iTRAK System

Bulletin Number 2198T-L16

Allen-Bradley
by ROCKWELL AUTOMATION

Troubleshooting Guide

Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.

SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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About This Publication

This manual provides troubleshooting instructions for use in the commissioning of an iTRAK® system.

This manual is intended for engineers or technicians who are directly involved in the design, installation, and wiring of the iTRAK system. It is also intended for programmers who are directly involved in the operation, field maintenance, and integration of this system with an EtherNet/IP™ communication module or controller.

If you do not understand the basics of the iTRAK system, contact your Rockwell Automation sales representative for information on available training courses.

Conventions

These conventions are used throughout this manual:

- Bulleted lists provide information, not procedural steps.
- Numbered lists provide steps or hierarchical information.

Appropriate Use

Before you use the iTRAK system, read and understand the safety instructions found in the iTRAK System with TriMax Bearings User Manual, publication 2198T-UM002.

ATTENTION: Incorrect use of the products can cause personal injury and property damage.

In addition, also follow these guidelines:

- Leave the hardware in its original state; never make structural changes.
- Do not de-compile software or alter source code.
- Do not use damaged or faulty components.
- Use the system in the manner that is described in this manual.
- Operate the system in the ambient conditions that are described in the iTRAK System Technical Data, publication 2198T-TD001.

Download Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
iTRAK System Technical Data, publication 2198T-TD001	Contains product specifications for iTRAK system components. Includes performance, environmental, certifications, load force, and dimension drawings.
Kinetix Servo Drives Specifications Technical Data, publication KNX-TD003	Provides product specifications for Kinetix® Integrated Motion over the EtherNet/IP network, Kinetix 5700 iTRAK Power Supply, Integrated Motion over sercos interface, EtherNet/IP networking, and component servo drive families.
iTRAK System with TriMax Bearings User Manual, publication 2198-UM002	Provides information on how to install, configure, start, and troubleshoot your iTRAK system with TriMax bearings.
Kinetix 5700 iTRAK Power Supply and iTRAK Bus Conditioner Installation Instruction, publication 2198T-IN001	Provides information on how to wire and connect the Kinetix 5700 iTRAK power supply to the iTRAK system.
iTRAK System Programming Manual, publication 2198T-PM001	Provides information on how to commission and program an iTRAK system.
3D CAD Models of iTRAK Components 2198T-3DCAD.zip. Motion Analyzer website, https://motionanalyzer.rockwellautomation.com/Products/iTrak	Provides 2D outline, assembly, and system drawings, STEP files for the movers and motor modules, and hyperlinks to complete system STEP files.
ControlLogix System User Manual, publication 1756-UM001	Provides details on how to configure, program, and operate a 1756 ControlLogix® system. Also provides technical specifications
System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001	Provides information, examples, and techniques that are designed to minimize system electrical noise failures.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation® industrial system.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at rok.auto/literature.

iTRAK System Hardware

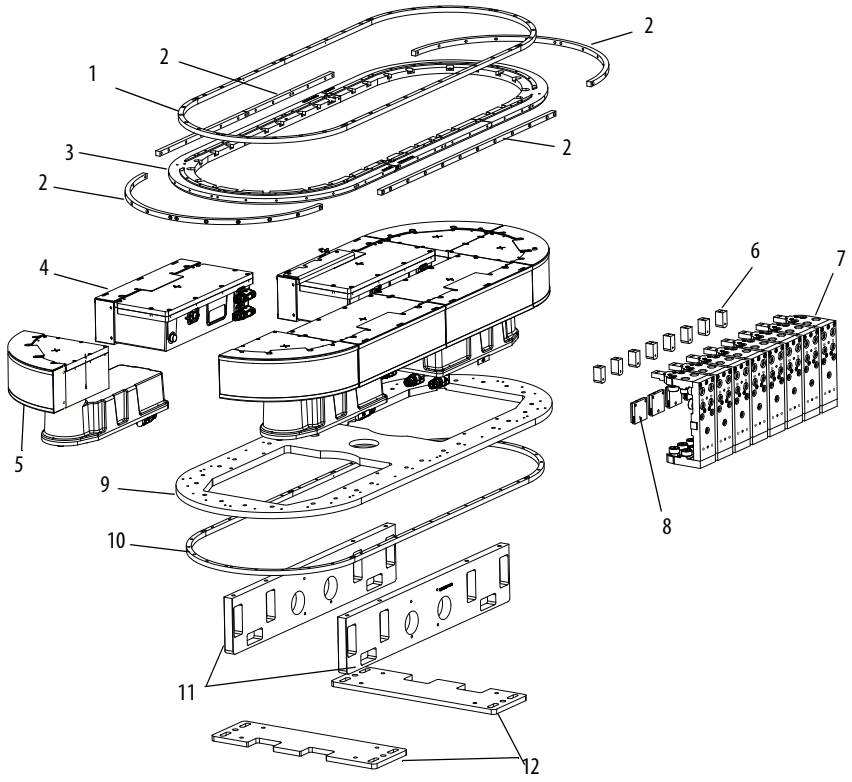
The iTRAK® system is composed of motor modules, mounting plates, bearing rails, and movers. The motor modules are an integrated drive motor system with feedback. Mounting plates can be attached to the sides of the motor modules, and bearing rails can be attached to the mounting plates. Movers have independent linear motor magnets and bearings, and multiple movers can be operated on a motor module at any time. Movers can be synchronized or independently controlled, however they are programmed.

When installing or troubleshooting an iTRAK system, it is important to be familiar with the components and how they are described in the iTRAK System with TriMax Bearings User Manual, publication 2198T-UM002.

This document focuses on basic troubleshooting steps to get your iTRAK system running for the first time, or after a fault has occurred.

Mechanical iTRAK components

An exploded view of the mechanical and servo components of an iTRAK system is displayed in the following diagram. Familiarize yourself with the nomenclature and use of each component.



Item	Description
1	Top bearing rail
2	Transverse bearing rail
3	Top frame plate
4	Straight motor modules
5	Curved motor modules
6	Position magnets

Item	Description
7	Movers
8	Mover magnets
9	Bottom frame plate
10	Bottom bearing rail
11	Spine bars
12	Mounting plate

Power supplies

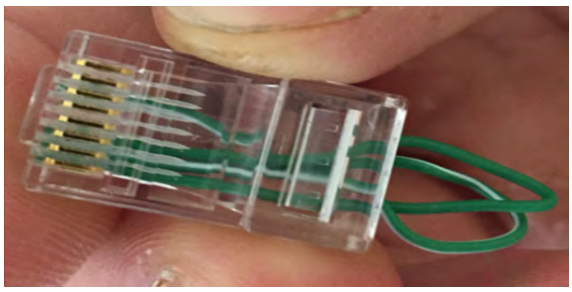
The iTRAK system can be powered by using a preconfigured Power Control Module (PCM) with fixed output wattage or with a scalable Kinetix® 5700 iTRAK power supply as part of a Kinetix 5700 system.

Details and installation instructions on the use of the two power supplies are covered in the iTRAK System with TriMax Bearings User Manual, publication 2198T-UM002.

Gateway

The gateway provides centralized motion processing and communication between the controller and the motor modules. There are three generations of gateways, which all provide the same function, however, there are some differences:

- Gen 1 and Gen 2 require a loopback connector after the last communication cable if all ports are not occupied by communication cable. (Gen 3 doesn't require a loopback connector)



- The Compact Flash card used on Gen 1 is different than CFast card Gen 2 and Gen 3 utilize therefore they cannot be used interchangeably.

For more information about the gateway, see the iTRAK System with TriMax Bearings User Manual, publication 2198T-UM002.

Digital USB I/O

The digital USB I/O module provides an interface between the power supply that is used by your system and the gateway. This module is integrated in a gateway cabinet and must be included in your system when using Kinetix 5700 iTRAK power supply.

For more information about the digital USB I/O module, see the iTRAK System with TriMax Bearings User Manual, publication 2198T-UM002.

Notes:

Power Up the System

The following sections describe how to complete initial power up of your iTRAK® system.

Turn Main Power On

When you power up the system, it means that you bring AC power to the cabinet where all the electronic components, such as power supplies, circuit breakers, and safety circuitry, are located.

When you use a Kinetix® 5700 iTRAK Power Supply (iPS), the cabinet has been designed and built by the original equipment manufacturer (OEM).

In the past, Rockwell Automation provided a single cabinet with the electronic components known as a Power Control Module (PCM), which provided DC power to the iTRAK motors and gateway. See the iTRAK System with TriMax Bearings User Manual, publication 2198-UM002, for further information about the power supplies.

Motor Modules Status LED

Once AC power is turned ON, the power supplies send 24V DC to the motor modules through the power cables. For the Series B motor modules, upon power up, two out of three LEDs are ON. Control Power is solid green. The Communication LED flashes green until it has made a connection to the gateway, at which point the LED turns solid green. Power up and connection to the gateway takes 3…5 minutes. Observe the behavior of the LEDs after this time. There are three scenarios that can occur:

1. All motor module Communication LEDs are solid.

   This indicates that the system is functioning properly and that all motor modules have made connection with the gateway. No further action is necessary.

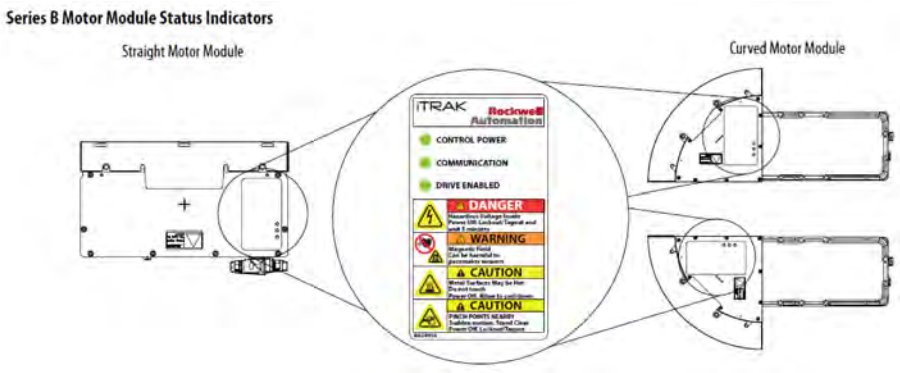
2. All motor module Communication LEDs are still flashing green.

   This indicates that none of the motor modules have properly made a connection with the gateway. Check all communication cable connections to the motor module and gateway. If, after checking the communication cables, the problem persists, proceed to Connect a Monitor and Key Board to the Gateway on page 15 for further diagnostics.

3. Most motor modules Communication LEDs are solid, however, one or more motor modules are flashing.

This indicates that there is a problem with the particular section or sections making a connection with the gateway. Check communication cable(s) connection to the motor(s) and gateway. If, after checking the communication cables, the problem persists, proceed to Connect a Monitor and Key Board to the Gateway on page 15 for further diagnostics.

The Drive Enabled LED does not turn solid until the iTRAK system has been energized and has servo power.



Control Power or Communication LED Off

If you do not have any LED illuminated, including Control Power, this indicates that you have no power to the iTRAK system or particular motors. Follow these steps to diagnose power:

1. If the Control Power LED is off, that motor module is not receiving 24V DC from the power supply. Check the following:
   a. Disconnect the two-pin connector from the power supply.
   b. Measure the output of the 24V DC power supply. The output should measure between 18…26V DC.
   c. Check the orange power cable for continuity.
   d. Make sure the power connector is properly secured at the power supply end and at the motor module.
   e. Remove the power cable from the motor module and use a multimeter to measure the 24V DC input from the cable.
   f. If 24V DC is present at the power cable, it is possible that there is an internal problem in the module and it may need to be replaced.
2. If the communication LED is Off:
   a. Check both ends of the cable at the motor module and the gateway and ensure that they are connected properly.
   b. Each cable is labeled from 00 to the last number of sections in the system. Make sure the communication cable from motor 00 goes to port 00 in the gateway, motor 01 to port 01, and so on.
   c. The communication cables need to be connected in ascending order in the gateway, 00, 01, 02,…0x in the counter clockwise direction of the track.
   d. After you verify that the cables are connected properly, and you still see the communication issue, two scenarios are possible.
   - There is a bad port on the gateway.

     Connect one section at a time to the gateway until the bad port is found.

- The motor module is faulty

  Remove all other communication cables from the gateway. Place the suspect motor section in port 00 of the gateway (make sure to move the loopback to port 01 if you use a Gen 1 or Gen 2 gateway), and then reboot. If the problem persists, the module needs to be replaced.

