Tips for Migrating Applications from 2500P-ACP1 to 2500P-JACP

1.1 Introduction

CTI 2500 Series® Coprocessor modules are used to expand the capabilities of existing 2500 Series® and Simatic®/TI 505 systems. The newest member of the Coprocessor family is the 2500P-JACP Janus Application Coprocessor (JACP). The JACP includes several new capabilities which are not available on the previous generation, the 2500P-ACP1, including support for Block Transfer I/O, CAMP Server, Ethernet/IP Tag Server, Ethernet/IP Flex I/O and OPC-UA Server. This Tech Tip explores requirements for converting applications from ACP1 to JACP.

This Tech Tip assumes the user is familiar with the use of Workbench (JSoft) for developing applications for ACP1 and JACP.

1.2 Conversion Overview

Workbench applications developed for ACP1 will generally run on JACP with only minor modifications. One important note is that the JACP places limits on the usage of some client protocols. With the JACP, you are limited to using only 2 of the following protocols, while the ACP1 allowed use of all 3 simultaneously.

- Modbus UDP/TCP Client
- Ethernet/IP Scanner / Flex IO
- Ethernet/IP Tag Client

The Ethernet/IP Tag Client is most often used to allow the ACP1 to read tag data from a Rockwell PLC which is functioning as a tag server. Accordingly, it is usually possible to switch these roles – setting the Rockwell PLC as the tag client and the JACP the tag server. Since the Ethernet/IP Tag Server on JACP does not count against the limit of 2, this “role swap” will allow the ACP1 application to be migrated to JACP.

Here are the steps for the conversion:

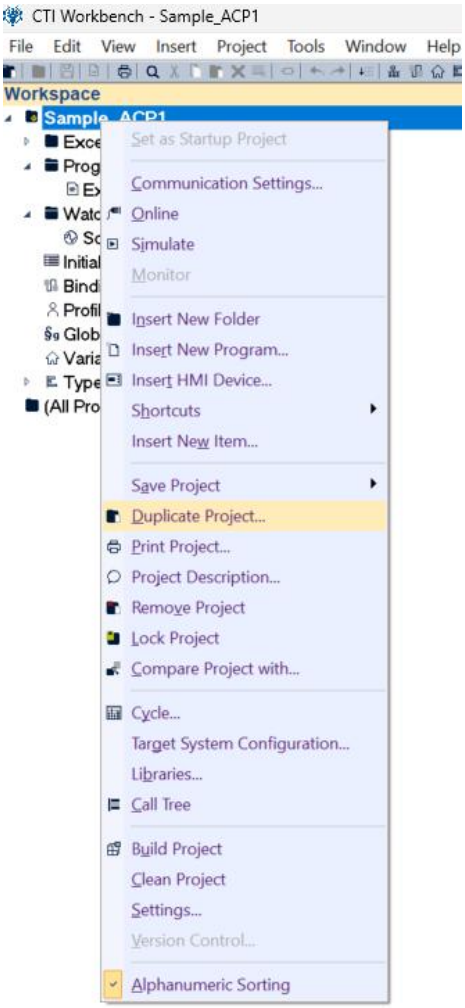
1. Duplicate your ACP1 project
2. Change project target from ACP1 to JACP
3. If the ACP1 project uses the “CTI ACP1 Data Cache” protocol, this must be converted to the “CTI Enhanced Data Cache” supported by JACP.

4. If the ACP1 project uses “CTI 2500 ACP1 I/O” protocol, this must be converted to the new “Block Transfer” protocol on JACP.
5. If the ACP1 project logic uses any of the “CTI 2500P-ACP1 Functions”, they must be converted to equivalent functions supported by JACP.
6. If your ACP1 project uses all three of the client protocols in the list above, implement the role swap with the Rockwell PLC and configure a new Ethernet/IP Tag Server on the JACP.

