Diagnosing Hardware and Software Faults

2000 series, 5100 / 5200 series and 5300* series

*5300s when programmed using Quickstep

TechNote

48

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Hardware Fault Conditions – On-Steady Fault Light:

The On-Steady fault light condition is a known as a hardware fault. A hardware fault causes the CPU to be held in a reset condition by its on-board watch-dog circuitry. Possible causes and solutions are as follows:

1) Internal power supply issue
   a. Operating voltage is too low – Check input voltage.

2) A module in the controller's rack failed to initialize. Modules with on-board CPUs are initialized by the main CPU on power-up. A hardware fault, on-steady fault light, will result if any module in the rack fails to initialize.
   a. Power off the controller and unplug boards from backplane and repower to see if fault clears to off or blinking. *See next section for a software fault event.*

3) Loss of user program – requires a re-download of the (.dso) file
   a. Spent RAM battery – would require battery replacement. *See Appendix A at the end of this TechNote for battery replacement detail.*
   b. Program is lost due to extreme environmental conditions, e.g. power surge or extreme static electricity discharge.

4) The rare case the CPU has completely failed and requires replacement.

Depending on the nature of the fault you still may be able to communicate with the CPU and can connect to it using CTCMonitor to further analyze and resolve the issue. Refer to the '**Making Physical Connections'** and '**Monitoring Program Status**' sections later in this TechNote for further detail.

Types of Hardware Faults:

In a hardware fault, registers and flags remain in the states they were in at the time of the fault. Hardware control to the digital and analog outputs are disabled, thus turning them all off. Motor and Servo axes are disabled.

1) Corrupt Program Data
   a. The user program is lost. The program (.dso) file must be reloaded. *See Technote 46 for detail on downloading programs and NV registers.*

2) Watch dog / Hardware Fault
   a. The on-board watch-dog circuitry has disabled the CPU. Then try cycling power to clear this error. If the same fault occurs check power input or replace CPU.

Software Faults Conditions - Blinking Fault Light :

A blinking fault light condition is a software fault. On a software fault, <u>all</u> Quickstep program execution is stopped. The state of the controller's registers, flags, digital outputs and analog outputs remain at the states they were in at the time of the fault. *Refer to register#13009 in the Quick Reference Register Guide list for detail on turning off a digital out output on s software fault event. This output can be used to drop out an external EMO circuit.*

Motor and Servo axes running at the time of the fault will complete their profiled motions. Geared and cammed axes will remain operational.

Types of Software Faults:

Destination Step is Empty	Display#X does NOT exist
Bad Thumbwheel Data	Digital Output#X does NOT exist
Step#1 is Empty	Thumbwheel#X does NOT exist
Too Many Tasks	Illegal Data Table Value
No Such Stepper Motor	Message Transmitting Busy
Motor Not Ready	Divide-By-Zero Error
Motor Unprofiled	Data Out Of Range
Servo#X does NOT exist	Error Network Fault

Servo#X is Not Ready	Network Access Timeout
Servo#X Error	Network Access Busy
Register#X" does NOT exist	Network Request Lost
Data Table Column#X does NOT exist	Network Bad Response
Data Table Row#X does NOT exist	Network Bad Return Message
Analog Input#X does NOT exist	Comm Port#X Does Not Exist
Analog Output#X does NOT exist	Comm Protocol Error
Out of Delay Timers	Flag#X Does Not Exist
Out of Soft Counters	Unknown Error

Making Physical Connections:
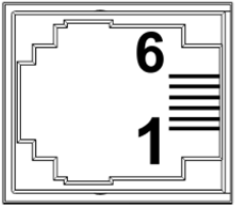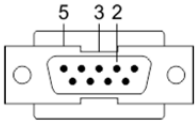
Serial: *A standard USB Serial adapter can be used on PCs without physical serial ports*

CTC 2881 modular-jack cable ($19) and 2880B 9-Pin adapter ($44).

OR you can make your own:

Wiring Diagram:

Pin Mappings for COM port (on controller)	Pin Mappings for DB-9 Connector (on cable to Computer)
1.	
2. TxD Outbound (Comm0) goes to:	**Pin 2:** (RxD) Inbound
3. Common goes to:	**Pin 5:** (Signal Ground)
4. Common	
5. RxD Inbound (Comm0) goes to:	**Pin 3:** (TxD) Outbound
6.	

Ethernet:

Ethernet crossover cable is recommended. Or you can use a standard Ethernet cable if an Ethernet Switch or Hub is used. 5300 controllers can accept either type of Ethernet cable.

CTCMonitor Software Tool:

Download and install CTCMonitor V3.6 from CTC's website. *Yes, it runs under Windows 7, 10 and 11 32-bit and 64-bit platforms*

http://support.ctc-control.com/customer/downloads/ctcmon/CTCMON36-Install.zip

Connecting to your CTC controller via serial port:

Connect your CTC2880B and 2881 to your PC, note the port number. If a USB adapter is used you will need to determine the port number it was assigned to by Windows. Go to Control Panel and view *Device Manager*. You should see the port assignment similar to below:
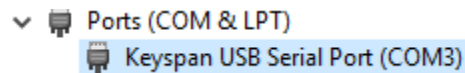
Pull down the *Configuration* menu and select *Change Configuration*
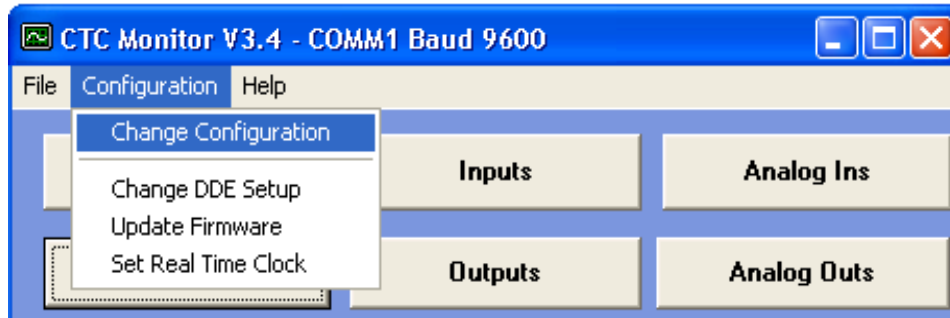
Select the PC's port connected to the CTC 2880B / 2881 and press Exit.
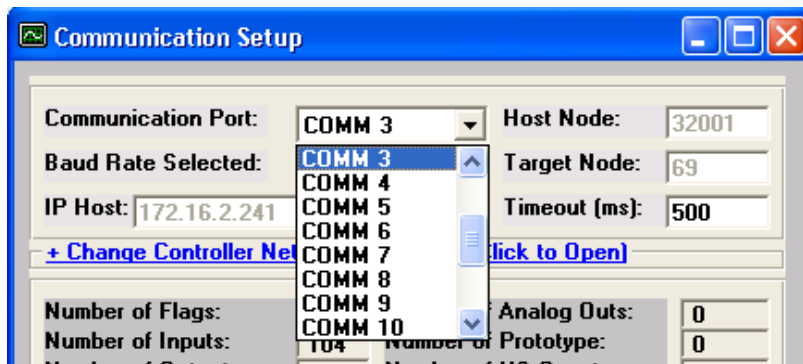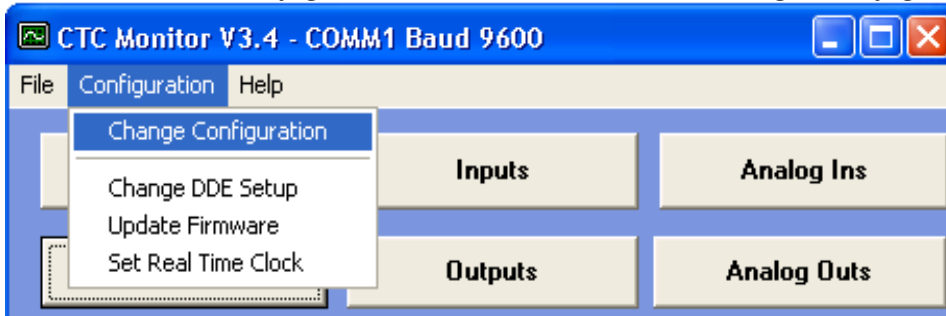
A successful connection.

**<u>Connecting to your CTC controller via Ethernet:</u>**

Connect your Ethernet cable to your PC. Verify your PC is on the same address network as your CTC controller. Typically, pinging the controller is the best way to validate this.
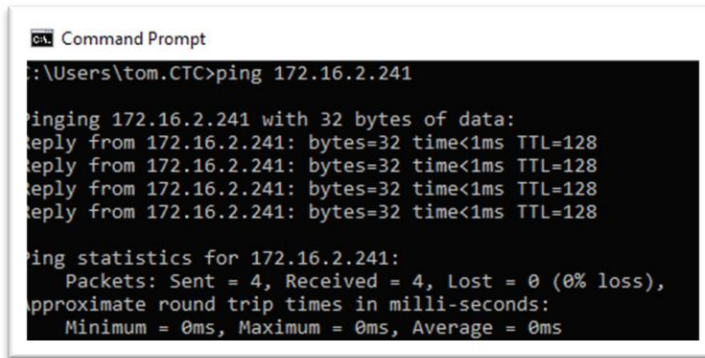
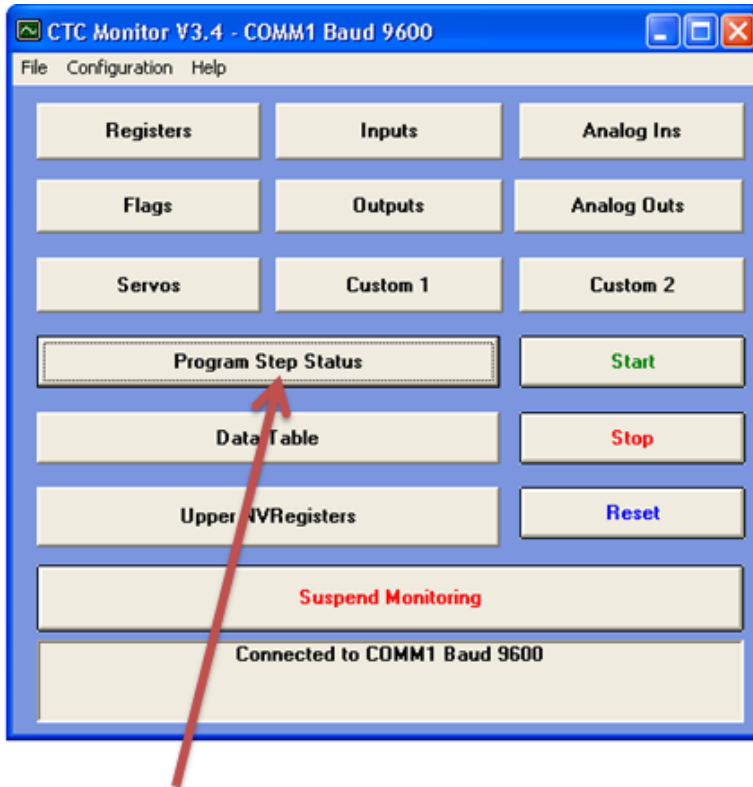Pull down the *Configuration* menu and select *Change Configuration*

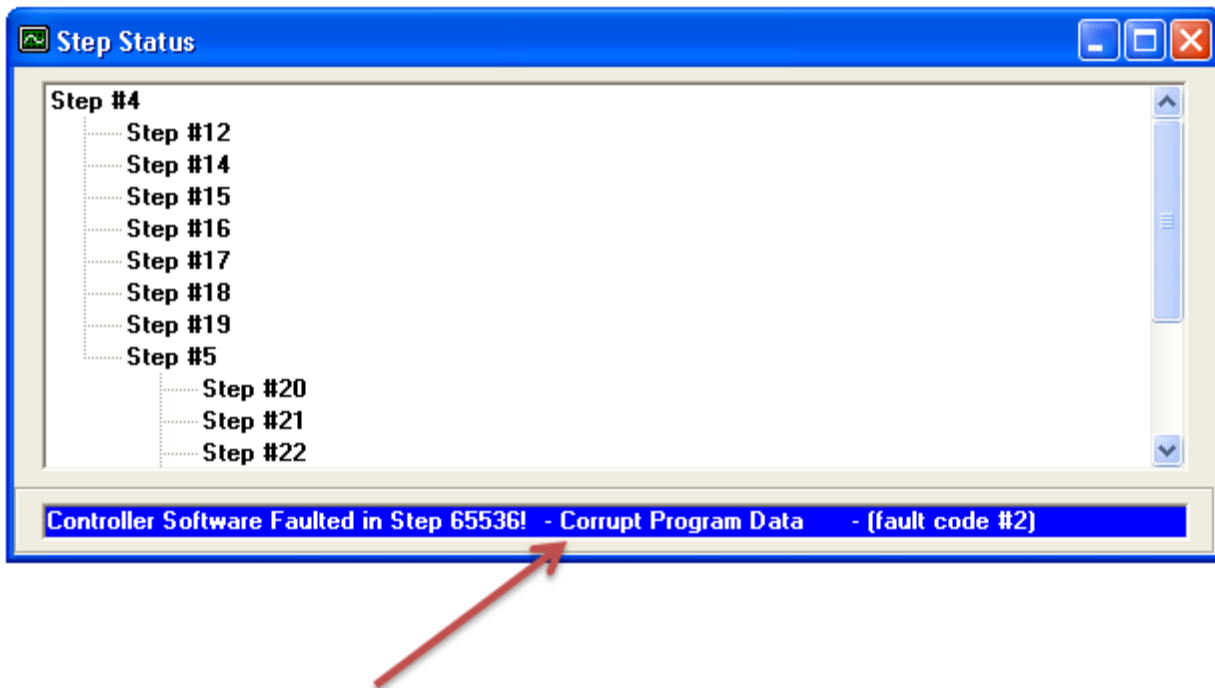Select CtcTCP and enter the Controller's IP address into the IP Host field. Then press Exit.