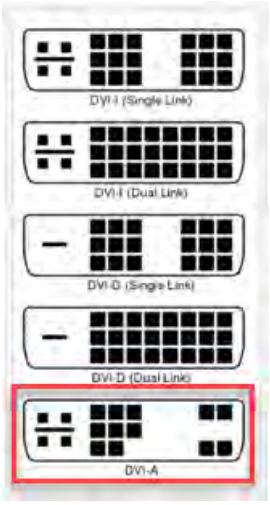
Notes:

Connect a Monitor and Key Board to the Gateway

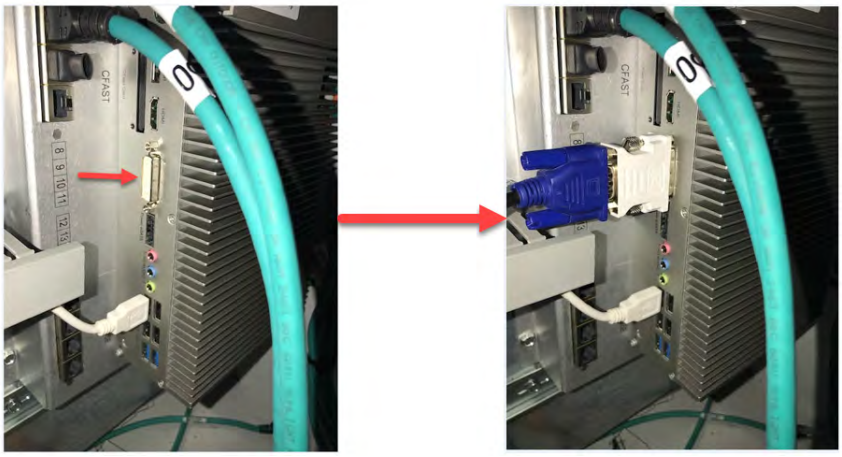
The use of a monitor is recommended when troubleshooting iTRAK® issues. All information for the iTRAK system is in the gateway and can easily be displayed by using a monitor.

To connect the monitor, complete the following steps:

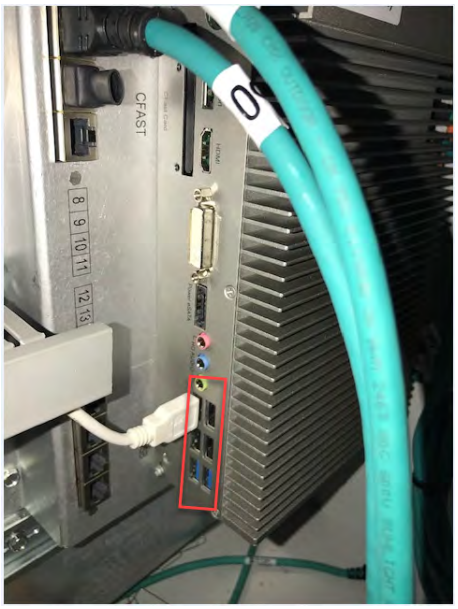
1. Connect a monitor with a DVI connector to the gateway.
2. If the monitor has a VGA connector, use an adapter VGA to DVI in order to connect to the gateway.



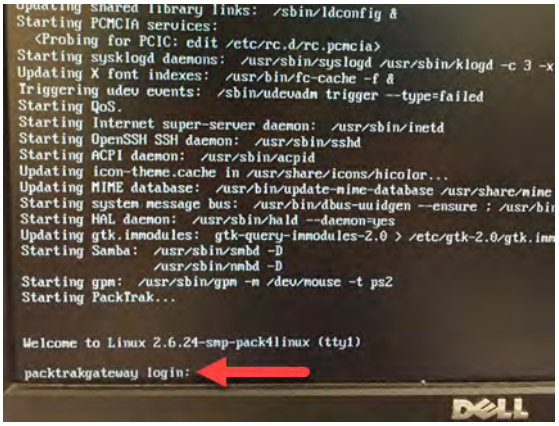
3. Connect the DVI-A male end from your computer monitor into the DVI plug on the gateway.



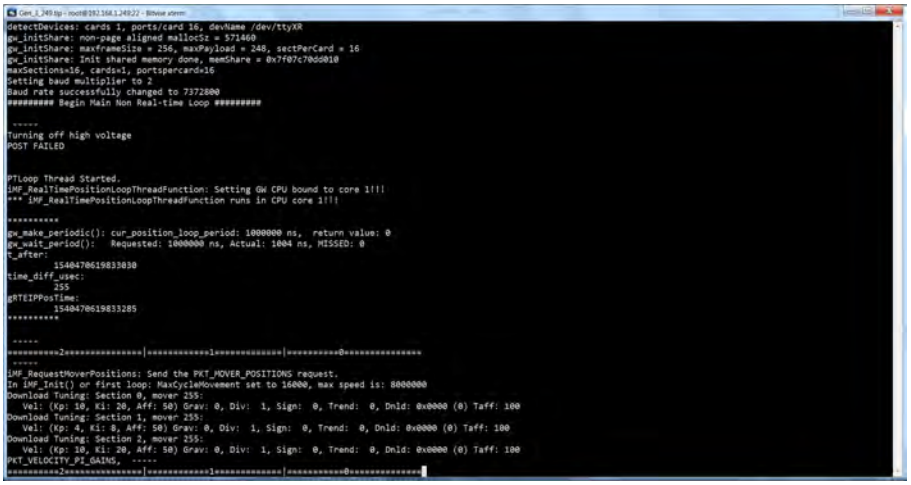
4. Connect a keyboard to any one of the free USB ports in the gateway.



5. Once the gateway has booted up, it asks for a log in. Press Alt + F2.



6. The screen display a screen similar to the one shown.



The numbers represent the movers. If there are more than ten movers on the track, letters are displayed. The vertical lines represent each section of the iTRAK. In the following picture, there are two sections and three movers.

If no motor sections or movers are displayed on the screen, proceed to Sections are not Displayed on the Monitor.

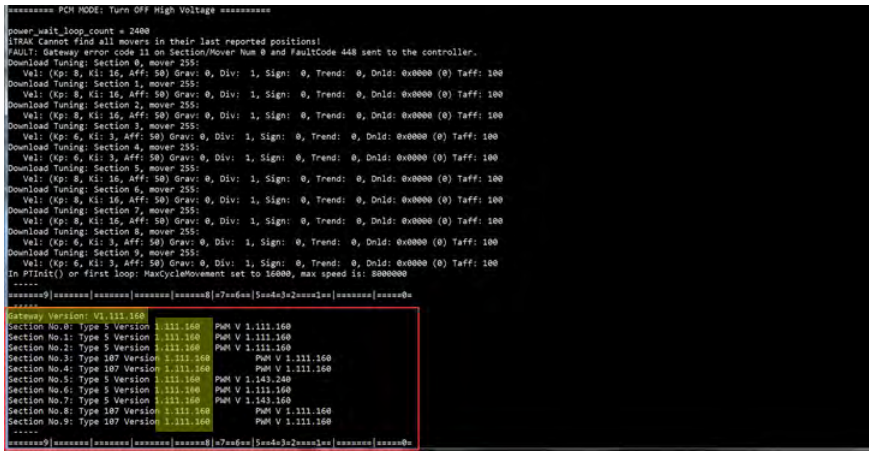
Check Firmware Revision and Section Type

You need to verify that the firmware revision of the gateway is the same revision as the firmware revision of the sections.

To verify the firmware revision, complete the following steps:

1. From the Bitvise terminal screen or keyboard and monitor, press x.

   This displays your gateway firmware and section firmware. Make sure that both are the same



2. Verify that your section types are correct.

   There are two different commutation tables for 50mm, 100mm, and 150mm movers. See the table below for section types for optimal current and optimal force for each mover. Verify that each section type corresponds to the correct mover size being used and that commutation tables match.

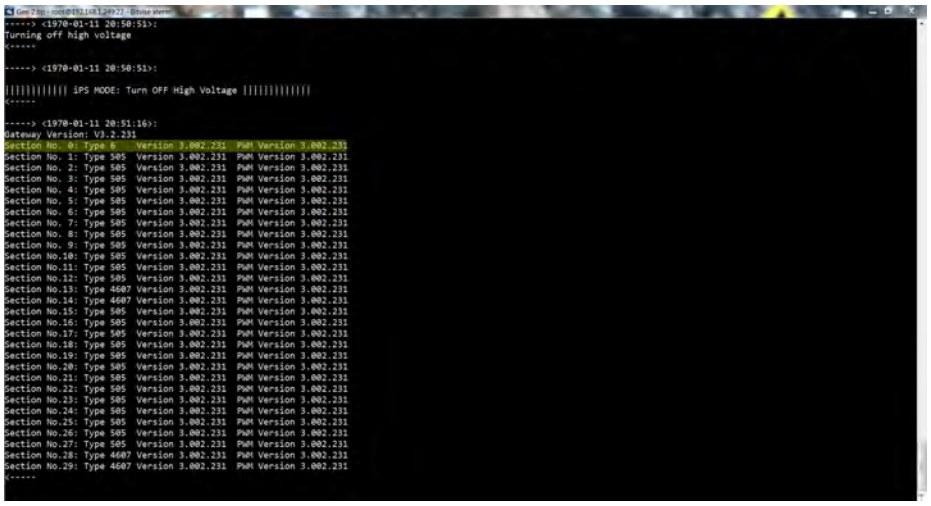
Mover Size	Straight Section Optimal Force	Straight Section Optimal Current	Curve Section Optimal Force	Curve Section Optimal Current
50 mm	Type 6	Type 506	Type 108	Type 4608
100 mm	Type 5	Type 505	Type 107	Type 4607
150 mm	Type 13	Type 513	Type 14	Type 4514

Change Incorrect Section Type using Bitvise or Terminal Monitor

If, in the previous procedure, you find that your section types do not match, follow these instructions to change the firmware from Bitvise or from the terminal screen:

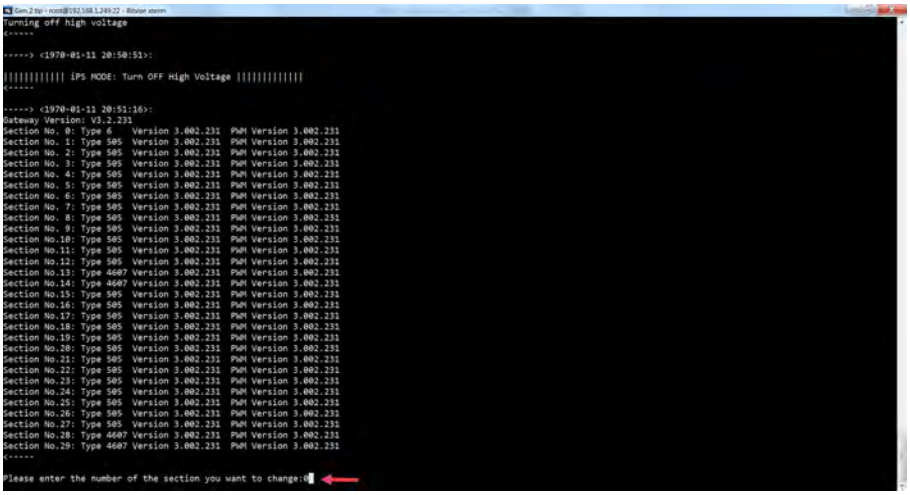
1. Press x.

Section 0 has a section type that does not match. Section 0 is type 6 which is a 50 mm optimal force, while the rest of the track is 100 mm optimal current.



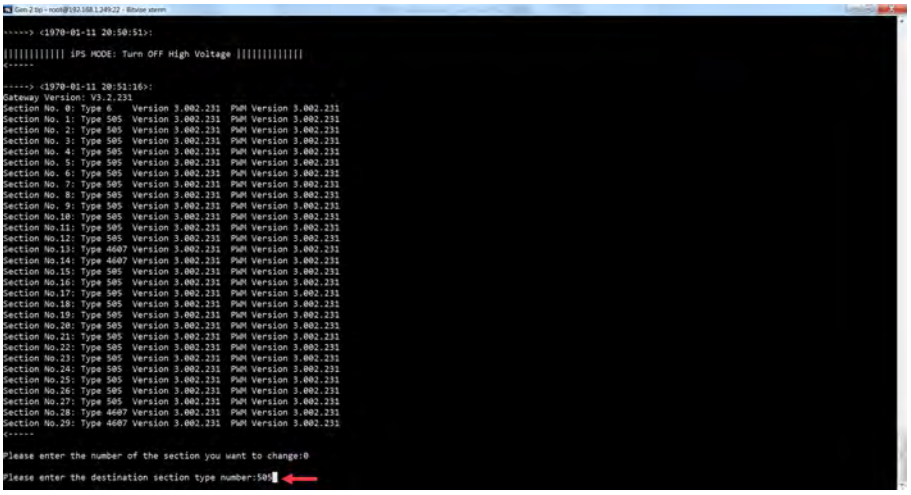
2. Press Shift + U at the same time.

