

# APPLICATION NOTE: Guide to Upgrading the TI 520C and the 530T to CTI 2500 Series® CPUs



The Siemens® Simatic 500 520C and 530T can be upgraded by using a CTI 2500 Series® 2500-RADP and a 2500-C200. The 2500-RADP is an electro-mechanical adapter that plugs directly into the 500 IO base and allows a new CTI 2500-C200 or any CTI 2500 Series CPU to be inserted into the adapter.

CPU Comparison Chart			
Models	Simatic 520C	Simatic 530T	CTI 2500-C200
Memory Configuration Total Ladder Program	10K Bytes 4K Bytes	40K Bytes 24K Bytes	256K User memory
Retentive Control Relays	256	512	32,768
Non-retentive Control Relays	256	512	4,096
Timers, Counters	256	400	20,480
PID & SF Subroutines			64 PID & 1023 SF
Remote IO		RS485	RS485 & Profibus
Addressable Analog IO	512	1024	1024
Addressable Discrete IO	512	1024	2048
Networking	TIWay	TIWay	Ethernet, Modbus RTU, Serial
CPU Serial Communication		RS232 DB25, RS422 DB9	RS232C DB9 Male

**Note:**

The 2500-C100 *could* be used in some cases, but only in applications that have no remote IO bases. By going with the 2500-C200 for a small amount in additional cost you gain the ability to add networked IO such Profibus and RS485 Remote IO. The 2500-C200 is the best fit for upgrading a 520C or 530T. The 2500-C300 is more horse power than needed for this specific upgrade.

## Program Compatibility

When the 520C and the 530T were introduced the program development package used was TISoft. All programs developed for these 2 processors were developed with TISoft. TISoft was replaced with Softshop, a Windows program. All programs developed with TISoft were 100% convertible to Softshop. New processors were introduced that would run programs created with either TISoft or Softshop. Softshop was developed for the Siemens® Simatic 500 and the 505 systems by Fastrak Softworks. Over the years Fastrak's Softshop has evolved to what is now 505Workshop. In every upgrade step, programs that were created using TISoft to the version of 505Workshop we have today programs have migrated without any loss of functionality, logic processing or IO addressing. CTI's CPUs are capable of running programs created with TISoft version 6.4 or later. Users can still use and maintain their programs using TISoft V.64 or later with our current version of CPUs. To date no user program that has been loaded into a CTI CPU has failed to run exactly as it did in the Siemens® Simatic 500 or 505 CPUs.

APT was another program development package used to create applications. These applications are running today on CTI CPU's without issues. Customer may still use this package to create and maintain their programs with CTI's CPUs.

There is only one type of programming functionality that CTI does not support and that is XSUBS. The reason for this is the "C" compiler used by Siemens is not supported in our OS. The compiler is no longer available or supported. If you have used XSUBS in your program please contact CTI for an evaluation of a work around solution.

In summary, there are no known issues or a program failure to run on CTI's CPU in the manner the program ran on the original Siemens® Simatic 500 or 505 CPUs. We are the only company that can run a program created in the 1980's on a current CPU design. CTI allows customers to continue to extend the value of their investment and move forward by adding new functionality and capability to their system and applications.

## Base Addressing in the 520C/530T vs. 2500 Series CPUs

One of the biggest differences between the 520C/530T and the later processors including the 2500 Series® CPUs is the maximum number of slots in a logical base that was supported by the 520C/530T. The 520C/530T could only support 8 slots. The 500 had several different base including 6, 8, 12, 14 and 16 slot base. The local base was always the base with the CPU installed. When using a base with the CPU larger than 8 slots there was Local Logical Base 0 and Base 1. They were physically the same base but had to be addressed as 2 logical bases. The 14 slot base consisted of Local Logical Base 0 with slots 1 through 8 and Local Logical Base 1 consisting of Slots 9 through 14. In this example of the 14 slot base the last 2 slots were just lost. In the 16 slot base there would be 2 Local Logical Bases, 0 & 1 with 8 slots allocated for each one. What this means is that you may have to reconfigure your bases in your program development software to conform to the newer base configuration scheme. This will not affect your IO addressing. If the application is using the 530T and Distributed IO then depending on the number of slots in each distributed base as to whether you had 1 or 2 logical bases in the Distributed IO Base. There were a maximum of 14 Distributed Bases allowed on the 530T and were numbered from 2 to 15.

## Status Words in the 520C/530T vs. 2500 Series CPUs

The Status Words in the 520C/530T were different than the Siemens Simatic® 505 or the 2500 Series® CPUs.