A successful connection.
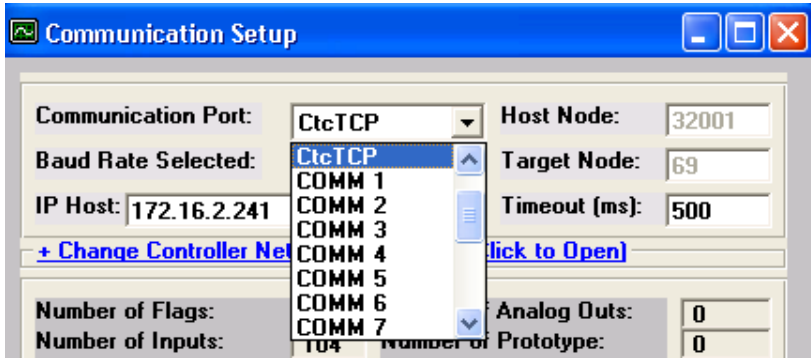
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Monitoring Program Step Status:

Once connected to the controller click on the 'Program Step Status' button and view the fault message at the bottom of the window.

The fault message indicates the controller's program has been lost. The program is a .dso file and can be downloaded by Quickstep, CTCMonitor or CTCUtils.
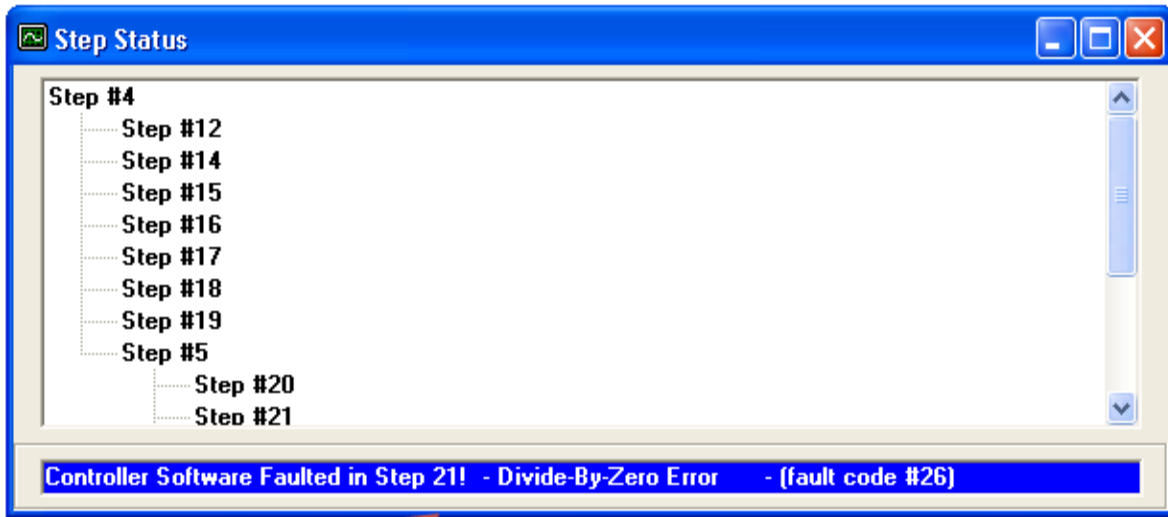
The fault message indicates a Divide-By-Zero occurred in step 21 of the program.
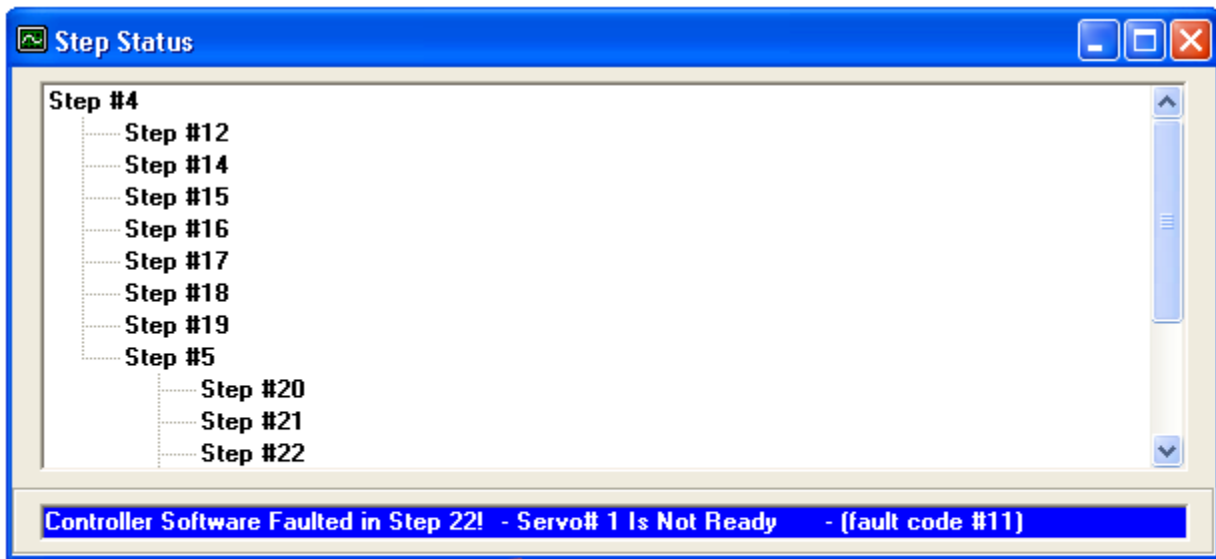
The fault message indicates Servo Axis 1 is not ready in step 22 of the program. This typically occurs when an axis has been commanded to move when it is already in motion or invalid motion parameters are being used.