   The system prompts you to enter the number of the section you want to change. In this example we are changing 0.



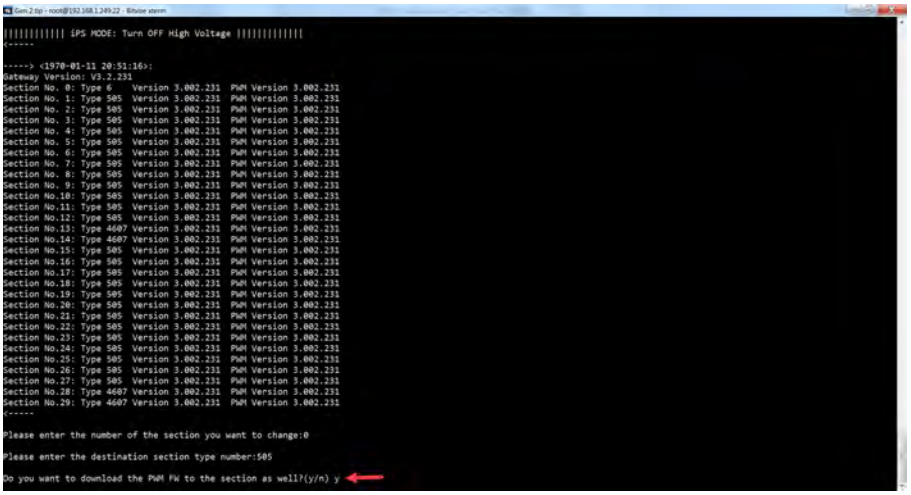
3. Type the correct section type for the track.

   This example calls for type 505.



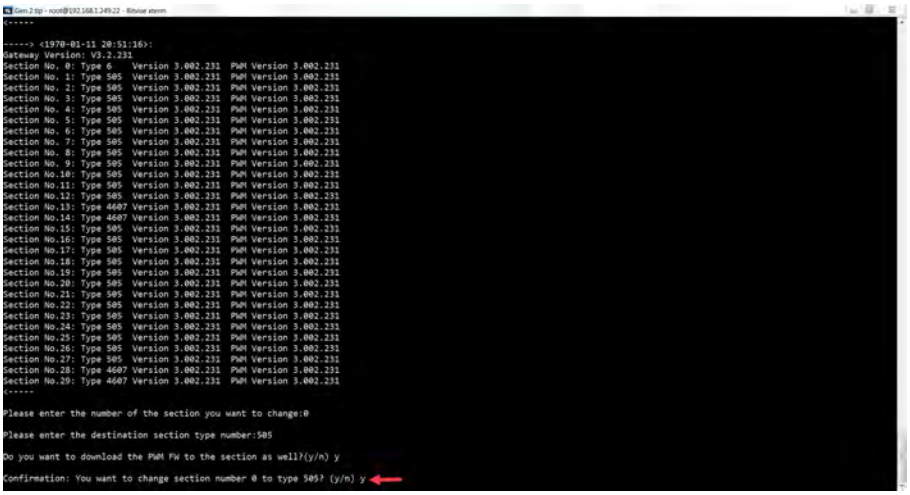
   The prompt asks: Do you want to download the PWM FW to the section as well? (y/n).

4. Type y.

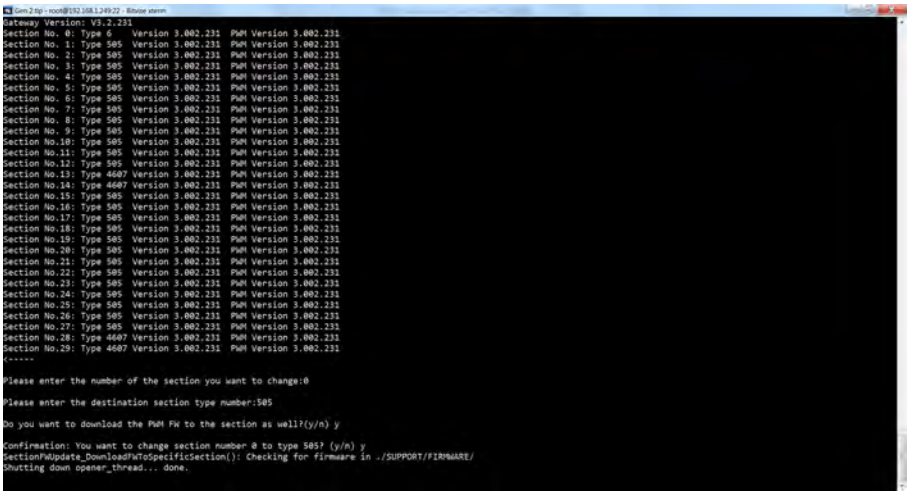


   The system asks you to confirm the change: You want to change section number x to type y? (y/n).

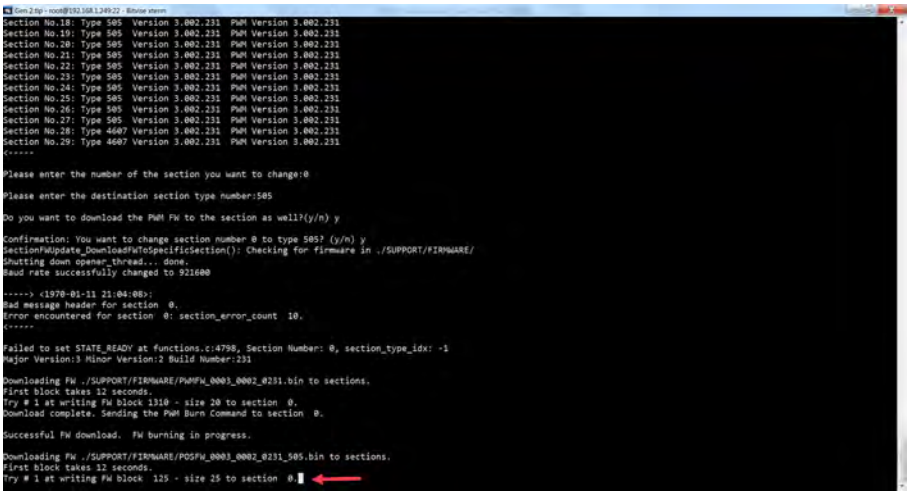
5. Type y.



The gateway immediately goes down for a reboot.



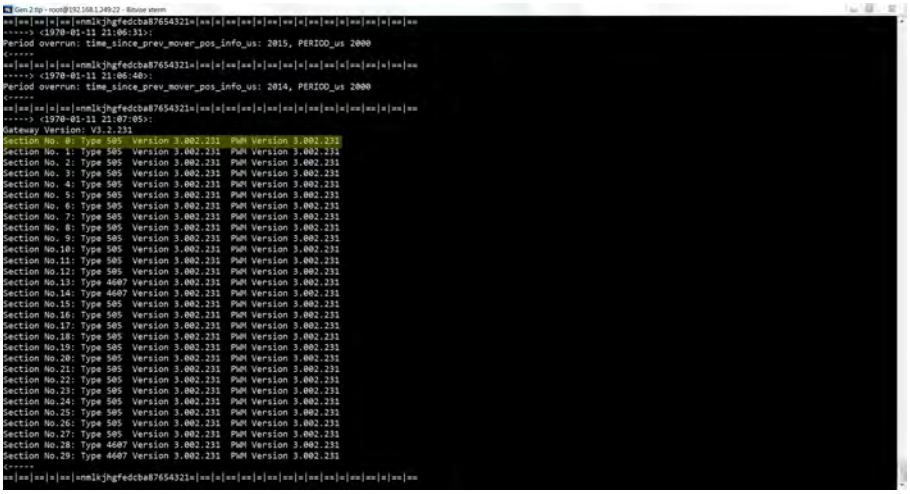
After the reboot, the gateway downloads the firmware and begins to burn the section.



After completion, the gateway reboots again.

6. When the second reboot is finished, press x again and verify that your section type is now correct.

   Section 0 now has the correct section type.



7. Repeat steps 1…6 as many times as needed for all sections with incorrect section types.

Notes:

Correct Monitor Problems

Sections are not Displayed on the Monitor

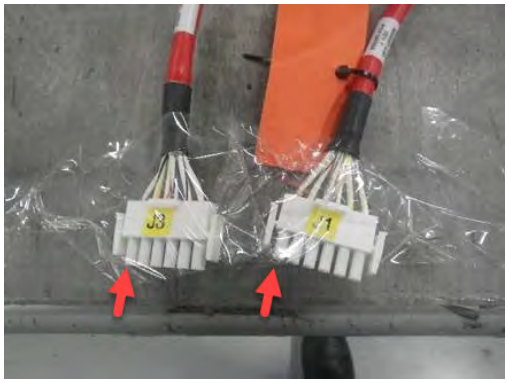
If the sections are not displayed, one or more of the motor sections are disrupting communication with the gateway.

To correct the problem, complete the following steps:

1. Check all cables. Verify that power cables and communication cables go from the iTRAK® system to the gateway and power supply.
2. Make sure that the communication cables are connected in order from 00 to the last section in the iTRAK (counter clockwise direction).

   Check the loop back on the Gen 1 and Gen 2 Gateway. Gen 3 does not require loop back.
3. Verify motor shorts:
   a. Before you enable the system, move one mover around the track and make sure the continuous push force is 3…7 lb, and consistent all the way around.
   b. If there is a short in one or more motors, it requires more force to move a mover and the cogging of the magnet/coils can be felt. To confirm the motor is shorted, complete the following steps:
   - Remove the white position board cover from the module.
   - Unplug the 4 connectors J1, J2, J3, and J4 from the power board.

4. To confirm a shorted coil, check the resistance of the same color wires in the groups below:
   - J1 and J3
   - J2 and J4



   Resistance should measure 1.9 Ω or very close to it. Check all six wires on both sets. All readings should be the same.

5. If confirmed short, the motor module needs to be replaced.

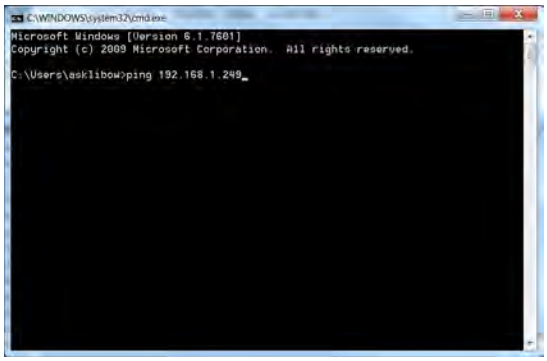
Retrieve a Log File

Log File Retrieval Tool

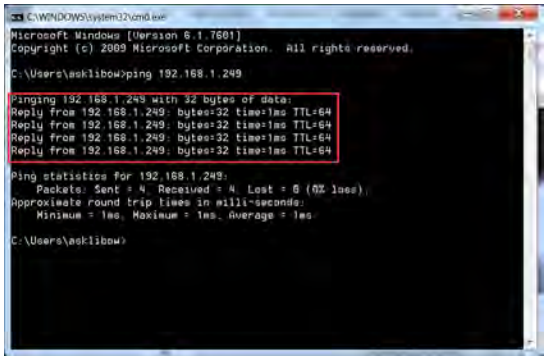
In order to use the Log File Retrieval Tool, you need to be able to ping the gateway.

To use the Log File Retrieval Tool, complete the following steps:

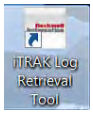
1. Open a command prompt, type ping 192.168.1.249 (or whatever your gateway IP address is), and press enter.