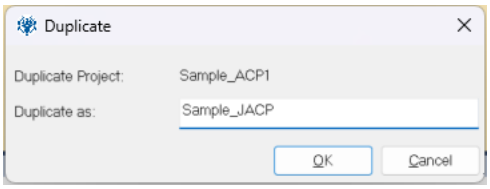
1.3 Duplicate the ACP1 Project

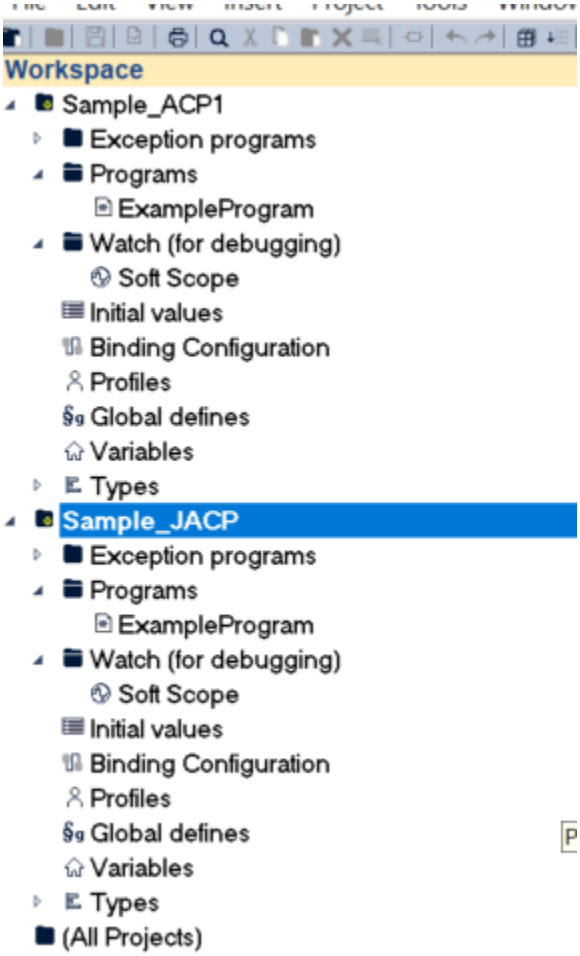
We recommend that you begin the process by making an exact duplicate of your existing ACP1 project and modify the duplicate as required for JACP. Then, if there are problems, it is easy to get back to the original ACP1 project.

To duplicate the project, highlight the project name in your workspace, right click on the project name and click “Duplicate Project”.



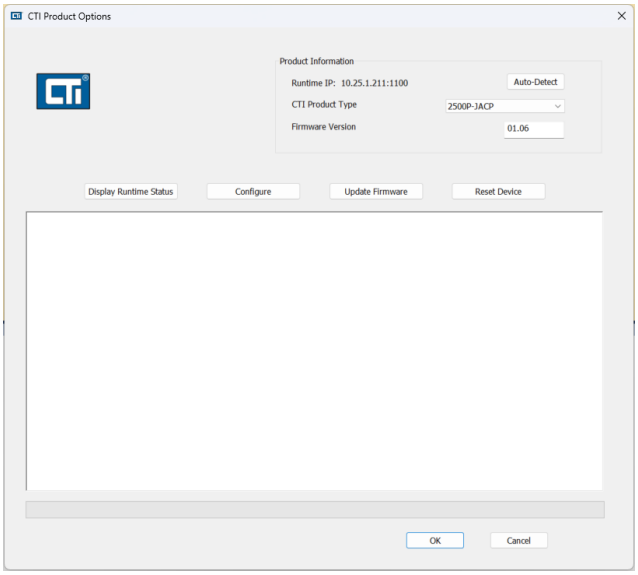
The “Duplicate” dialog will come up. Enter a name for your duplicated project and click OK.