	520C/530T STW	2500 CPU STW
<b>STW01</b>	Battery Low, Scan Overrun Comm Port Fail, IO Fail, Indirect Table move overflow Intelligent Module Fail	Misc. Status and Non-Fatal Errors
<b>STW 02</b>	Shows the status of up to 16 bases	Base Controller Status
<b>STW03</b>	Not Used	Status of Profibus DP Channel Slaves
<b>STW04</b>	Not Used	Status of Profibus DP Channel Slaves
<b>STW05</b>	Not Used	Status of Profibus DP Channel Slaves
<b>STW06</b>	Reports the status of EPROM/EEPROM	Status of Profibus DP Channel Slaves
<b>STW07</b>	Absolute address of first error programming the EPROM/EEPROM	Status of Profibus DP Channel Slaves
<b>STW08</b>	Shows Checksum calculated from the RLL	Status of Profibus DP Channel Slaves
<b>STW09</b>	Checksum generated from the EPROM/EEPROM based on all data stored in EPROM/EEPROM	Status of Profibus DP Channel Slaves
<b>STW10</b>	P/C Scan in binary. The integer value is given in milliseconds	Dynamic Scan Time
<b>STW11 through 18</b>	Status of the IO modules in the logical bases	IO Module Status is reported in STW11 through STW26
	The 520C/530T Status Words are limited to the ones listed, based on the info available.	CTI CPUs support hundreds more Status Words

Note: If you using these Status Words you will need to modify the interpretation of the new Status Words used by the CTI CPUs.

## 2500-Cxxx CPUs Communication Ports vs. the 520C and the 530T

CTI's 2500 Series® CPUs provide 3 communication ports for programming interface and HMI interfaces. All models of CTI's CPUs provide the traditional RS232C Serial Port as well as an Ethernet Port and a USB Port. The 520C and the 530T only provided Serial Communication interfaces.