2. If you are communicating properly with the gateway, you receive a Reply from 192.168.1.249.

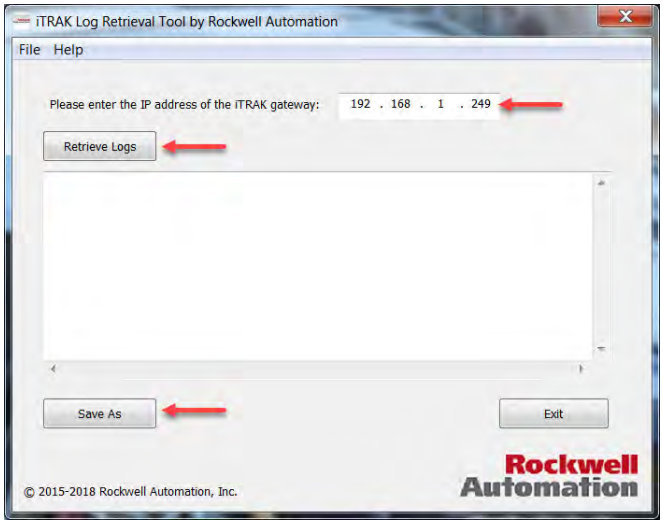


3. Find the iTRAK® Gateway Log Retrieval Tool and double-click it.



4. To use the tool, complete the following steps:
   a. Type the IP address of the iTRAK gateway.
   b. Click Retrieve Logs.
   c. Click Save As to name the log file and place it in your desired location.

d. Exit the application if you are finished

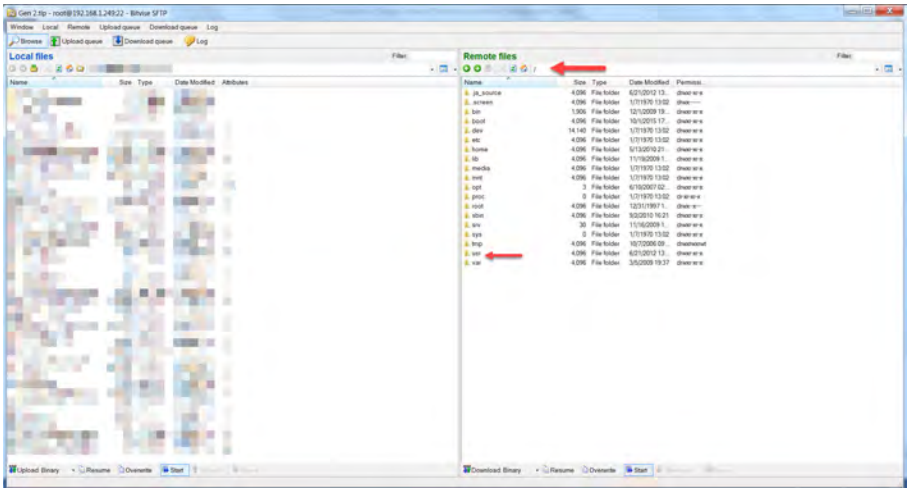


5. Send this log file, as requested, to ictsupport@ra.rockwell.com.

Gen 1 and Gen 2 Gateway Bitvise

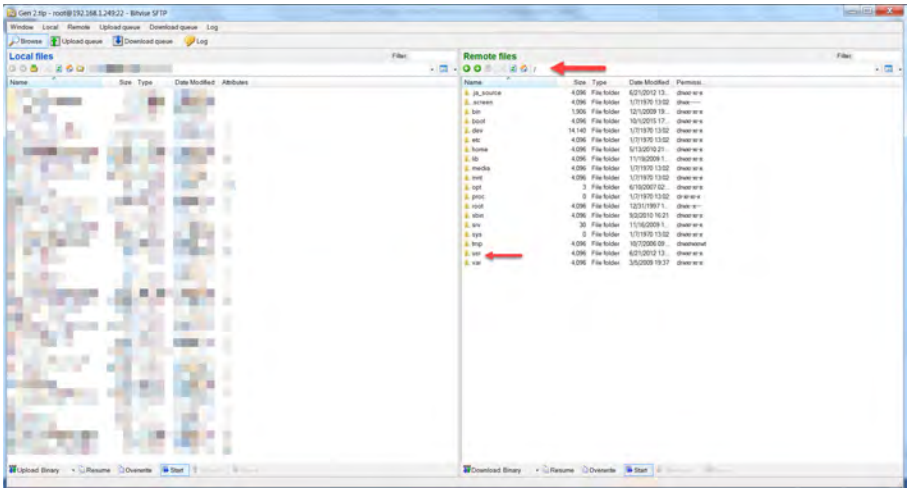
To access log files with Bitvise, complete the following steps:

1. To access log files using a Gen 1 or Gen 2 gateway with Bitvise, navigate to the SFTP window that opens when you log into Bitvise.
2. In the remote files screen on the right hand side, begin by typing / into the address bar of the Remote Files, and navigate through the following folders:
   a. Usr
   b. Src
   c. Rtai-extra
   d. Jacobs_Automation
   e. PackTrak-devel

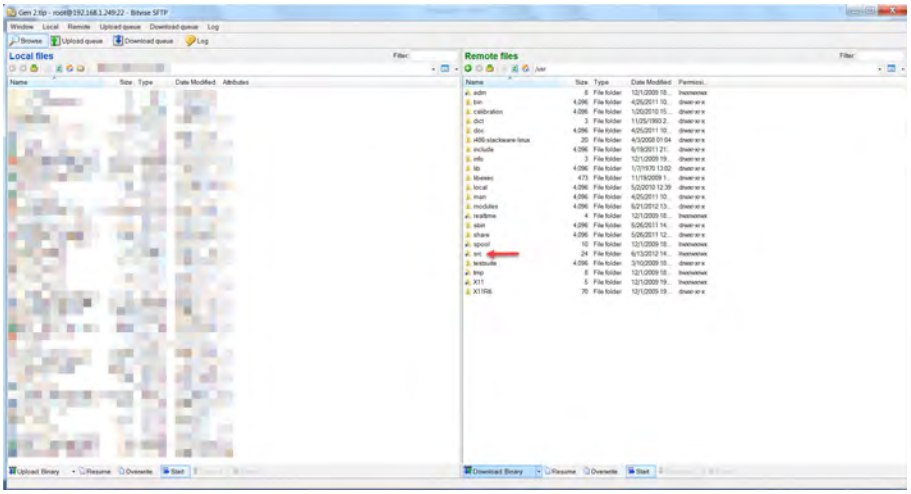


The following screen shots show what these screens look like.

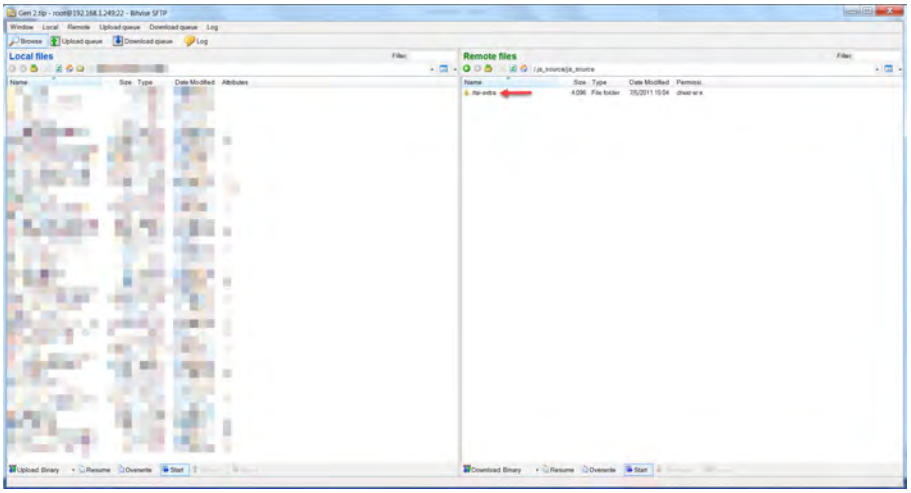
Usr



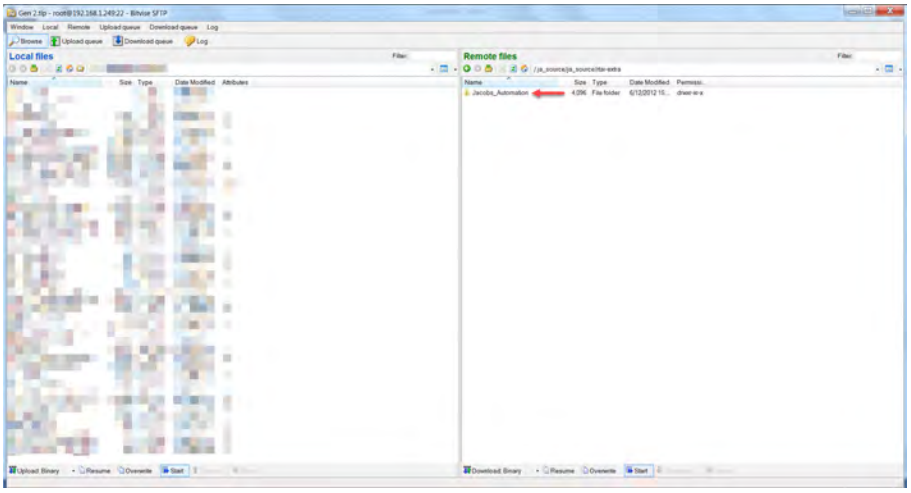
Src



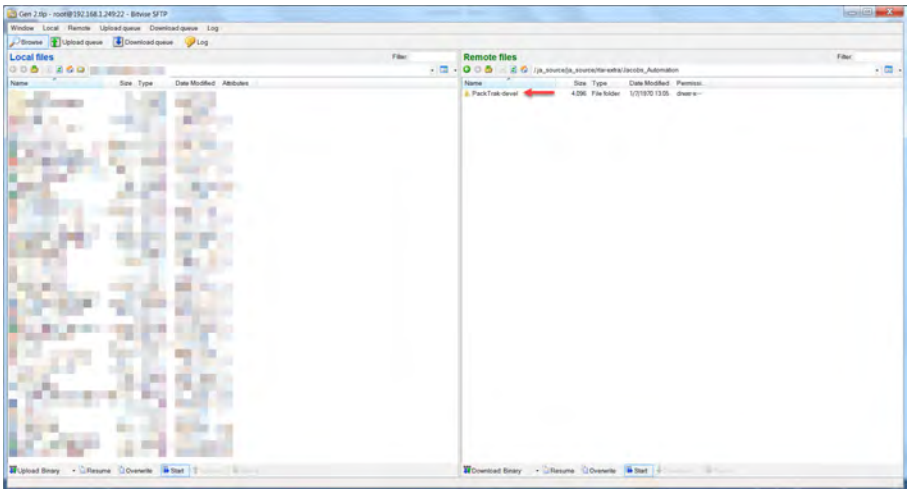
Rtai-extra



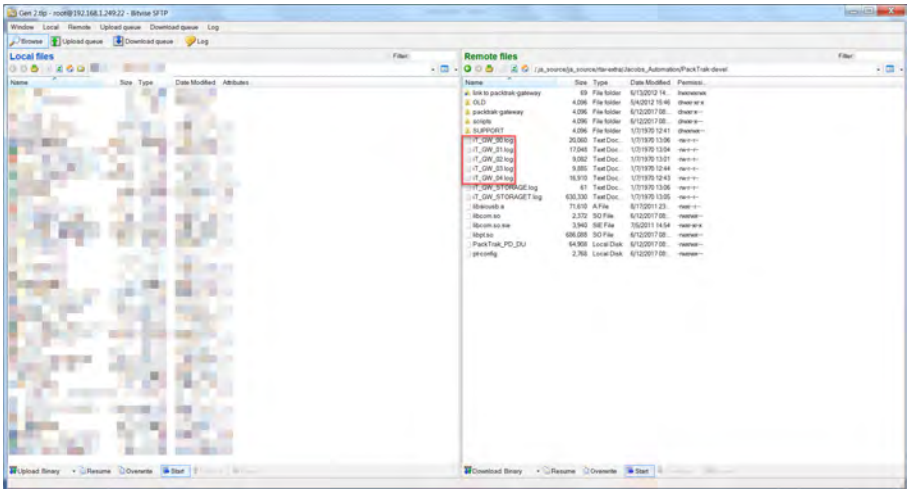
Jacobs_Automation



PackTrak-devel



3. In the PackTrak-devel folder, there can be up to five log files. iT_GW_00.log is the latest file. You can use Note Pad or Note Pad ++ to open this file.