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Appendix A – Location of CTC controller batteries

If a battery is being replaced for maintenance reasons, and the program in the controller is still operational, it is recommended the program be backed up **before** the battery is removed. TechNotes 45 contains the procedure for uploading the user program (.dso file) and nonvolatile registers (.txt file) and TechNote 46 is the procedure for downloading user programs and nonvolatile registers.

Important Note: 5100, 5200 and 5300 controllers <u>MUST</u> have their IP addresses reentered before re-downloading your program and NV registers unless DHCP is being used. This can be performed within CTCMonitor's Communications Setup menu.
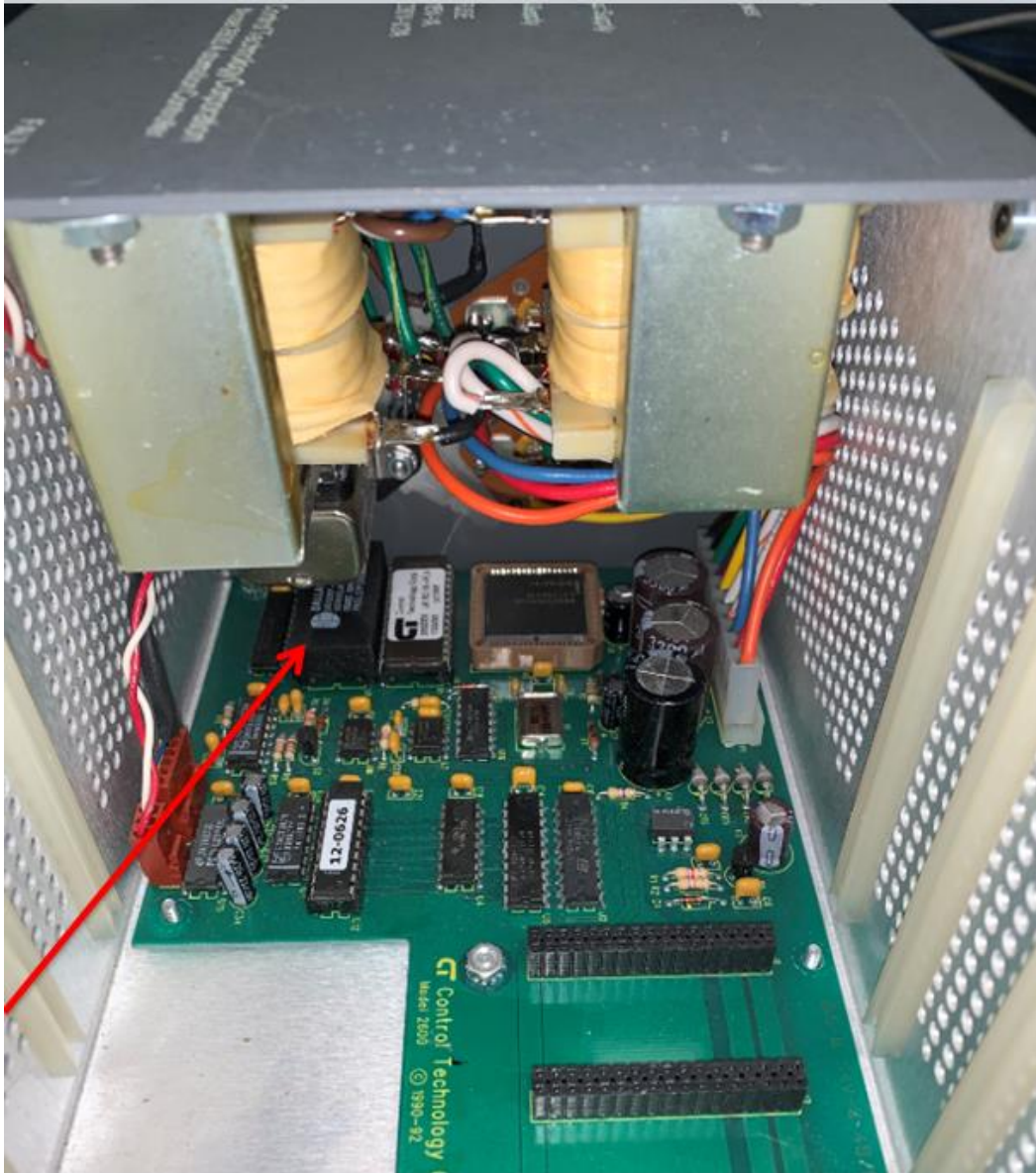
Model 2200 Series Controller