1.4 Change Project Target from ACP1 to JACP

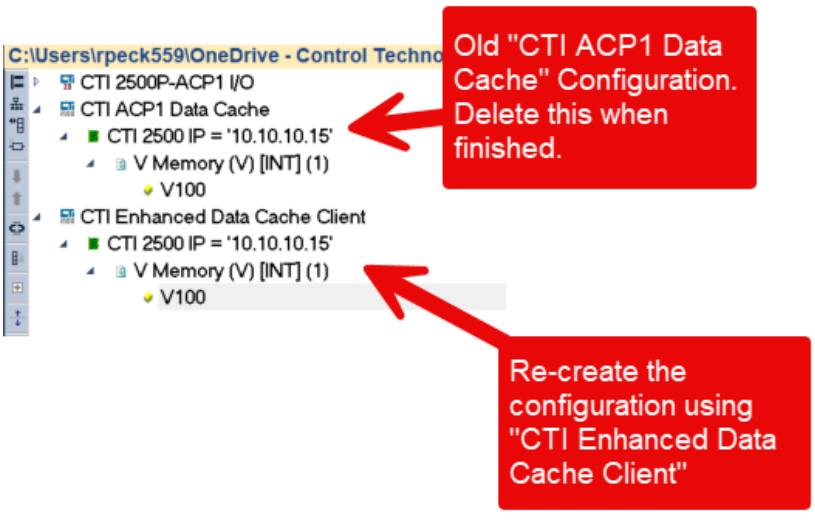
Set your new JACP project to be the startup project. Modify the communications setting if needed for the new IP address of the JACP. Then, using Tools – CTI Product Options, modify the CTI Product Type to be 2500P-JACP and enter the firmware version (or use Auto-Detect if the module is available on your network).



1.5 Convert “CTI ACP1 Data Cache” to “CTI Enhanced Data Cache”

The Data Cache configuration for the application must be manually re-created using the “CTI Enhanced Data Cache” protocol supported by the JACP. For most configurations this process only requires a few minutes of time; however, if you have a very large Data Cache configuration with hundreds of variables, it is possible to export your configuration to an xml file, make a few edits using Search/Replace, and re-import the new configuration. That process is summarized in Converting Data Cache by Editing XML Export below.

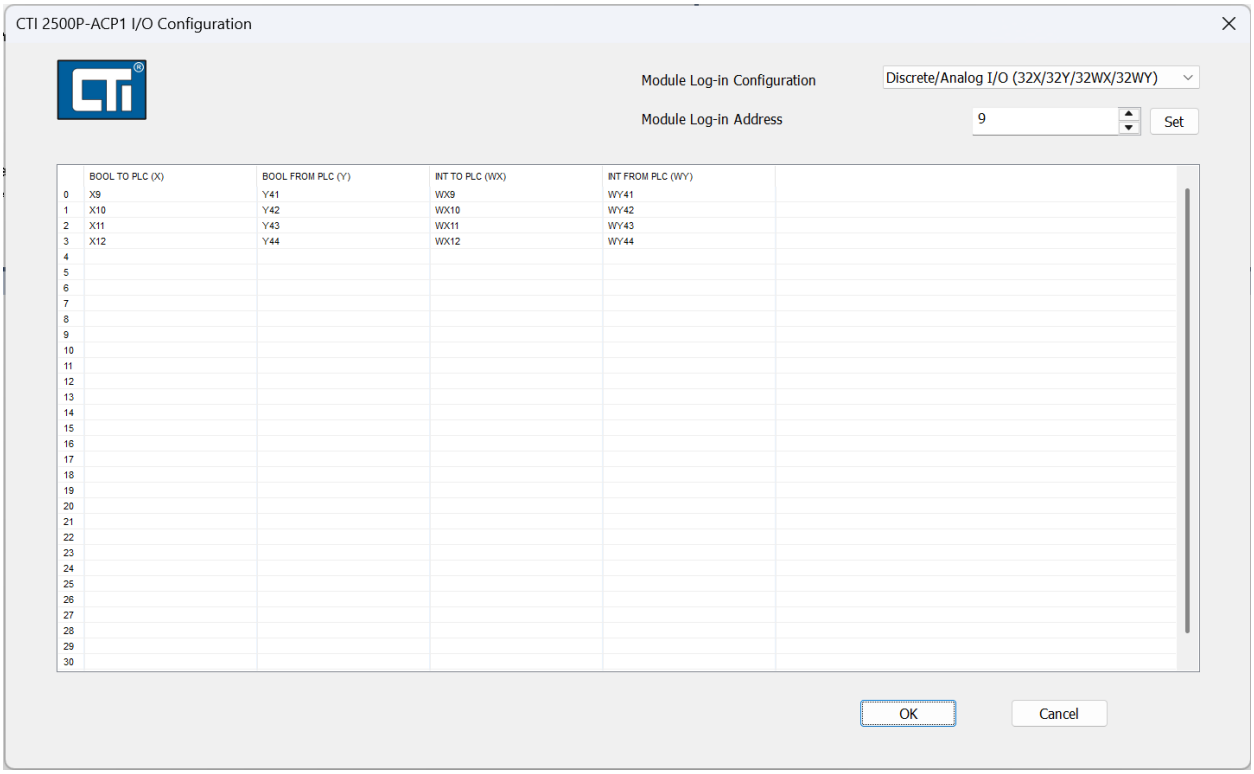
The easiest way to re-create the configuration is to temporarily leave the “CTI ACP1 Data Cache” in place and add the “CTI Enhanced Data Cache”, recreating the connection and all the data blocks and variable under CTI Enhanced Data Cache. Once you have completed the new configuration, simply delete the old “CTI ACP1 Data Cache” configuration.