4. If requested, send this log file to ictsupport@ra.rockwell.com.

Gen 3 Bitvise

To access log files with Gen 3 Bitvise, complete the following steps:

1. To access log files using a Gen 3 gateway with Bitvise, navigate to the SFTP window that opens when you log into Bitvise.
2. In the remote files screen on the right hand side, begin by typing / into the address bar of the Remote Files and navigate through the following folders:

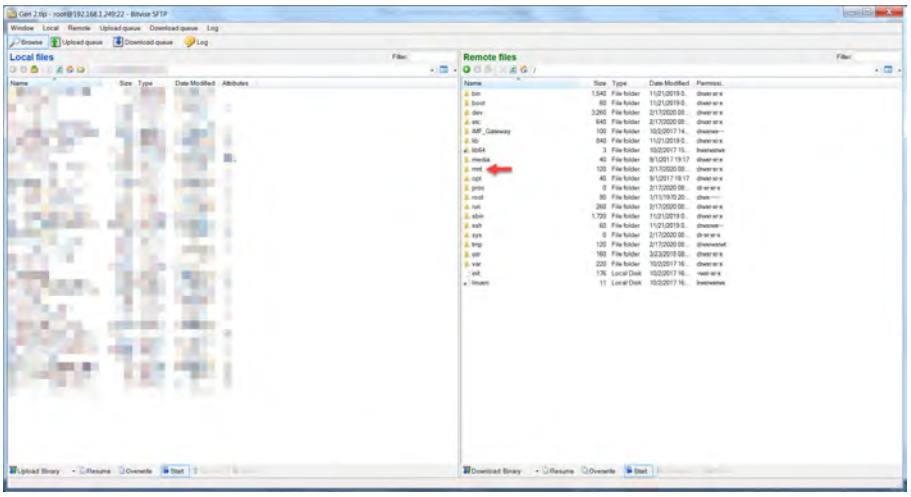
   a. Mnt

   b. Cf

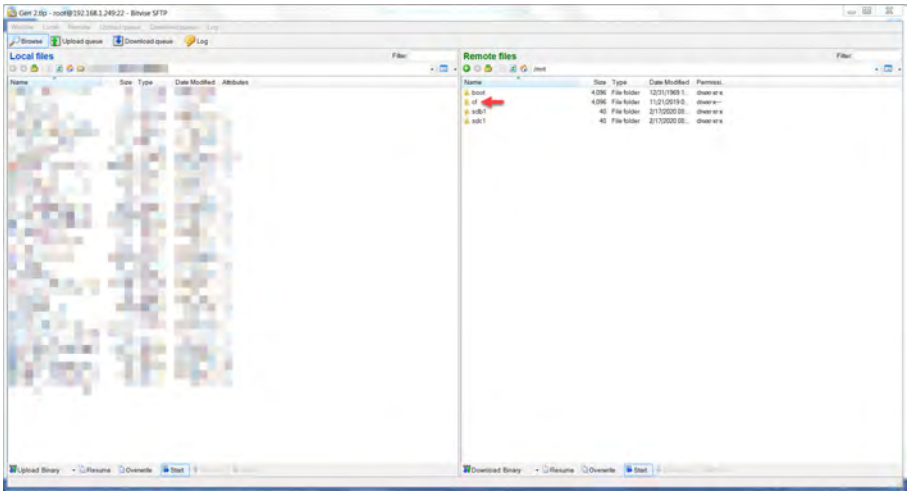
   c. GW_logfiles

   The following screen shots show what these screens look like.

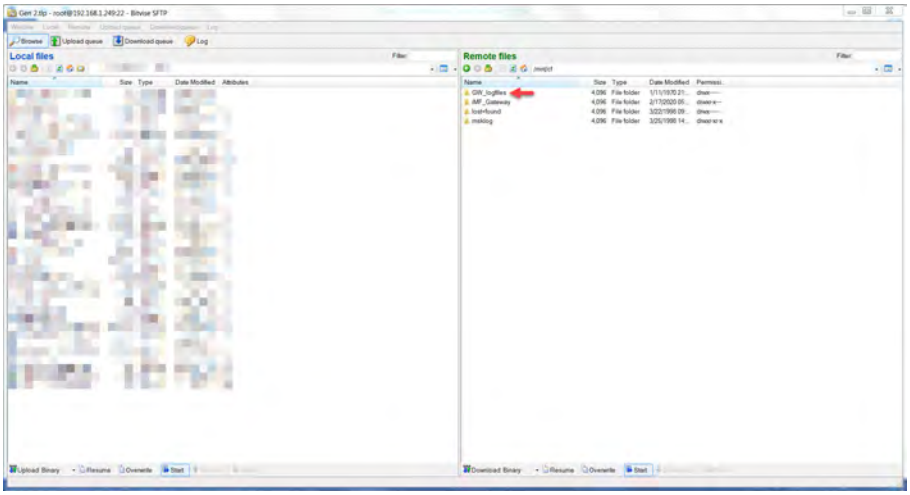
Mnt



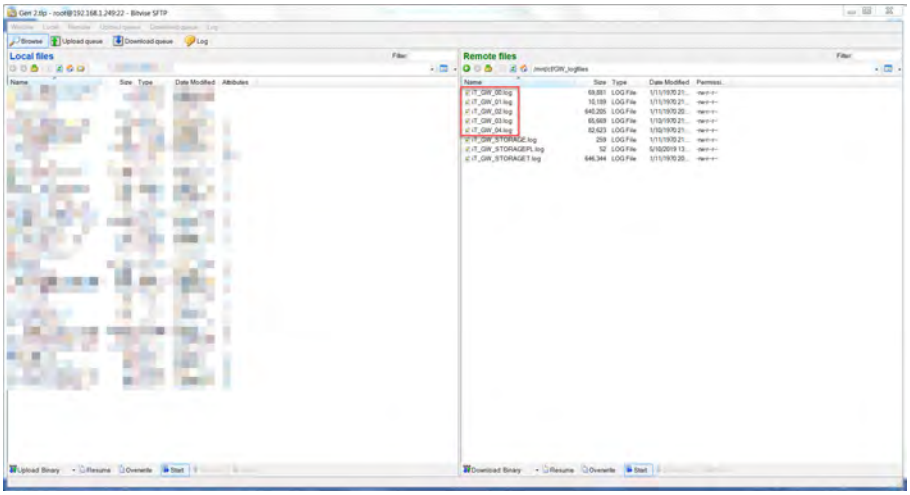
Cf



GW_logfiles



3. In the GW_logfiles folder, there can be up to 5 log files. iT_GW_00.log is the latest file. You can use Note Pad or Note Pad ++ to open this file. If requested, send this log file to ictsupport@ra.rockwell.com.



ACD file

The following sections describe how to configure the .ACD file.

Loop Update Rates

You can configure three update rates:

- Position Loop Update Period (PLUP)
- Requested Packet Interval (RPI)
- Course Update Rate (CUR)

It is important that you check the .ACD file and gateway to ensure that they are set correctly. Balance the performance requirements of your system against the overhead time that is required and set the appropriate CUR. A smaller CUR increases the performance of the motion application, but reduces the time for other tasks in the controller.

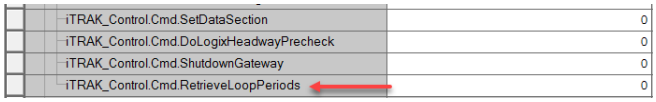
IMPORTANT The recommended CUR is 2x the RPI, which is typically 1x or 2x the PLUP of the iTRAK® system.

Position Loop Update Period

The iTRAK firmware automatically calculates the PLUP based on number of motor sections and system movers. Based on this calculation, you can set the CUR and RPI.

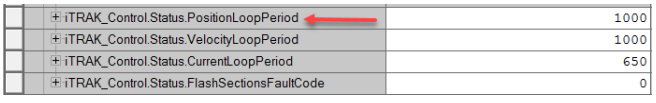
To check the PLUP by using template code, complete the following steps:

1. Navigate to iTRAK_Control.Cmd in the controller tags.
2. Find and toggle iTRAK_Control.Cmd.RetrieveLoopPeriods.



3. Navigate to iTRAK_Control.Status in the controller tags.

   The value for the PLUP is displayed under iTRAK_Control.Status.PositionLoopPeriod in µS. In the example below, 1000 µs is 1 ms.



4. Based on this value, set the RPI to 2 ms and set the CUR to 4 ms.

To check the PLUP by using Libraries, complete the following steps:

1. There is no retrieve loop rate command in Libraries. To determine what your PLUP is, you need to pull a log file and look for the configuration portion as shown in the graphic.

```
PTConfig.NumofActualMovers 14

Movers:
213993 4776133 4527437 4337859 4097084 3432331 3232567 2941427
2286127 2097820 1898612 937218 709572 447176

 === PERIOD calc info: Sections: 1, Movers: 3, HW Version: 2, Min Pos Loop Time: 8000 ns =====
 -----

******** Calculated Loop PERIOD: 1000000 ********
PTConfig.TrackLength 4800000 - Position Loop Time in ns = 1000000
Now sending Positon Loop period of 1000 usec to sections
```

   In the example above, the PLUP is set to 1 µS.

2. Based on this value, set the RPI to 2 ms and set the CUR to 4 ms.

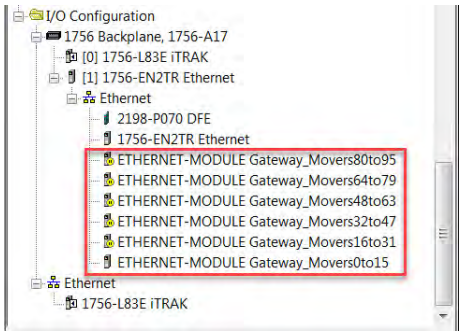
Requested Packet Interval (RPI)

The RPI is the update period of the gateway to the PLC.

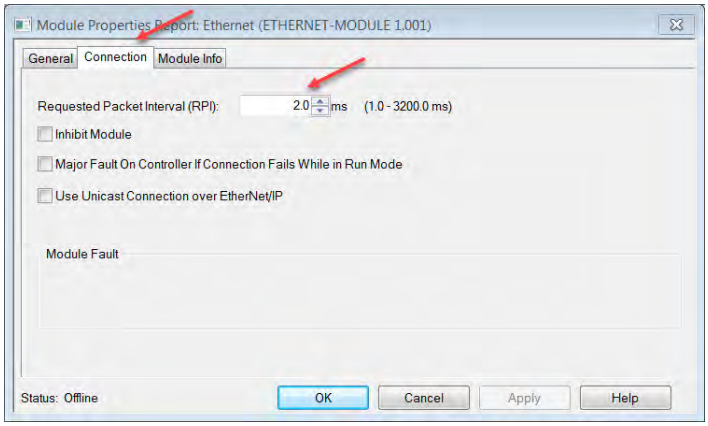
To check the RPI, complete the following steps:

1. Locate the Ethernet modules in the I/O configuration.

   The number of movers on the system determines how many of the Ethernet modules you use.



2. To view or set the RPI, right click on each of the modules you are using and select properties.
3. Click the connection tab and set the RPI to the appropriate number based on the PLUP, and click Apply.

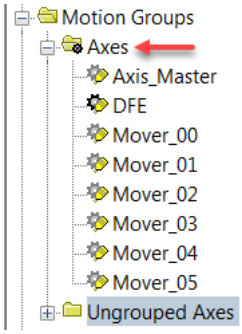


Course Update Rate (CUR)

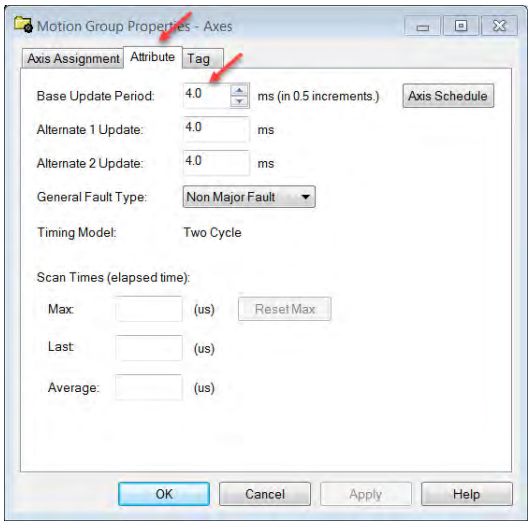
The CUR is the frequency at which the PLC updates and receives information from the gateway.

To view the CUR, complete the following steps:

1. Locate your Motion Group, right click on Axes, and select properties.



2. On the Attribute tab, set the Base Update Period to the appropriate value based on the RPI, and click Apply.

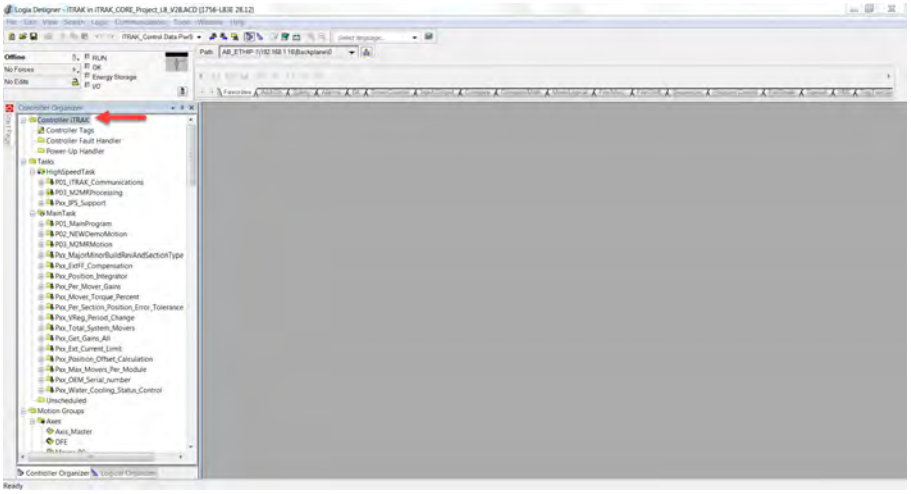


Configuring Template Code

Getting your iTRAK system to run requires configuration of the .ACD file.