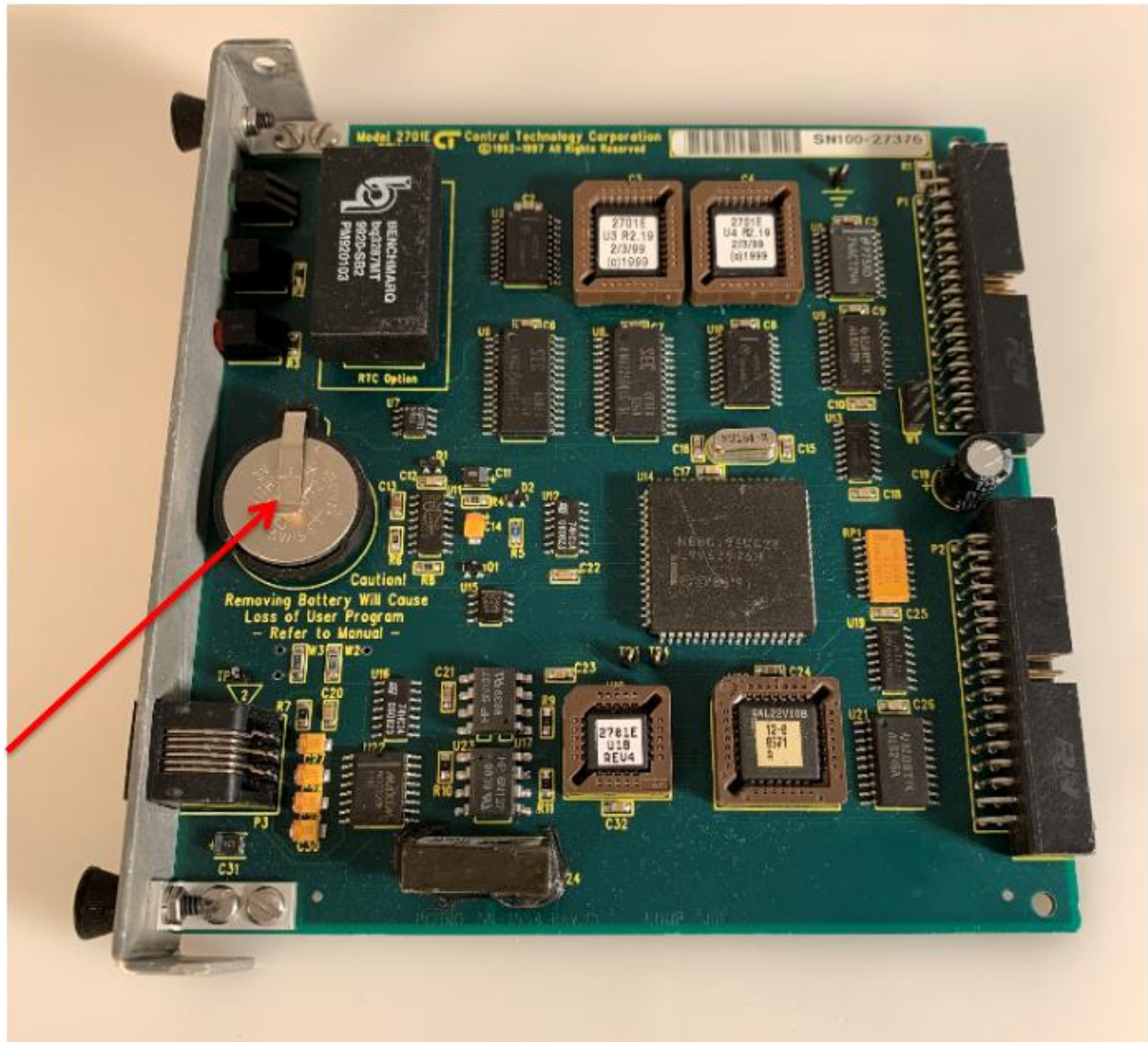**Battery:** CTC Model#11-8830 Cost:$75

Field Replaceable

Model 2600 Series Controller

Battery: CTC Model#11-8830 Cost:$75
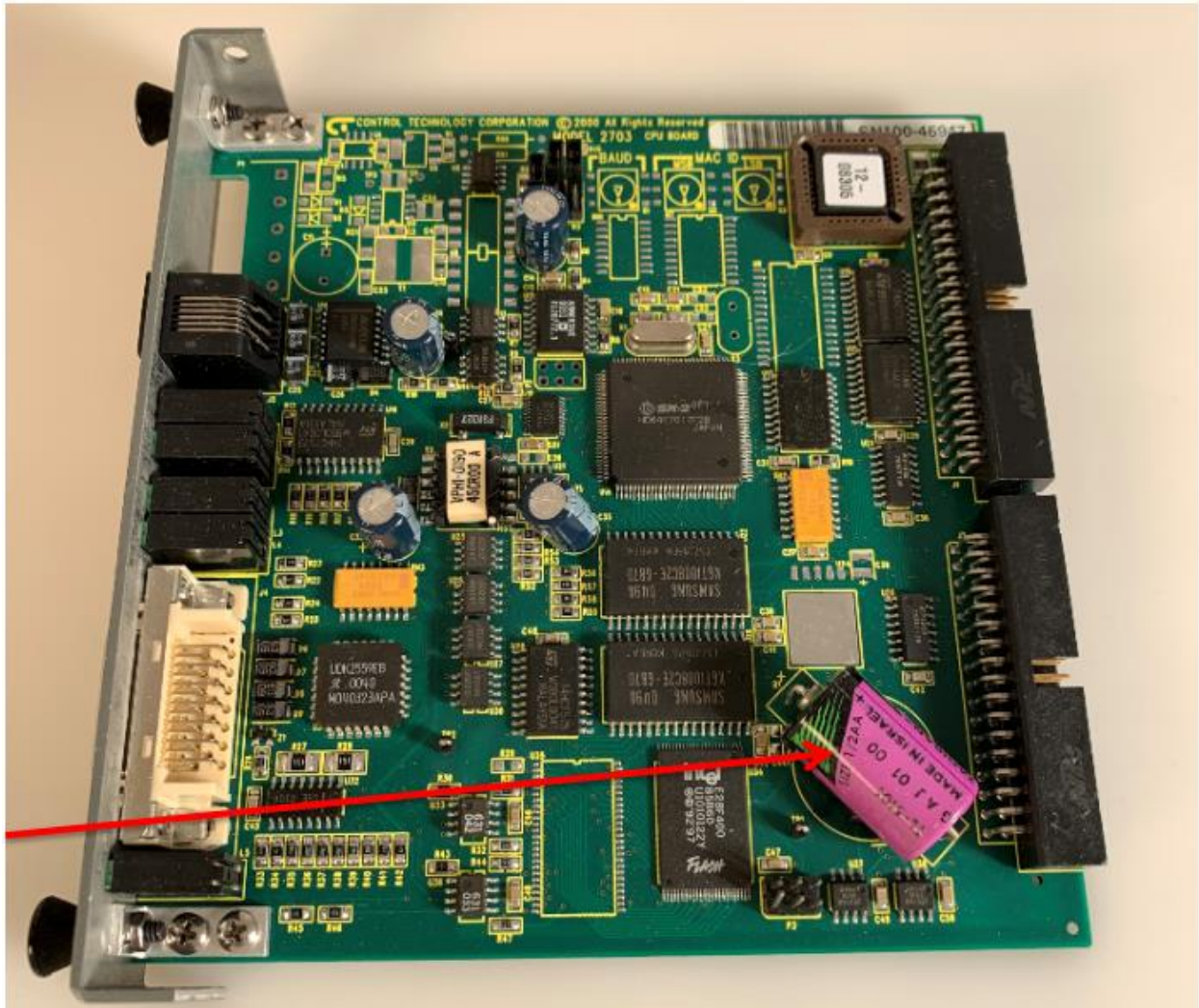**Field Replaceable**