1.6 Convert “CTI 2500 ACP1 I/O” protocol to the new “Block Transfer” protocol on JACP.

The 2500P-JACP includes a new Block Transfer feature which operates using the same protocol as a CTI 2572-A/B Ethernet module to transfer data from the PLC across the backplane to the JACP. The module logs in to the PLC (2500-Cxxx or Simatic/TI 545/555) as a Special Function module, so this method works in a local or remote base, but not in a Profibus base. Use of this interface removes the limitation of 32DI/32DO/32AI/32AO data which existed with the ACP1 and gives access to Control Relays and V-memory. The X/Y/WX/WY values which were available on CTI ACP1 I/O are also available on Block Transfer.

The use of Block Transfer requires rebuilding the configuration using Block Transfer for JACP. Since the old interface was limited to 32DI/32DO/32AI/32AO, the reconfiguration can be done quickly. To explore the process, consider this CTI ACP1 I/O Configuration as viewed in the ACP1 I/O Configuration Wizard:



In this configuration, the user had specified that the ACP1 would log in to the base at address 9. Accordingly, the I/O available in the interface was:

X9-X40
Y41-Y72
WX9-WX40
WY41-WY72

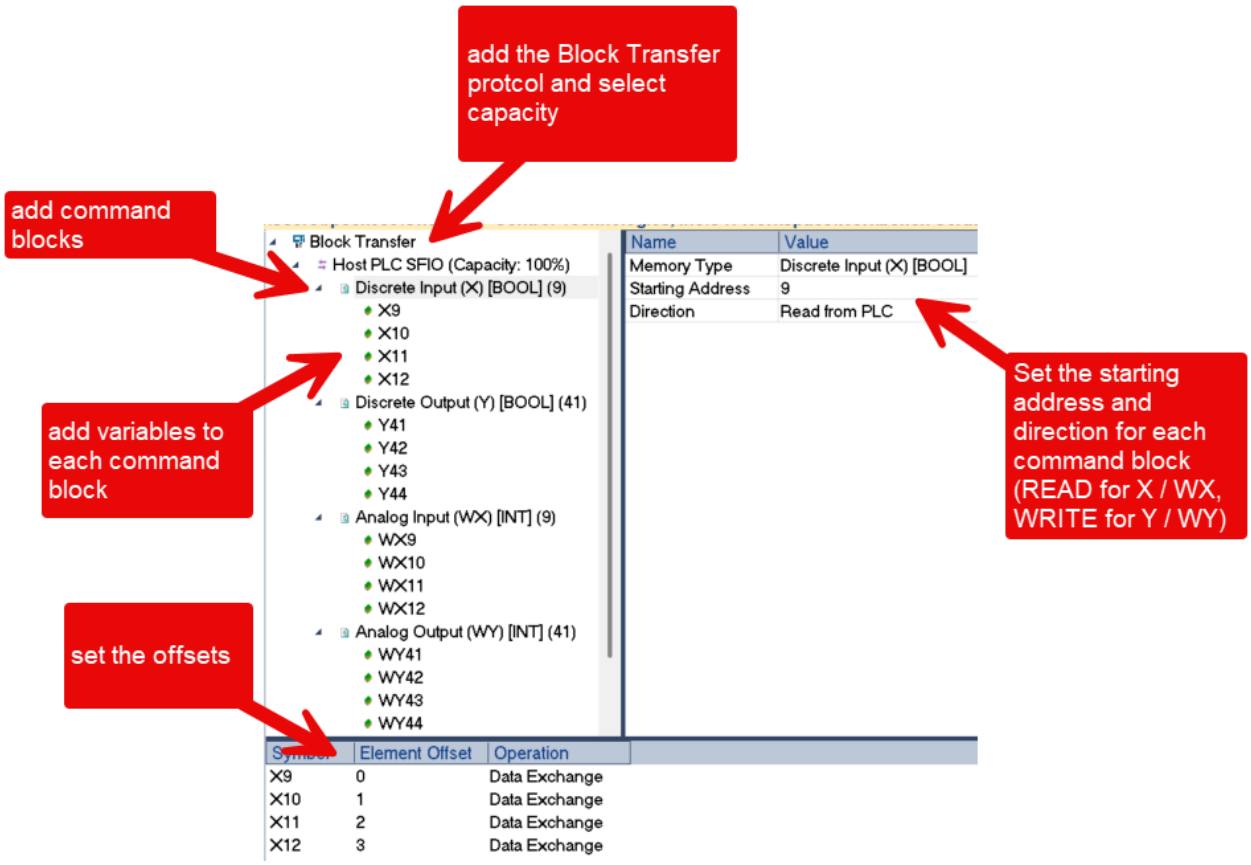
In this case, the user only required X9-X12, Y41-Y44, WX9-WX12, and WY41-WY44, and therefore only assigned variables to those locations in the interface. For ease of understanding, we have used variables of the same name as the I/O register address, but this is not required in Workbench. However, be sure to

use the same names from your ACP1 application to ensure the JACP program logic works the same as the ACP1.

To produce the equivalent configuration in Block Transfer, here are the steps:

1. Add the Block Transfer protocol into the Fieldbus configuration.
2. Select the block transfer capacity to use (50%, 75%, Max). Usually, it is OK to use the maximum.
3. Add in the command blocks for Discrete Input, Discrete Output, Analog Input, Analog Output. In each command block, be sure to set the starting address so it matches what was set in the ACP1 configuration and set the appropriate direction (READ for X/WX, WRITE for Y/WY).
4. Add variables to each command block, being sure to give them the same names as were used in the ACP1 application. After inserting all the variables for each command block, be sure to use set up the offsets correctly either manually or by using “Renumber Offsets”.

Following the steps above for our example, here is the resulting Block Transfer Configuration:



1.7 Convert any "CTI 2500P-ACP1 Functions" to equivalent functions supported by JACP

In this step, you will need to modify the usage of the following functions, if they appear in the logic of any POUs in your application. Note that because of new features added to JACP, the positions of some status bits may have changed. Tables are included in the sections below showing the bit assignments for each function.