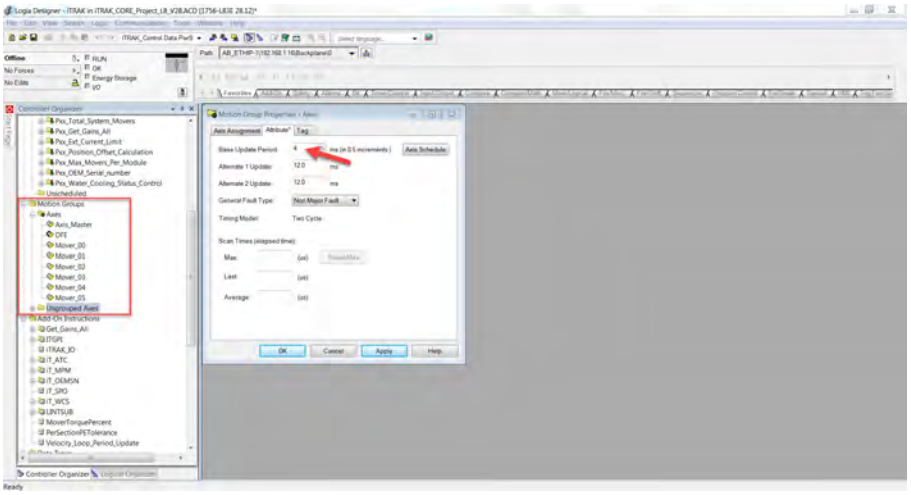
To ensure that your template code project is set up properly, complete the following steps:

1. In the Controller Organizer, right click on Controller iTRAK and verify that the PLC and Logix version you are using is correct.



2. Set the correct number of movers in the motion group and set your course update.

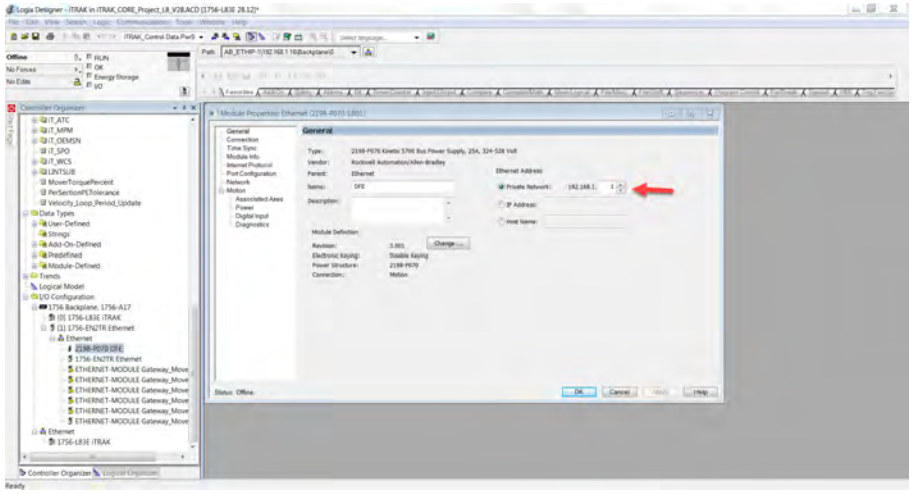
   For guidance on what to set the course update rate to, see Position Loop Update Period on page 31.



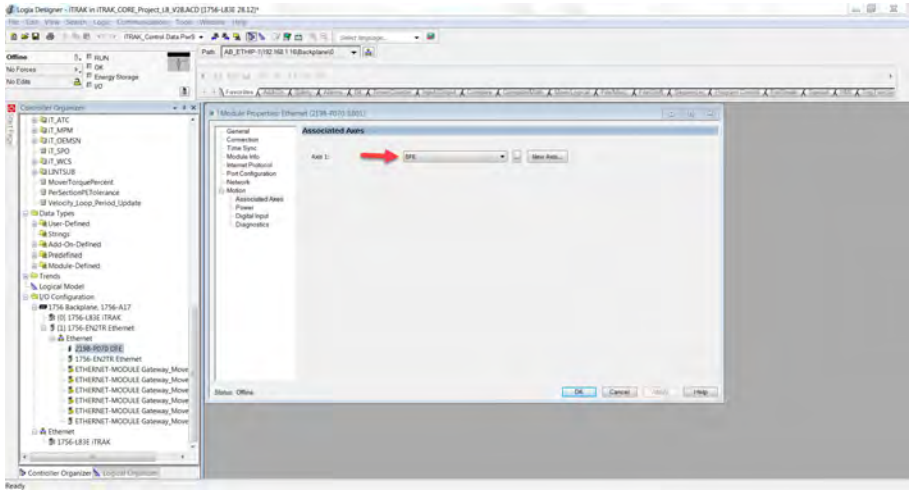
3. Expand I/O Configuration, right click the DFE line, and select properties.

4. Set the following parameters for the DFE properties:
   - IP Address – Set the IP address of the DFE.

     Note: This is not the Kinetix® 5700 iTRAK Power Supply (iPS). The iPS does not belong in the Ethernet tree. All communication between the PLC, gateway, and power supply occurs through the DFE.

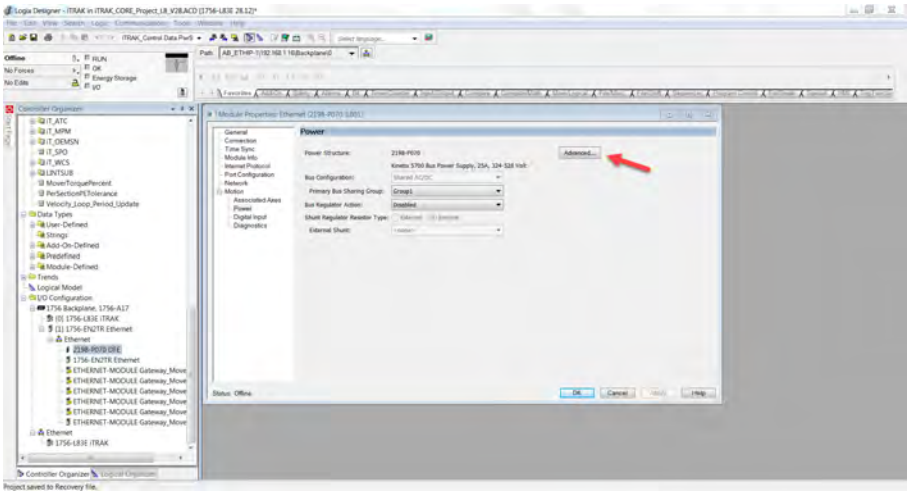


5. On the Associated Axes tab, make sure that Axis 1 is set to DFE (or whatever you named it in the motion group).

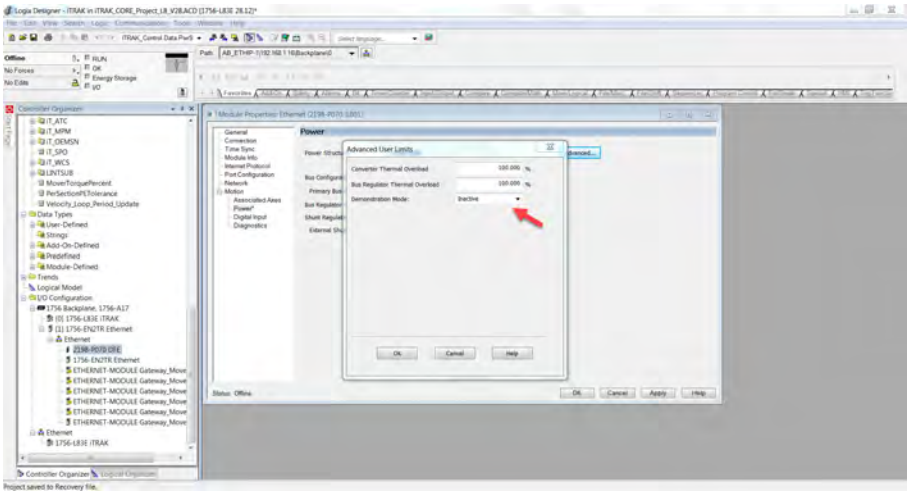


6. On the Power tab, verify that the following parameters are set:
   - Primary Bus Sharing Group is set to Group 1.
   - Bus Regulator Action is set to Disabled.

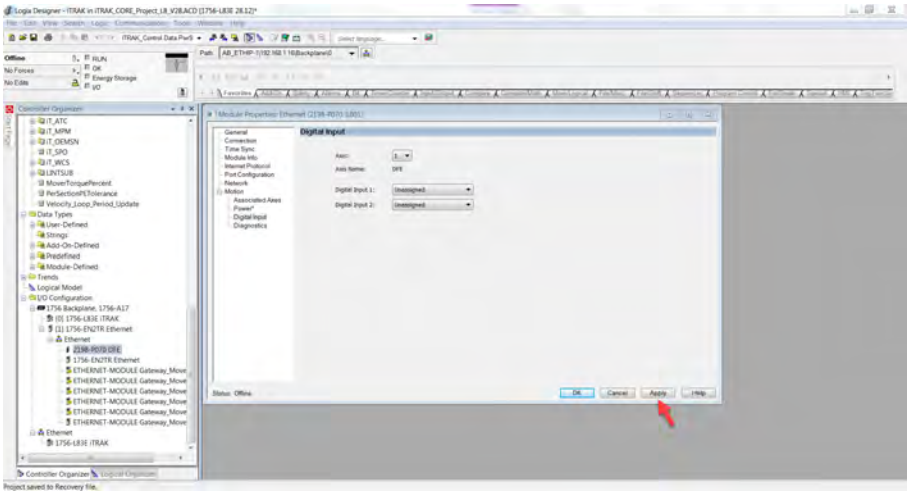
7. Click the Advanced button.



8. In the Advanced User Limits dialog box, verify that Demonstration Mode is set to Inactive.

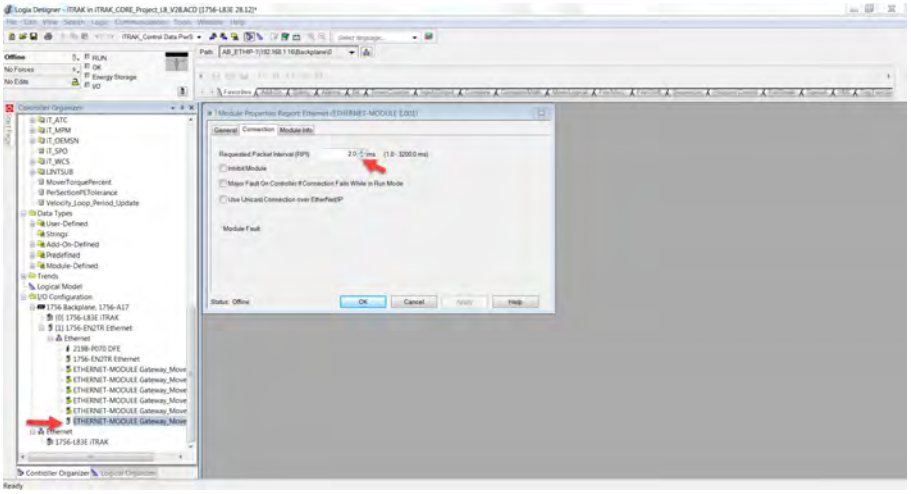


9. On the Digital Input tab, verify that Digital Input 1 and Digital Input2 are both set to Unassigned, and click Apply.

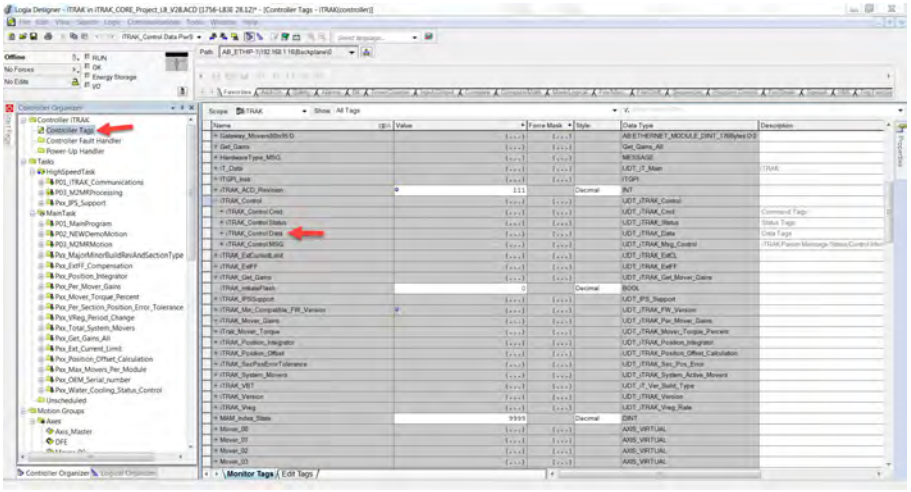


10. Set the Requested Packet Interval (RPI) of the Ethernet modules.

    Depending on the number of movers on your system, inhibit those modules not being used. For guidance on what to set the RPI to, see the section entitled Loop Update Rates on page 31.