Model 2701 Series CPU

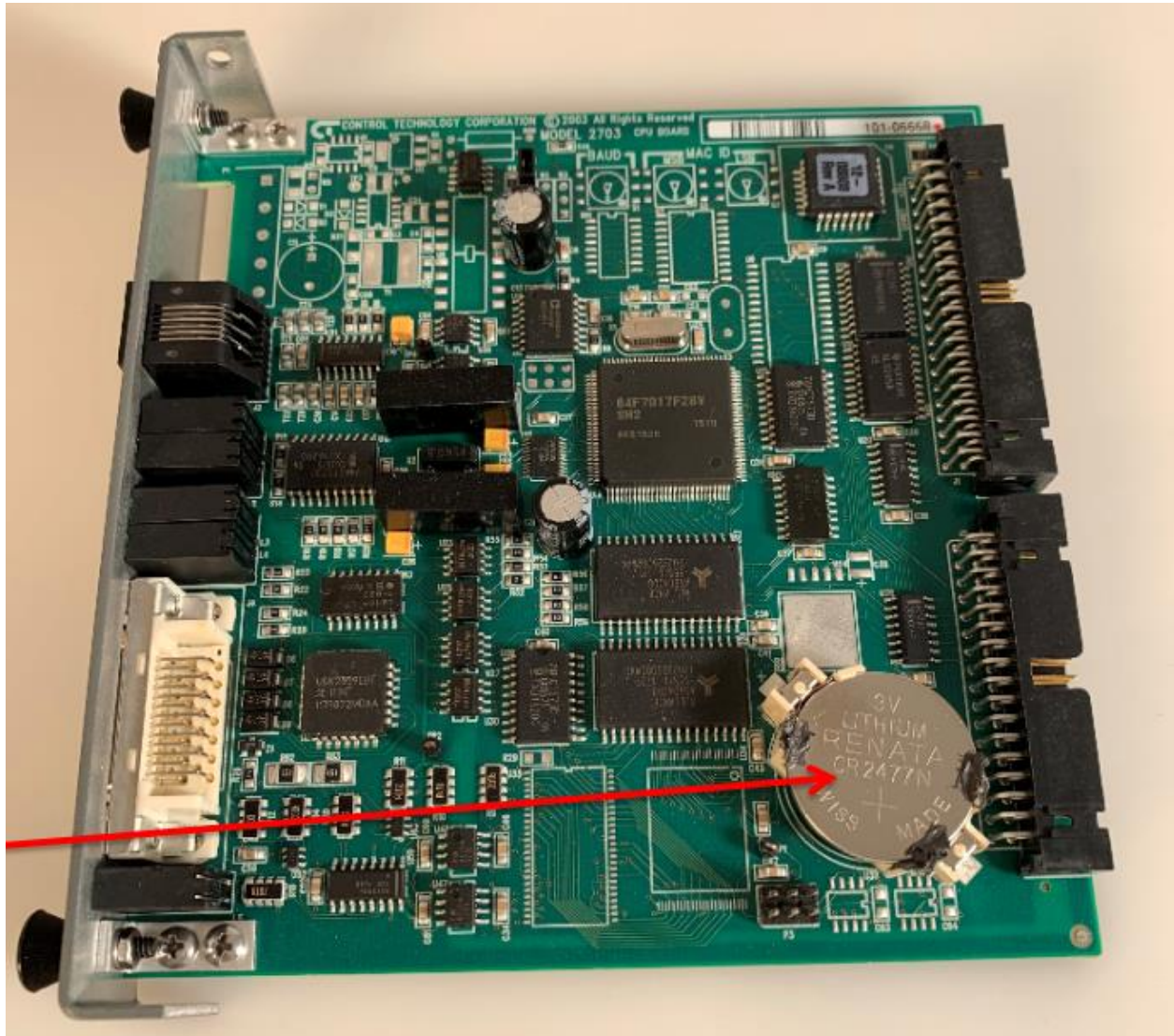**Battery:** CR2032 coin type – CTC Model# 77-2032   Cost:$20
Field Replaceable

Model 2703 Series CPU with axial lead battery

Battery: Axial Lead type – CTC Model# 77-5101 Cost: $195 (includes full test)
Not Field Replaceable – Requires hand soldering ability - Request RMA

Model 2703 Series CPU with coin type battery

Battery: CR2477N coin type battery – CTC Model# 77-2478 Cost: $25
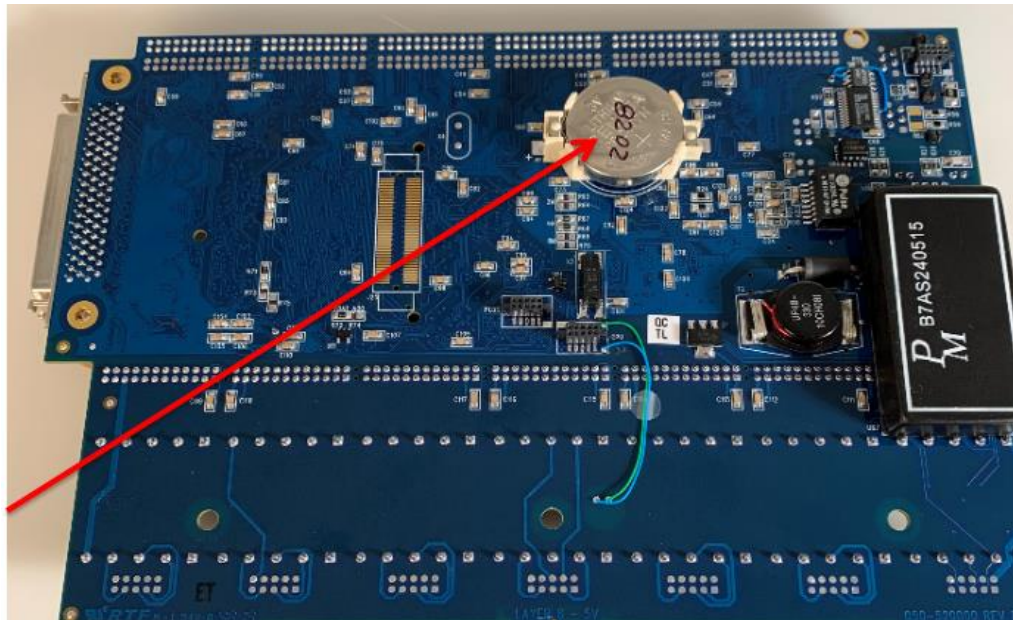
Field Replaceable