ACP1 Function	Equivalent JACP Function	Comments
CTI_ACP1_CONFIG	JACP_CONFIG	Rarely used
CTI_ACP1_STATUS	JACP_STATUS	
CTI_SET_RTC	CTI_PLC_SET_RTC	
CTI_USER_LED	No equivalent in JACP	Rarely, if ever, used
CTI_XFER_FILE	No equivalent in JACP	Rarely, if ever, used. FTP capability removed for improved security.

1.7.1 *CTI_ACP1_CONFIG to JACP_CONFIG*

CTI_ACP1_CONFIG

Bit No.	Description
0 (LSB)	**RTC Synchronization Enable Status** ON = Enabled, OFF = Disabled
1	**RTC Synchronization Activation Status** ON = Active, OFF = Failed
2	**FTP Transfer Enable Status** ON = Enabled, OFF = Disabled
3	**Normal IO Interface Configuration Status** ON = Configured, OFF=Unconfigured
4	**2500 Data Cache Configuration Status** ON = Configured, OFF = Unconfigured
5	**CAMP Client Configuration Status** ON = Configured, OFF = Unconfigured
6	**MODBUS Master Configuration Status** ON = Configured, OFF = Unconfigured
7	**Modbus TCP Server Configuration Status** ON = Configured, OFF = Unconfigured
8	**Modbus Serial RTU Slave Configuration Status** ON = Configured, OFF = Unconfigured
9	**Binding Publisher Configuration Status** ON = Configured, OFF = Unconfigured
10	**Binding Subscriber Configuration Status** ON = Configured, OFF = Unconfigured
11	**Ethernet/IP I/O Scanner Configuration Status** ON = Configured, OFF = Unconfigured
12	**Ethernet/IP Adapter Configuration Status** ON = Configured, OFF = Unconfigured
13	**Ethernet/IP Tag Client Configuration Status** ON = Configured, OFF = Unconfigured
14	**Reserved**
15	**MQTT Client Configuration Status** ON = Configured, OFF = Unconfigured
16 - 31	**Unused**

JACP_CONFIG

Bit No.	Description
0 (LSB)	**RTC Synchronization** RTC SYnchronization ON = Configured, OFF = Unconfigured
1	**HTML Data Server** ON = Configured, OFF = Unconfigured
2	**CTI Enhanced Data Cache Client** ON = Configured, OFF = Unconfigured
3	**Block Transfer** ON = Enabled, OFF = Disabled
4	**Binding Subscriber** ON = Configured, OFF = Unconfigured
5	**Binding Publisher** ON = Configured, OFF = Unconfigured
6	**CAMP Client** ON = Configured, OFF = Unconfigured
7	**CAMP Server** ON = Configured, OFF = Unconfigured
8	**Modbus Master/Client** ON = Configured, OFF = Unconfigured
9	**Modbus Slave/Server** ON = Configured, OFF = Unconfigured
10	**Ethernet/IP IO Scanner** ON = Configured, OFF = Unconfigured
11	**Ethernet/IP Adapter** ON = Configured, OFF = Unconfigured
12	**Ethernet I/P Tag Client** ON = Configured, OFF = Unconfigured
13	**Ethernet/IP Tag Server** ON = Configured, OFF = Unconfigured
14	**MQTT Client** ON = Configured, OFF = Unconfigured
15	**Ethernet I/P Flex IO Client** ON = Configured, OFF = Unconfigured
16	**OPCUA Server** ON = Configured, OFF = Unconfigured
17	**Reserved**
18	**Reserved**
19 - 31	**Unused**

