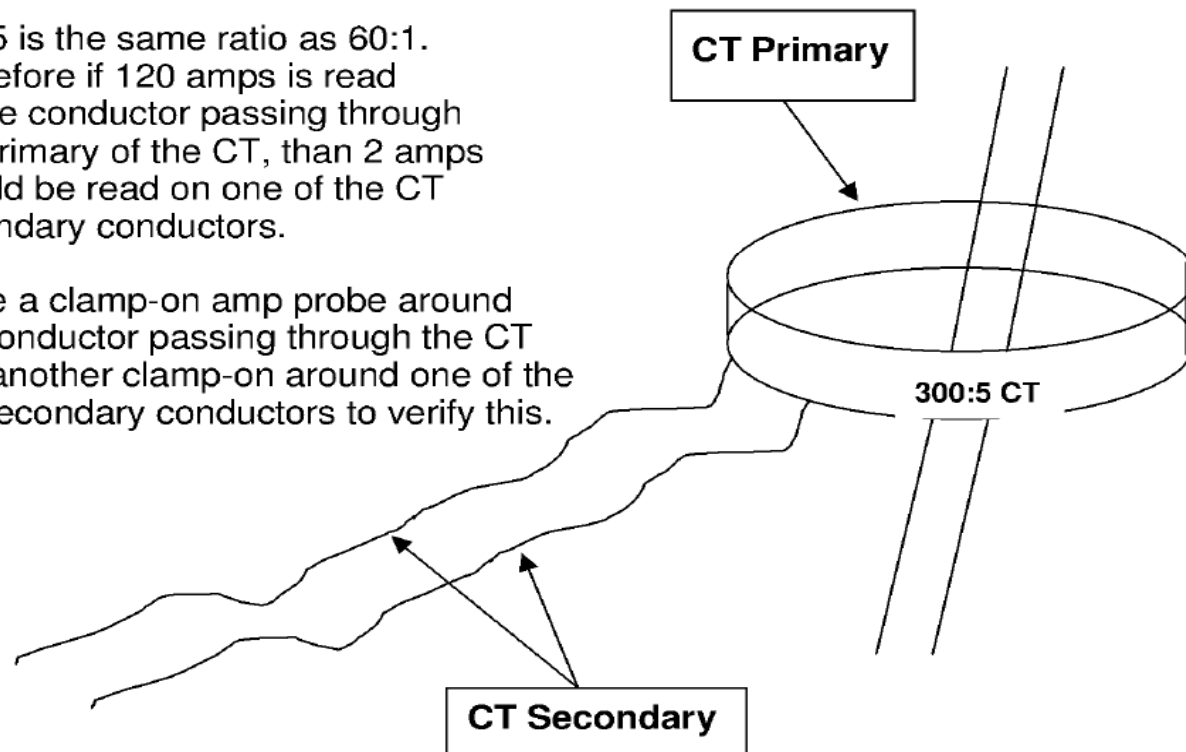
Motor Current Testing

Checking the motor current on the Primary and the Secondary of the CT

Tools: 1 clamp-on amp probe capable of reading amps equal to the primary of the CT ratio and one able to accurately read the secondary
In this case that would be 300 amps primary and 5 amps secondary.

300:5 is the same ratio as 60:1.
Therefore if 120 amps is read on the conductor passing through the primary of the CT, than 2 amps should be read on one of the CT secondary conductors.