Model 5100 Series Controller

Battery: CR2477N coin type – CTC Model# 77-2478 Cost: $25

Field Replaceable – Important Note: The IP Address MUST be reloaded for proper operation.
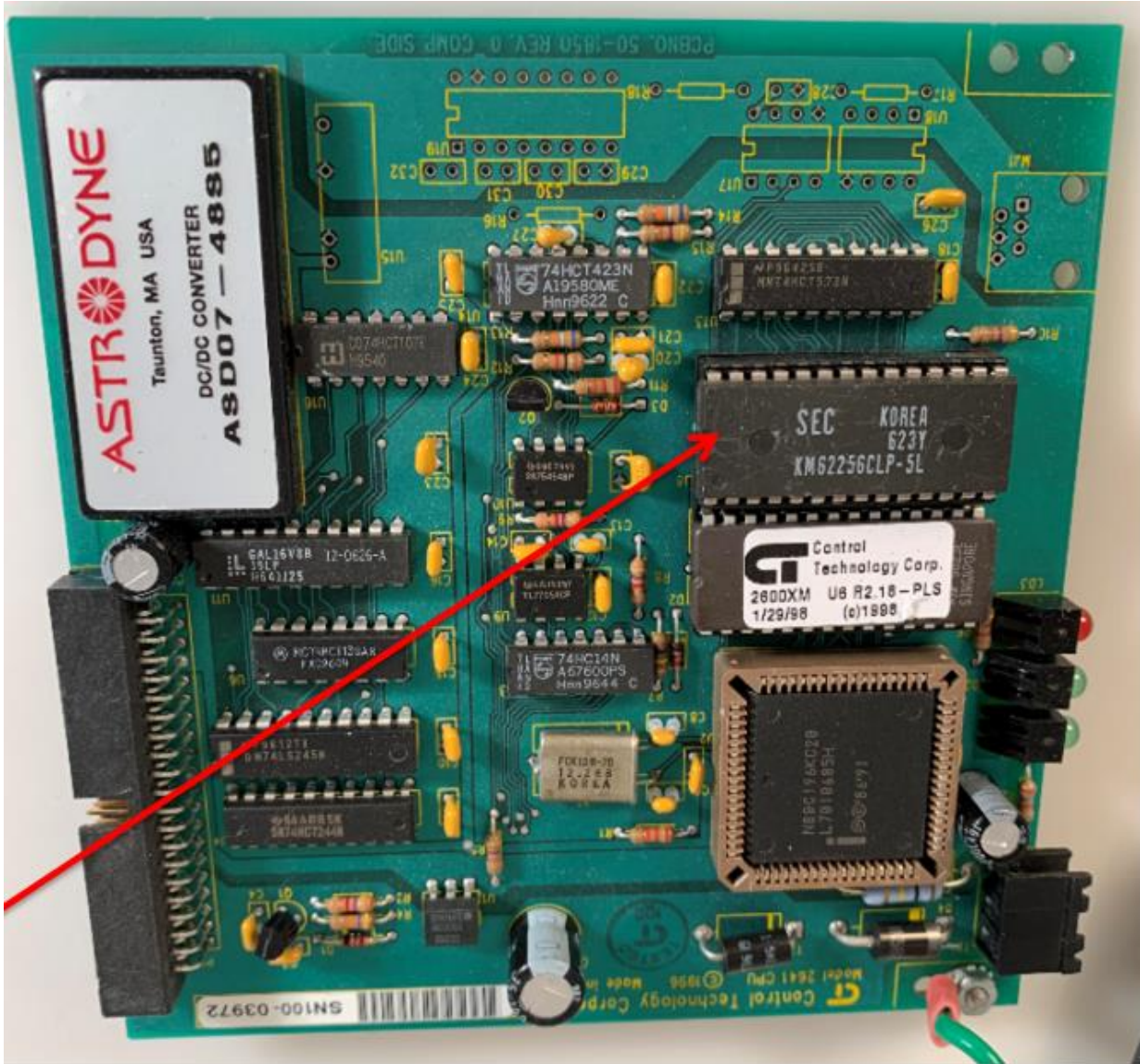

Model 5200 Series Controller – Note: Located on backside of main board

Battery: CR2477N coin type– CTC Model# 77-2478 Cost: $25

Field Replaceable - Important Note: The IP Address MUST be reloaded for proper operation.
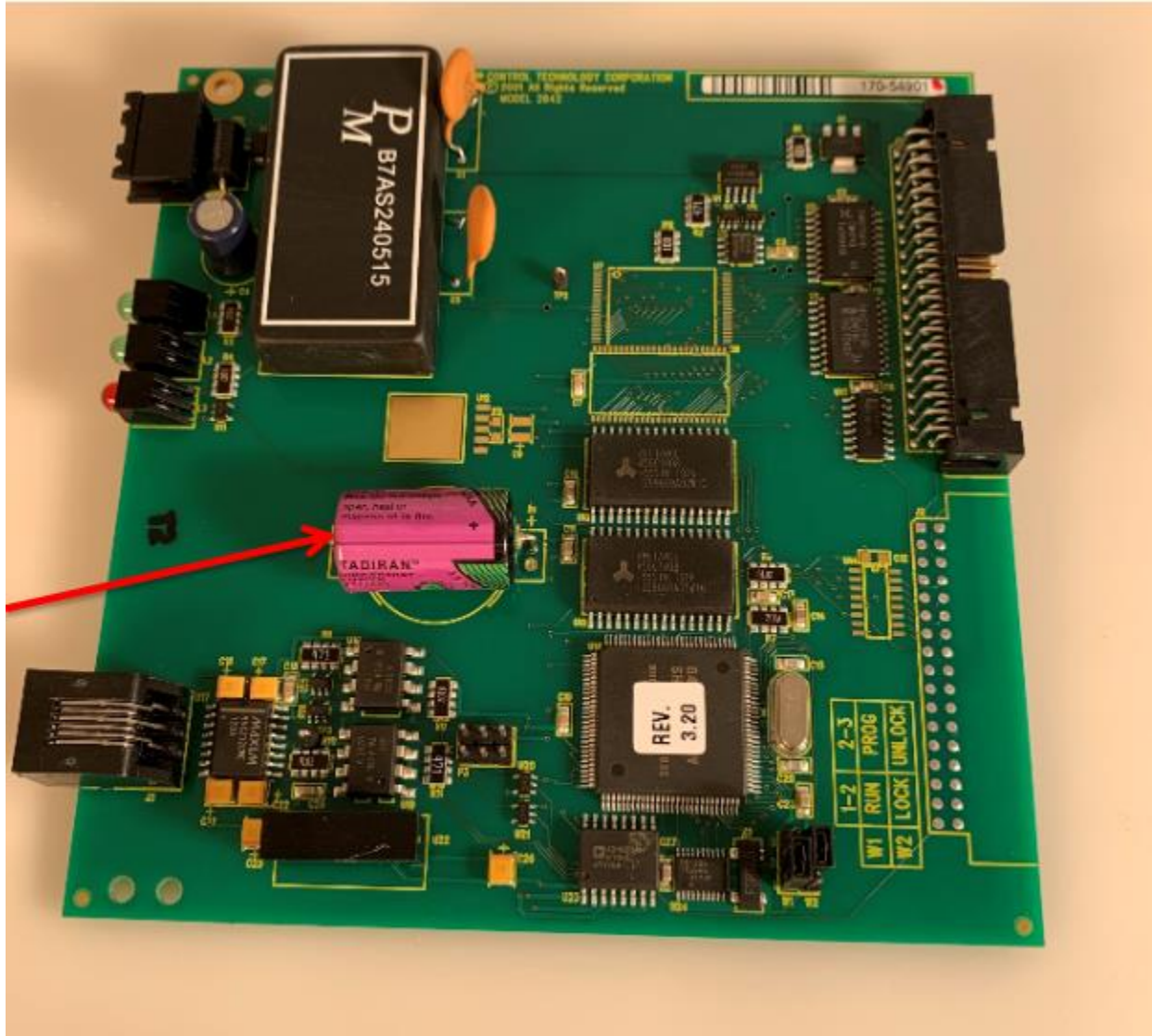
Multipro 2641 CPU