1.7.2 *CTI_ACP1_STATUS to JACP_STATUS*

CTI_ACP1_STATUS

Bit No.	Description
0 (LSB)	**Data Cache Status** ON = Error, OFF = OK or not Configured
1	**Host PLC Mode** (via Data Cache) ON = Program Mode, OFF = Run Mode
2	**Host PLC Fatal Error** (via Data Cache) ON = Error , OFF = OK
3	**Data Cache Transfer Error - No Available Buffers** Application program that include rapidly changing variables that are written to the PLC (i.e.'Write to PLC' or 'Read and Write') should monitor this status bit. It may indicate variable data was not written to PLC on change of value in ACP1. Call CTI Technical Support if this error is reported. ON = ACP1 Data Transfer to/from PLC failed because all buffers were in use. OFF=OK
4	**Host PLC Normal I/O Output Disable Status** ON = ACP1 2500 I/O configured –AND- PLC Fatal Error or Loss of Communications to ACP1 module OFF = Output Disable is not asserted -OR- ACP1 2500 I/O is not configured.
5	**Host PLC Normal I/O Timeout** ON = Mismatch between CTI 2500 I/O configuration and Host PLC configuration or Failure of Module I/O interface subsystem OFF = CTI PLC I/O data transfer is active or 2500 I/O subsystem is not configured
6	**Unused**
7	**SD Card Missing or Not Accessible** ON = Error, OFF = OK
8	**SD Card Write Protection Switch** ON = Enabled, OFF = Disabled
9	**SD Card Free Space Threshold Warning** ON = Warning, OFF = OK
10	**SD Card Disk Full Error** ON = Error, OFF = OK
11	**FTP Pending File Count Warning** ON = Warning OFF = OK
12	**FTP Transfer Queue Full** On = Error, OFF = OK
13	**FTP Server Log-in Authorization Error** ON = Error, OFF = OK
14	**FTP File Transfer Error** ON = Error, OFF = OK
15	**CAMP Client Error** ON = Error, OFF = OK
16	**Modbus Client Error** ON = Error, OFF = OK
17	**Network Data Exchange Subscriber Error** ON = Error, OFF = OK
18	**Ethernet/IP I/O Scanner** ON = Error, OFF = OK
19	**Ethernet/IP Adapter** ON = Error, OFF = OK
20	**Ethernet/IP Tag Client** ON = Error, OFF = OK
21	**Reserved**
22	**MQTT Client Error** ON = Error, OFF = OK
23 - 31	**Reserved**

JACP_STATUS

Bit No.	Description
0	**RTC Synchronization** ON = Error, OFF = OK or Not Configured
1	**CTI Enhanced Data Cache Client Connection** ON = Error, OFF = OK or Not Configured *Note: Error indicates that the JACP module cannot connect or register with the Host PLC.*
2	**CTI Enhanced Data Cache Client Host PLC Mode** ON = Host PLC in Program Mode or Fatal Error, OFF = OK or Not Configured
3	**CTI Enhanced Data Cache Client Data Transfer** ON = Error, OFF = OK or Not Configured *Note: Includes 'Transfer Buffers Exceeded', 'Address Out of Range', and "Non-CTI MAC Address' errors*
4	**Block Transfer Start Up Failure** ON = DDK Structure Mismatch, OFF = OK or Not Configured
5	**Block Transfer Host PLC Mode** ON = Host PLC in Program Mode or Fatal Error, OFF = OK or Not Configured
6	**Block Transfer Data Transfer** ON = Error, OFF= OK or Not Configured *Note: Includes 'Transfer Buffers Exceeded' and 'Address Out of Range' errors.*
7	**Binding Subscriber** ON = Error (Unable to connect to one or more Publishers), OFF = OK or Not Configured
8	**CAMP Client** ON = Error , OFF = OK or Not Configured
9	**Modbus Client** ON = Error, OFF = OK or Not Configured
10	**Ethernet/IP I/O Scanner** ON = Error, OFF = OK or Not Configured
11	**Ethernet I/P Tag Client** ON = Error, OFF = OK or Not Configured
12	**Ethernet I/P Flex IO Client** ON = Error, OFF = OK or Not Configured
13	**MQTT Client** ON = Error, OFF = OK or Not Configured
14	**Reserved**
15	**System SD Card** ON = Error (full or Free-space limited), OFF = OK
16	**Processor Temperature** ON = Error (High Temperature Warning), OFF = OK
18- 31	**Unused**

1.7.3 *CTI_SET_RTC to CTI_PLC_SET_RTC*

There are no differences in the data input to these 2 functions for setting the clock. The only action required is to rename the functions from CTI_SET_RTC to CTI_PLC_SET_RTC wherever they appear in program logic.