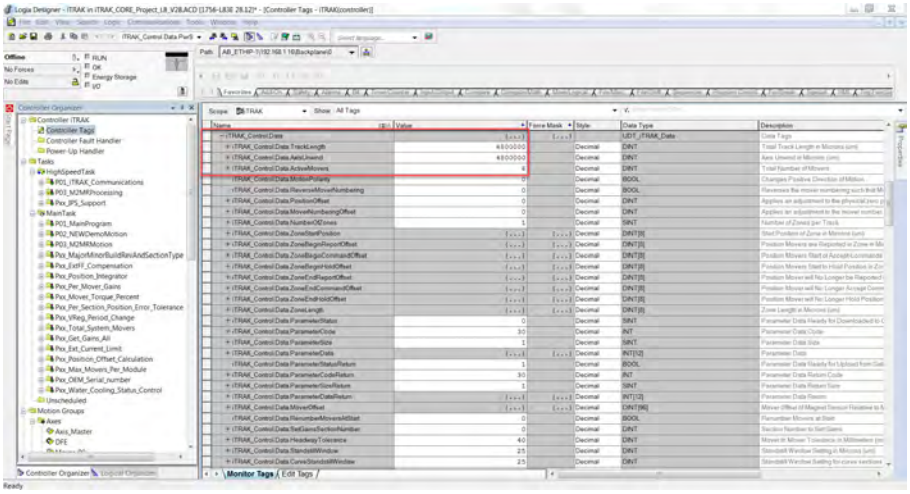


11. In the controller tags, find iTRAK_Control.Data

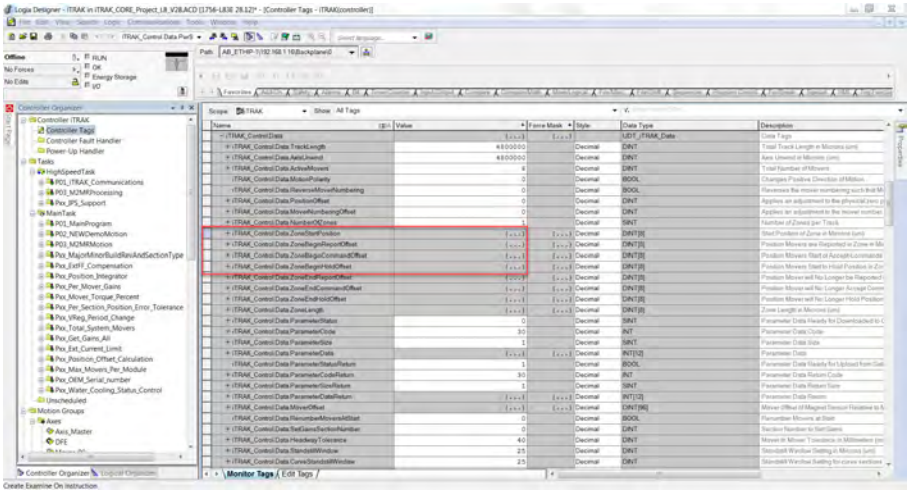


12. Set the track length, axis unwind, and number of active movers.

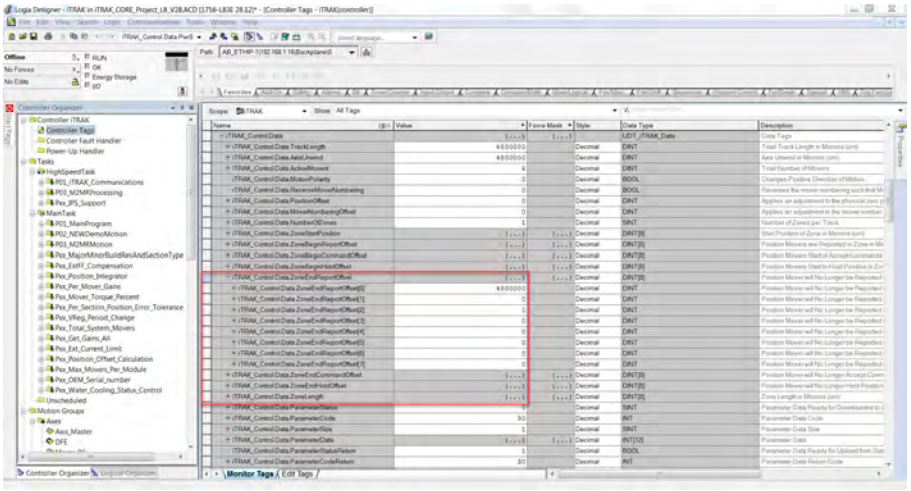
    Track length and axis unwind are the same value and are the length of your iTRAK in µm. For example, a 12 section track is 4800 mm but is set to 4800000 µm in these tags.



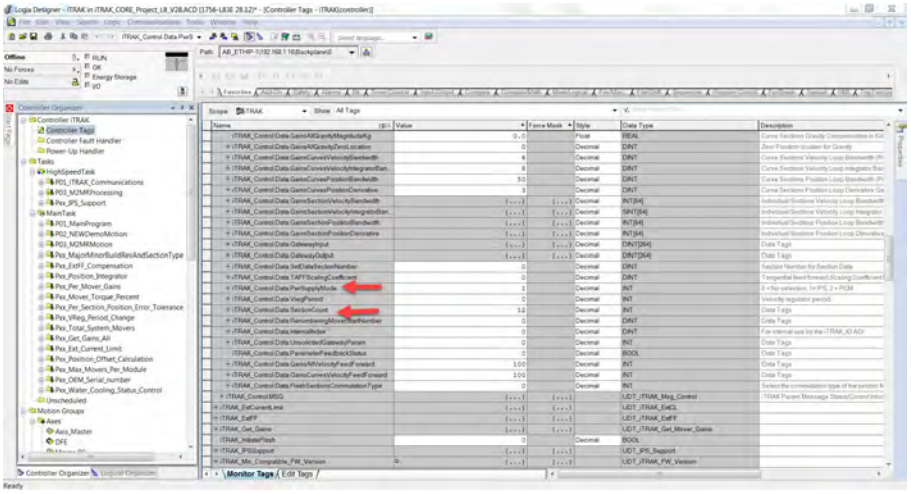
13. Set the number of zones to 1 and enter the value 0 in the [0] array for each of the following tags:
    a. Zone Start Position [0]
    b. Zone Begin Report Offset [0]
    c. Zone Begin Command Offset [0]
    d. Zone Begin Hold Offset [0]



14. Set your track length in µm in the [0] array (for example, 4800000), for the following tags:
    a. Zone End Report Offset [0]
    b. Zone End Command Offset [0]
    c. Zone End Hold Offset [0]
    d. Zone Length [0]



15. Set the Power Supply Mode, type 1 for iPS and 2 for PCM, and then type the correct number of sections on your system.



16. Download your code to the PLC.

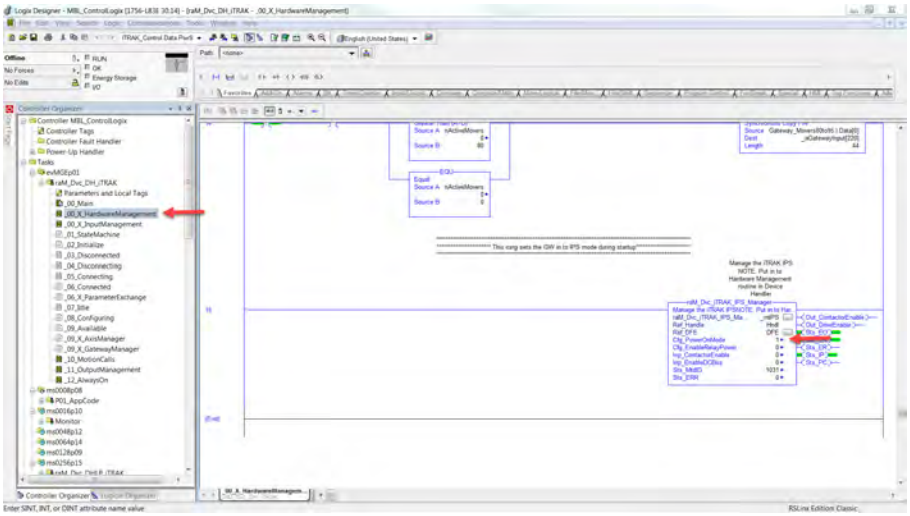
Configuring with Libraries

Getting your iTRAK system to run requires configuration of the .ACD file. Follow these steps to ensure that your Library code project is set up properly.

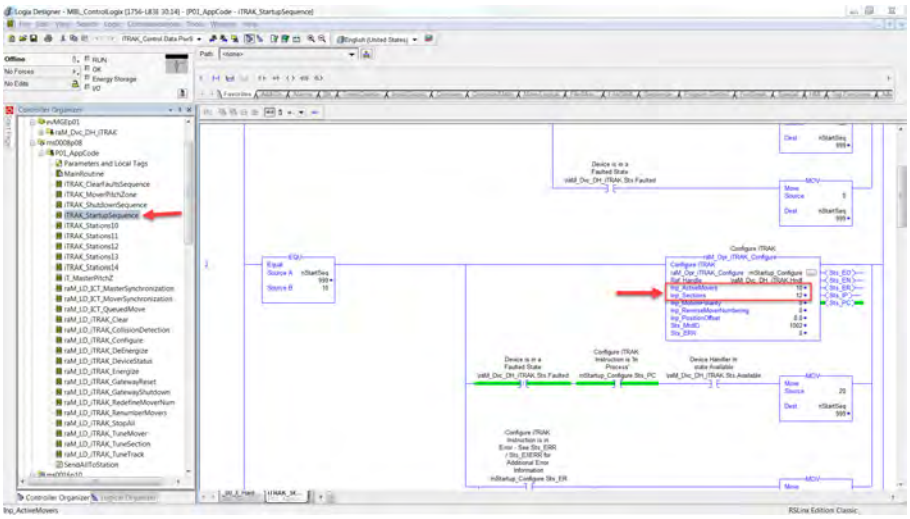
This topic assumes that you have already generated your Library code through Machine Builder Libraries and have the appropriate Add On Instruction (AOI) included in your project. This section focuses on configuration to make the track ready for motion.

See Configuring Template Code on page 34, for steps on how to configure the CUR, RPI, and DFE. These steps are the same whether working with template code or libraries.

1. Locate the Device Handler (DH) in the Controller Organizer, expand it, and find 00_X_HardwareManagement.



2. In the last rung, make sure you have the appropriate power supply manager, either iPS or PCM.
3. Set Cfg_PowerOnMode to 1.
4. Find the iTRAK_StartupSequence.



5. In rung 2, there is a Configure iTRAK command. Set the number of movers on your system and type the number of motor sections.
6. Download your code to the PLC.

Field Use Cases

The following sections describe the problems you may encounter with your iTRAK® system, and they also provide steps taken to resolve the problem.

Intermittent Low Voltage Errors

System Configuration

Size Mover	# of Movers	# of Sections	Gateway Version	Temp Code or Libraries?	F/W Version	IPS or PCM?	Stratix Switch?	Switch Managed?	TriMax Rails?
–	–	–	Gen 2	Template	V1.107	PCM	No	–	No
Track Orientation	**Logix**	**Other**	**Other Comments/Configuration**						
Horizontal	V28	–							

Troubleshooting the Problem

Completed the following steps to troubleshoot the problem:

1. Observed the power supply and line voltage during startup, and observed that one of the power supplies was not coming up to full voltage.
2. Replaced the power supply, but noticed that the problem remained.
3. Traced the power supply enable signal from the USBI/O to the safety side of the DC bus contactor.
4. Located a break in the signal at the DC bus contactor.
5. Replaced the DC bus contactor, and noticed that the problem resolved.

Resolving the Problem

High voltage trend trace data is not a reliable measure of the problem. Testing identified that the contactor is the source of the problem.

Completed the following steps to resolve the problem:

1. Forced the main contactor to ignore the USB-IO signal.
   a. Jumped the terminals for the USB-IO permissive. This forced the voltage to be on always, unless the safety relays are open. The following USB IO outputs are connected per the schematic.