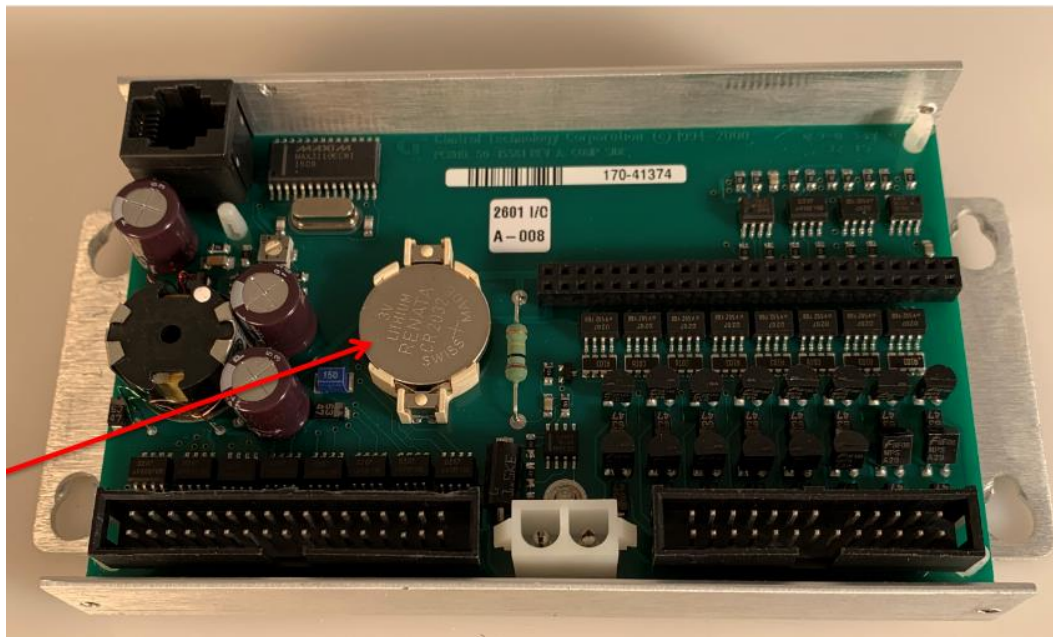**Battery:** CTC Model#11-8830 Cost:$195 (includes full test)

Not Field Replaceable – Requires hand soldering ability - Request RMA
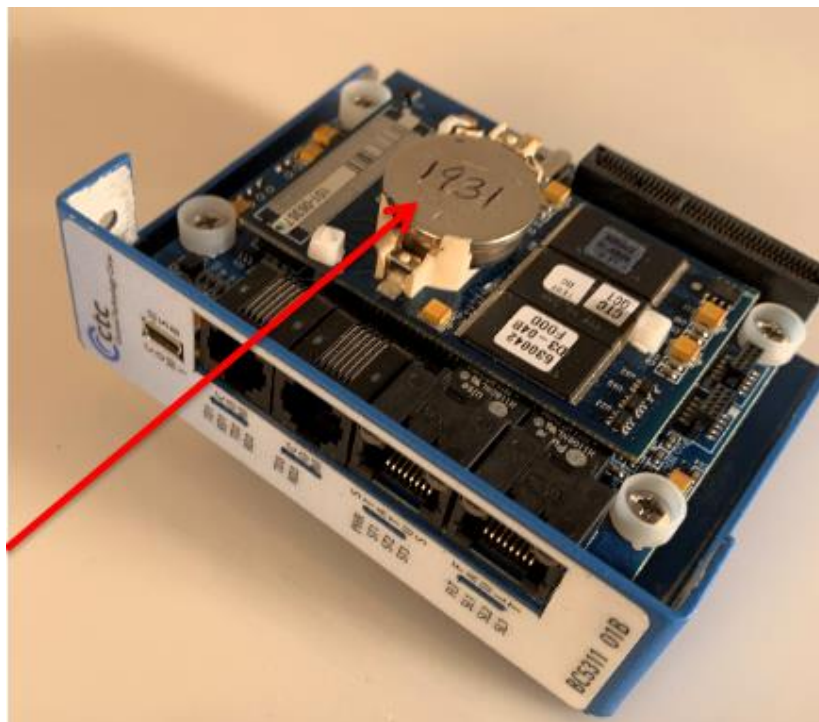
Multipro 2642 CPU

Battery: Axial Lead type – CTC Model# 77-5101 Cost:$195 (includes full test)

Not Field Replaceable – Requires hand soldering ability - Request RMA

2601 Series Controller

Battery: CR2032 coin type – CTC Model# 77-2032 Price: $20

5300 Series CPU

Battery: CR2477N coin type– CTC Model# 77-2478 Cost: $25

Field Replaceable - Important Note: The IP Address MUST be reloaded for proper operation.

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