1.8 Ethernet/IP Tag Client / Server Role Swap (if needed)

If your ACP1 project uses all three of the client protocols listed in Conversion Overview above, implement the role swap with the Rockwell PLC and configure a new Ethernet/IP Tag Server on the JACP. For HELP on configuring Ethernet/IP Tag Server in JACP, search for “Ethernet/IP” in Workbench HELP and click on the “Ethernet/IP Tag Server” topic.

1.9 Converting Data Cache by Editing XML Export

For small ACP1 Data Cache configurations, manual re-creation is usually faster and more trouble-free. However, if you have a large configuration with hundreds (or thousands) of individual items, it may be faster to use a more automated process. Here are the steps involved.

1. Export your “CTI ACP1 Data Cache” configuration to an XML file using Tools – Export in Workbench.
2. Edit the XML file to make the necessary changes.
3. Re-import the XML file into your new JACP1 project.

We recommend using an “xml-aware” text editor like Notepad++, which can be downloaded for free. To illustrate the changes required, consider the screenshot below, which shows both the ACP1 and the Enhanced Data Cache configuration from our earlier example. Your xml file would not normally contain both configurations – we are only showing that here to highlight the needed changes. These two configurations are equivalent because we manually created the CTI Enhanced Data Cache configuration to be identical.


```
<?xml version="1.0" encoding="iso-8859-1" standalone="yes"?>
<K5project version="1.1">
   <networks>
   </networks>
   <fieldbus>

   <K5Bus2500Cache K5ID="1" __F="-17" NEXTID="5" DLLVERSION="2">
   <fieldbusmaster K5ID="2" INTERFACETYPE="LAN" IP="10.10.10.15" __F="-1" STW267="0" TIMESLICE="10">
   <fieldbusslave K5ID="3" STARTINGADDRESS="1" __F="-1" MEMORYTYPE="1" DIRECTION="0">
   <fieldbusvar K5ID="4" OFFSET="0" __F="-1" NAME="V100"/>
   </fieldbusslave>
   </fieldbusmaster>
   </K5Bus2500Cache>

   <K5Bus2500CacheV2 K5ID="1" __F="-17" NEXTID="5" DLLVERSION="4">
   <fieldbusmaster K5ID="2" INTERFACETYPE="LAN" IP="10.10.10.15" __F="-1" STW267="0" TIMESLICE="10">
   <fieldbusslave K5ID="3" STARTINGADDRESS="1" __F="-1" MEMORYTYPE="1" DIRECTION="0">
   <fieldbusvar K5ID="4" OFFSET="0" __F="-1" OPE="Data" NAME="V100"/>
   </fieldbusslave>
   </fieldbusmaster>
   </K5Bus2500CacheV2>
   </fieldbus>
</K5project>
```

As you can see from the items which are inside the red boxes, there are three changes that must be made to the “CTI ACP1 Data Cache” configuration:

1. Change the tags “K5Bus2500Cache” to “K5Bus2500CacheV2”
2. Change the “DLLVERSION” from “2” to “4”.
3. Add the OPE=”Data” parameter to each “fieldbusvar”. This can be done using Search/Replace to replace all __*F=”-1”* to __*F=”-1” OPE=”Data”.*

After you have completed edits on the XML file, use Tools – Import to re-import the modified XML file into your new JACP project. You may need to delete the old ACP1 Data Cache configuration if the import does not remove it.