OUT0/NC	Not connected
OUT0/NO	PCM 61AG27:P15, Logic Return in PCM
COM	PCM 61AG27:P12 (COM), PCM 61GB28:P12 (COM), Common rail
OUT1/COM	PCM 61AG27:P12 (COM), PCM 61GB28:P12 (COM), Common rail

OUT1/NC	Not connected
OUT1/NO	PCM 61AG27:P15, Logic Return in PCM
OUT2/COM	XF5 rail?
OUT2/NO	1734-IB4 input module

2. Made sure that the logic return (P15) could be jumped to the common rail (XD1) for both PCMs so only the safety relays, 664QZ27 and 664QZ28, controlled the Logic Fail signal
3. Trended (and saved) the common mode voltages to ensure that voltage is applied (just in case the low voltage fault occurs, because it may provide more information).
4. Determined if the race condition is causing the low voltage fault:
   a. Turned off the high voltage and let the unit sit for 5…10 minutes. This ensured that the capacitors are completely discharged.
   b. Pressed “q” on the gateway console to enable the iTRAK unit to go through a power on self-test (POST).
   c. Determined if the gateway encounters a low voltage fault.
   d. Immediately pressed “q” again to restart the gateway while the caps are still charged.
   e. Determined if the gateway does not encounter a low voltage fault.
   f. If the iTRAK faults on a low voltage after sitting for a while, it could be indicative of a race condition.
5. Checked all grounding and ensured chassis continuity between the sections.
   a. The voltage sensing circuit may be floating relative to other sections causing misreading.
6. Ensured that the time master clock between all PLC racks are synchronized.
   a. Checked this information in Logix, making sure the various components are not in a race condition with different master clock settings.
   b. Changed the order in the daisy chain so that section 0 is the first in its chain.
   c. The voltage drops across each daisy chained connector can cause the voltage at Section 0 to be low. Although this is an unlikely scenario, because the voltage must be below 17V, it is worth checking.
7. Measured the voltage with an oscilloscope at the Section 0 terminal.

Mover Oscillations, Missing Movers, Error 12

System Configuration

Size Mover	# of Movers	# of Sections	Gateway Version	Temp Code or Libraries?	F/W Version	IPS or PCM?	Stratix Switch?	Switch Managed?	TriMax Rails?
50W x 100L	54	24	Gen 3	Libraries	V3.002.231	iPS	Yes	Yes	Yes
Track Orientation	**Logix**	**Other**	**Other Comments/Configuration**						
Vertical	V32	–	Multi-gateway, multi-track system.						

Troubleshooting the Problem

Completed the following steps to troubleshoot the problem:

1. Disabled Eco-Current Mode and observed an improvement in mover oscillation.
2. Optimized tuning and observed minimized oscillation.
3. Ran the system and confirmed occurrences of missing (lost) movers.
4. Upgraded firmware to revision 3.002.231?

Resolving the Problem

Completed the following steps to resolve the problem:

1. Firmware revision 3.002.231 improved module-end sensor sensitivity, which greatly reduces occurrences of missing or lost movers.
2. As a result, Error 12 occurrences are dramatically reduced.

Rough and Choppy Mover Motion in Straights and Curves

System Configuration

Size Mover	# of Movers	# of Sections	Gateway Version	Temp Code or Libraries?	F/W Version	IPS or PCM?	Stratix Switch?	Switch Managed?	TriMax Rails?
100x100	2	28	Gen 3	Libraries	V3.002.2218	iPS	Yes	Yes	Yes
Track Orientation	**Logix**	**Other**	**Other Comments/Configuration**						
Horizontal	V32	–							

Troubleshooting the Problem

Completed the following steps to troubleshoot the problem:

1. Tuning

   No matter which tuning values were chosen, it had little effect on the performance in the curves or straights. In straights, the mover shook and vibrated, even in the middle of the section

2. Firmware

   Three different versions of firmware were tested on the track. No noticeable differences were observed between revisions 3.001.214, 3.001.218 and 3.001.2218.

3. Section Types

   With each version of firmware, both optimal current and optimal force section types were tested. With all three firmware revisions, no change was seen.

4. Loop Update rates

   With each version of firmware, the position loop update rate (PLUP), RPI and CUR were adjusted. Regardless of the rates, there was no improvement.

5. Testing with old template code

   To verify that the libraries or current .ACD file weren't causing issues, downloaded the correct version of template code and the problem continued across both libraries and template code.

6. Moving curve rail in and out

   To verify that the position magnet may not be making correct position with the encoder, moved the curve rail in and out, but neither action made an improvement in the motion.

7. Verifying both curve and straight sections had ferrites

   Spot checked one curve and one straight section. Both motors had ferrites.

8. Grounding

   Measured a slight voltage with respect to ground on the gateway. A wire was run directly from ground to gateway. AC voltage was grounded however we would still get approximately 12mV DC when measuring with respect to ground.

9. Separated all iTRAK communications from the rest of the system

   Attempted to verify that there wasn't anything from the managed switch that may be interfering with iTRAK communications. Separated everything from the network and ran it again, but observed no improvement.

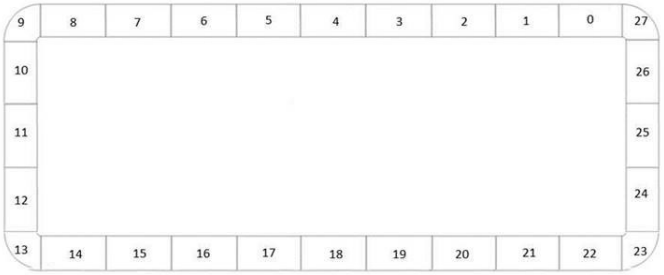
10. Replaced the black position magnet and measured air gaps.

    The position magnet measured 2.75 mm (0.11 in.). Motor magnets were 1.1 mm (0.04 in.) on straight sections and 1.5 mm (0.06 in.) on the curve section. No improvement was seen.

11. Removed all sections from the Gen 3 gateway and tested individual sections one at a time by jogging one mover back and forth 600 mm (23.62 in.)/s.

    Tested the first five straight sections, but oberved no improvement on any of the straight sections. Tested the first curve individually and observed no improvement. This test was to confirm that there was no power issue or undersized the power supplies causing erratic motion.

12. Completed an additional set of tests by using a visual of the track to understand the testing.



13. Connected Sections 8...14 to the Gen 2 gateway and had 1 mover jog back and forth at 600 mm (23.62 in.)/s.

Observed no improvement in the curves, but straight sections 8 and 14 were markedly smoother.

14. Connected straight sections 14...22 to the Gen 2 gateway and had 1 mover jog back and forth at 600 mm (23.62 in.)/s.

Motion was exactly as expected—smooth with no servo oscillations on the mover.

15. Connected straight sections 24...26 to the Gen 2 gateway and had 1 mover jog back and forth at 600 mm (23.62 in.)/s.

Sections 24 and 25 behaved poorly with rough motion with servo oscillation. Section 26 performed as expected

16. Connected straight sections 0...8 to the Gen 2 gateway and had 1 mover jog back and forth at 600 mm (23.62 in.)/s.

Motion was exactly as expected—smooth with no servo oscillations on the mover.

17. Performed the same tests on sections 10...12, but took voltage measurements from section 12 during motion, as it is the last section on the power daisy chain.

Motion was poor, as with all the gen 3 tests Voltage measurements read as follows:

- 24C – 0.000
- i24+ - 23.62V
- High bus with respect to midbus – 160V
- Low bus with respect to midbus – -160V

Voltage measurements were good.

Resolving the Problem

When troubleshooting, we used template code to troubleshoot the machine. When the project was created, we dragged and dropped the Ethernet modules (which contain all iTRAK communications) from the MBL version that was on the machine at the time.

We created a new file by using the template code from PCDC. This file was downloaded and we no longer saw the erratic and poor motion.

Intermittent Error Code 9

System Configuration

Size Mover	# of Movers	# of Sections	Gateway Version	Temp Code or Libraries?	F/W Version	IPS or PCM?	Stratix Switch?	Switch Managed?	TriMax Rails?
100x50	18	20	Gen 2	Template	V1.111	iPS	Yes	Yes	Yes
Track Orientation	**Logix**	**Other**	**Other Comments/Configuration**						
Vertical	V32	–	Multi-gateway, multi-track system.						

Troubleshooting the Problem

We first looked for a network communication problem with the Stratix® 5400 managed switch and Gateway 1. Only Gateway 1 was routed to the managed switch. Gateway 2 has a dedicated 1756-EN2TR. Gateway 1 and Gateway 2 were swapped testing whether error code 9 would follow Gateway 1 or stay with the Stratix 5400 managed switch network configuration. Results of the test were error code 9 followed original Gateway 1. Therefore a network communication issue was eliminated as a potential root cause.

To rule out a corrupted CF card, the Gateway 1 CF card was swapped with the Gateway 2 CF card. The result of the tests were that Error code 9 remained with Gateway 1. A corrupted CF card was eliminated as a potential root cause.

A review of BIOS settings revealed CPU temperature of Gateway 1 read 99˚C (210.2 ˚F) while Gateway 2 read 52˚C (125.6 ˚F).

Resolving the Problem

The cause of error code 9 was concluded to be an overheating Gateway 1 CPU. Gateway 1 will be sent to Advantech by RA for root cause failure analysis (RCFA). A new gateway CPU was sent overnight and built onsite. After implementation, no loop overrun periods or error code 9 were experienced. Operating temperature of the CPU is stable at 52...56˚C (125.6...132.8 ˚F).

Error Code 28 after Power Cycle

System Configuration

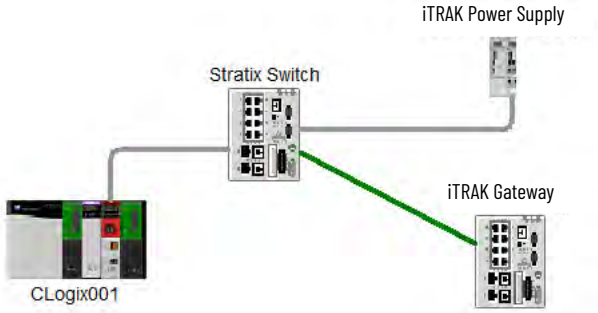
Size Mover	# of Movers	# of Sections	Gateway Version	Temp Code or Libraries?	F/W Version	IPS or PCM?	Stratix Switch?	Switch Managed?	TriMax Rails?
100x100	16	8	Gen 2	Libraries	V1.111	iPS	Yes	Yes	Yes
Track Orientation	**Logix**	**Other**	**Other Comments/Configuration**						
Vertical	V32	–							

Troubleshooting the Problem

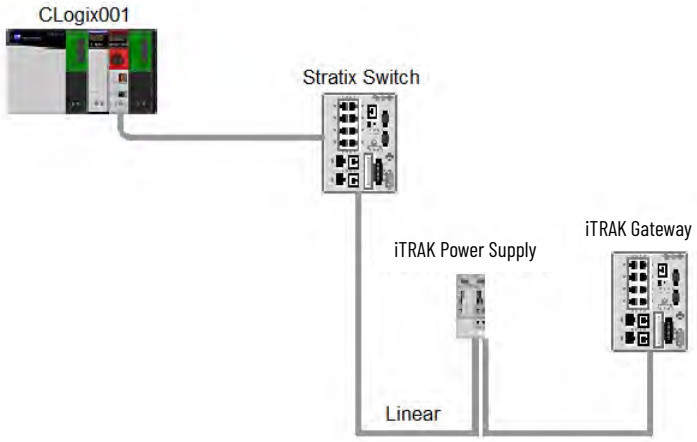
The customer used a managed Stratix 5400 switch.

1. After a power cycle, the gateway hangs waiting for a power supply configuration. This is due to the Stratix switch booting up much slower than the PLC and gateway.
2. The gateway requests a power supply configuration once and if it does not receive it generates an error code 28.

a. The screenshot below shows the customers original ethernet communication topology.



3. The customer's ethernet topology was changed such that the iTRAK Power Supply (iPS) and gateway connect directly to each other after the switch. This allows the gateway to receive its power supply configuration and continue with its boot up.



Resolving the Problem

The solution to error code 28 is to have the proper topology for ethernet communications. The iPS and gateway need to be talking to each other past the switch.

Alternatively, firmware 1.112 eliminates error code 28 with the POST on demand feature.

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Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
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Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Rockwell Otomasyon Ticaret A.Ş. Kar Plaza İş Merkezi E Blok Kat:6 34752, İçerenköy, İstanbul, Tel: +90 (216) 5698400 EEE Yönetmeliğine Uygundur

Connect with us.

rockwellautomation.com — expanding human possibility™

AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
ASIA PACIFIC: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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