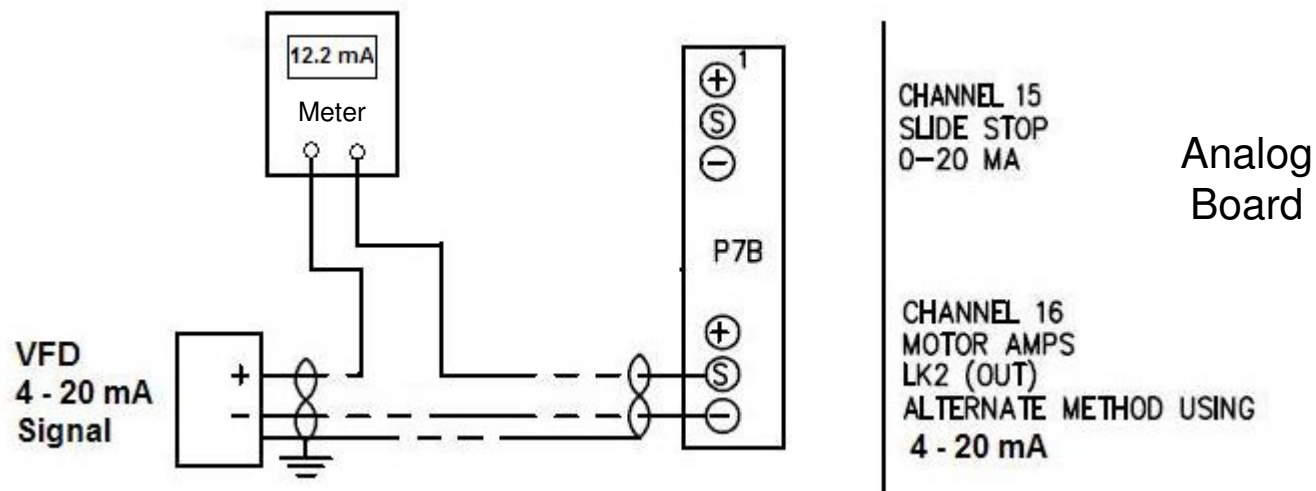
Place a clamp-on amp probe around the conductor passing through the CT and another clamp-on around one of the CT secondary conductors to verify this.



Quantum LX Motor Current Testing

Motor Current from a VFD

- The motor current signal from the VFD will typically be a 4-20 mA or a 0-10 vdc signal. The range of the output signal from the VFD will be programmed in the VFD.
- This signal from the VFD should be calibrated on the Quantum LX Motor Calibration screen.
- Measure the mA signal and compare this to the reading on the Quantum LX Operating Status screen, based on the output range of the VFD.



Quantum LX

Motor Current Testing



Motor Current on the Quantum LX

- The reading on the Quantum LX Service screen for analog board #1, channel 16, should match in volts, the amp reading of the clamp-on meter around the CT secondary conductor or the mA input from the VFD (20 mA = 5 vdc).
- The reading displayed on the Quantum LX Operating Status screen should match the reading on the clamp-on meter around the conductor passing through the primary of the CT or in the case of the VFD, the current output programmed in the VFD for the 4-20 mA signal based on the motor setpoint for the FLA in the Quantum LX.
- If this is off by not more than 15% of the motor FLA, go to the calibration screen for the motor current and correct (calibrate) the reading.

Quantum LX Motor Current Testing



Analog Inputs (data units are Volts DC)

Board 1 Channels

1	0.00	13	0.00
2	0.00	14	0.00
3	0.00	15	0.00
4	0.00	16	0.00
5	0.00		
6	0.00		
7	0.00		
8	0.00		
9	0.00		
10	0.00		
11	0.00		
12	0.00		

Analog Outputs (data units are Volts DC)

Board 1 Channels

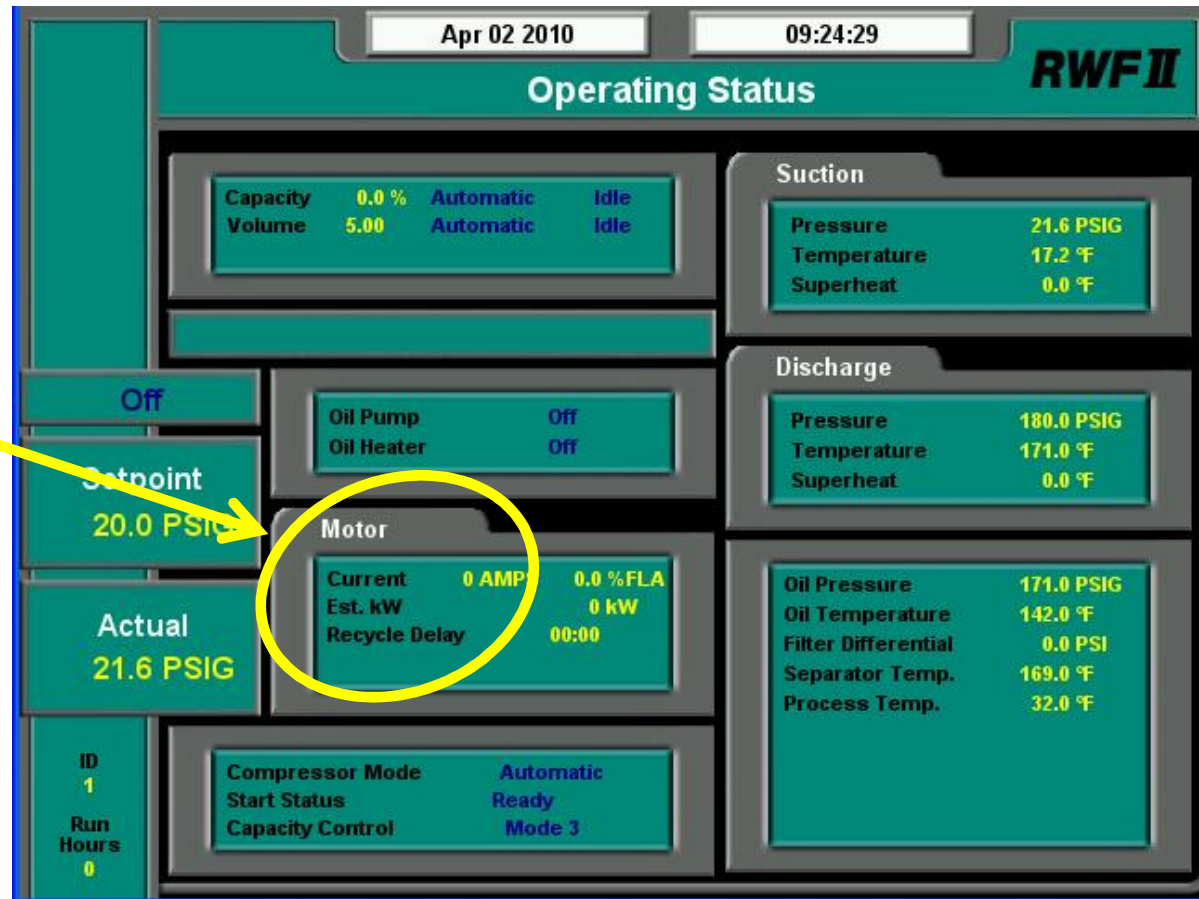
1	0.00	5	0.00
2	0.00	6	0.00
3	0.00	7	0.00
4	0.00	8	0.00

Motor Current (in volts)

Service Screen
User Level 2

Quantum LX Motor Current Testing

Motor
Current



Quantum LX Motor Current Testing



Motor Current Calibration

Feb 16 2010 11:06:44

Frick Calibration

Setpoint Off 20.0 PSIG
Actual 21.6 PSIG

Miscellaneous

	Current Value	Offset	Low	Range	High	Sensor Signal
Motor Amps	0 AMPS				300 AMPS	CT
Kilowatts	0 kW	0 kW	0 kW		5000 kW	4-20mA
RPM	0 RPM	0 RPM	0 RPM		3600 RPM	4-20mA

Enter actual motor amps to calibrate

Quantum LX

Motor Current Testing



Motor Current Calibration

- Note: It is important to calibrate the motor current when the compressor is fully loaded, at the proper VI and running at the intended high discharge pressure.
- If there are discrepancies in the readings, the problem could be with the CT (or VFD output), the wiring or the analog board. After troubleshooting, if you cannot find the cause of the discrepancies, accurately record the readings and contact Frick Service for assistance.