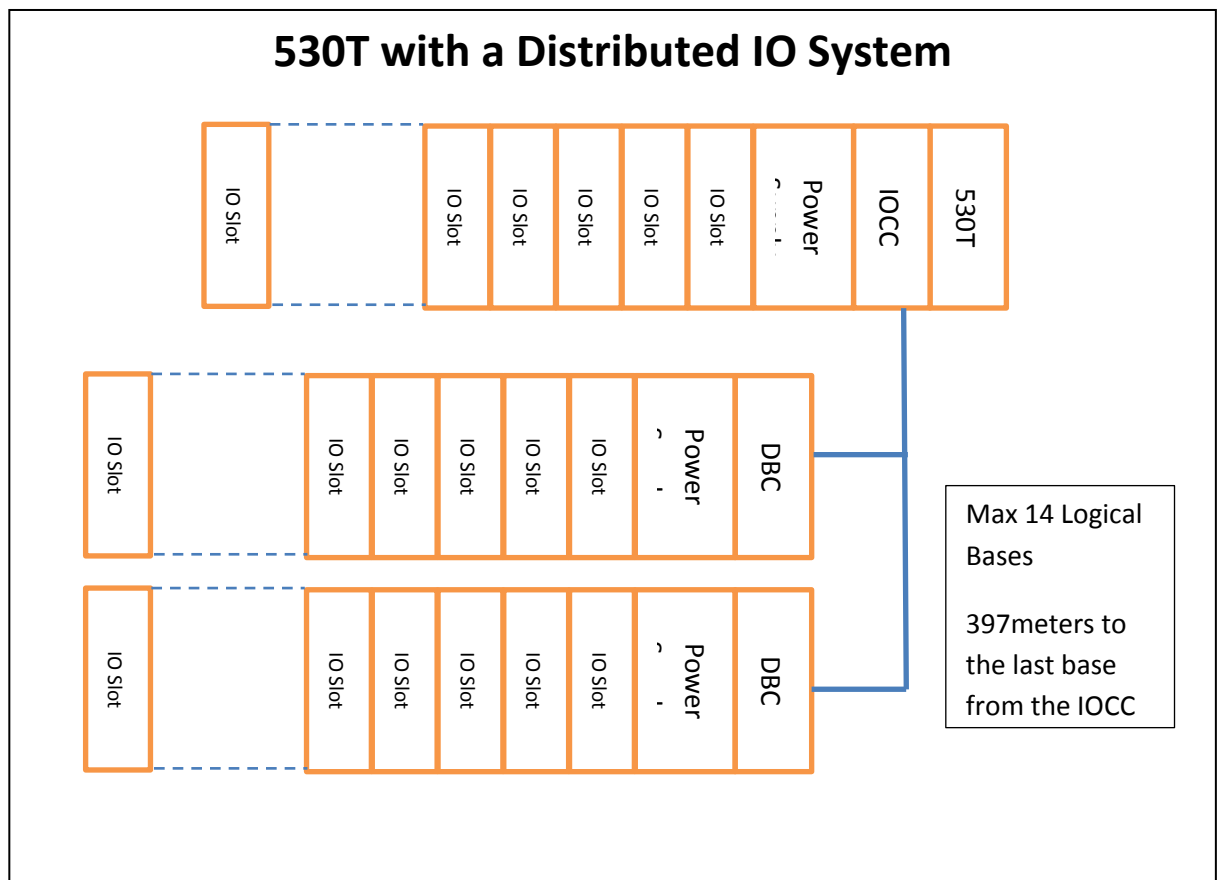
### Serial ports

The 520C and the 530T came with serial ports; one RS232 (25 pin) and one RS422 (9 pin). The CTI 2500 CPU's have one 9-pin serial port which can be configured (dip switch setting) for either RS232 or RS422; any existing cable interfaces will need to be re-wired. There is also a USB port which *may* be used by 505Workshop; a COM port mapper program (available on CTI website) will take any COM port and map it to the USB interface. This has limited success with DOS applications such as TISoft. Another difference will be the Serial Dipswitch settings. Please refer to the 530T Manual and the CTI 2500-Cxxx Installation and Operation Guide.

## Distributed I/O

For Distributed IO Communication System applications the 530T used an 500-2108 IOCC(IO Channel Controller) in the local base and a 500-2109 DBC(Distributed Base Controller) in the Remote Base. Later Siemens® Simatic would move on to the RS485 Remote IO Network and then Profibus. The Distributed IO Communications network only allowed for 14 Remote Bases and up to 396 meters from the local base with the 530T and the IOCC to last Remote Base DBC.

If your system uses this Distributed IO Communication system you will need to change this over to either the RS485 Remote IO Network or the Profibus Network System. The 2500-C200 supports both of these networks, however the communication wiring and the DBCs will have to be changed out to support your network of choice. The DBCs may be replaced with 2 different solution sets. For the first solution set you will need 2500-RADP adapter and a 2500-RIO-B for the RS485 network or a 2500-RADP and a 2500-RBC for a Profibus network. The second solution set would require only the 2500C-RADP-RBC or a 2500C-RADP-RS485. The 2500C compact system remote base controllers come modified in one simple cost effective integrated package.



## 2500 Classic 500 Adapters



2500-RBC Profibus

OR

2500-RIO Remote I/O

OR

2500-Cx00 CPU

Using the RADP adapter, an existing Series 500 I/O base can be converted to Profibus without having to change all the I/O modules out. Over time, this physical base can be converted to new CTI I/O and the same Profibus RBC can still be used. The conversion to Profibus is a reconfiguration step, not reprogramming. If you are still using Tlsoft, the COMPROFI program is used to configure the Profibus network, then a binary file is exported/imported to Tlsoft. If using WorkShop, the latest versions have an integral Profibus configuration tool; COMPROFI is not needed any longer. There are a few considerations to be aware of:

1. Profibus does not support Special Function modules, e.g. TIWAY, MODNIM, BASIC, ESP, etc. Only "normal" analog and discrete modules can be used.
2. Profibus cannot be dynamically configured the way Remote I/O can. Any changes require stopping the network, downloading new parameters, then restarting the network. This is much faster using WorkShop, but the I/O still gets bumped.
3. Profibus I/O scan is asynchronous to the PLC scan cycle. Best performance is when Profibus scan cycle is set to 2 to 3 times the PLC scan. Faster scanning of Profibus I/O will actually increase the total scan time of the PLC.
4. Profibus also relieves the restriction of having only 15 remote bases. There can be up to 112 nodes in a Profibus network (each RBC is one node). The maximum amount of I/O on one Profibus node is 244 bytes of input and output. This translates into 122WX and 122WY if using analog modules exclusively.

## The 2500C Compact Remote Base Controllers and 120VAC Power Supply



The 2500C Compact system provides not only a version for RS485 and a version for Profibus networks there is also a 120VAC Power Supply. Base configuration and addressing are the same as the larger Classic versions.

When would I use a Classic or a Compact conversion option?

1. The Compact version is smaller and fits in cabinets with any need for cabinet modifications. The Classic system solution stands out farther from the subpanel in the cabinet than the original 500 IO components. So panel depth should be considered when making a choice.
2. The Compact version is built as a one piece solution so the module case and the 500 backplane adapter is a single non-separable unit. The Classic solution is a 2 piece unit. The Classic requires an electro-mechanical adapter and then a separate module and adapter for power, base control whether a CPU or remote base, or the appropriate IO module. This 2 piece approach does allow the user to upgrade the 500 backplane in the future to a 2500 backplane or chassis and then reuse all the modules that had been in the adapters by removing them from the adapters and inserting the modules in the new 2500 rack. Because the Compact solution is a single piece unit it does not allow the same reuse of the power supply or remote base controller.
3. CTI also offers a 2500C-PADP-120V power supply that is a direct plug-in replacement for the 500-2152. No wiring changes, just plug it in. This power supply also provides longer hold-up time, this is 35 watt power supply. Verify your base power consumption in your base requires more than 35 watts you will need to use the classic system power supply and adapter.

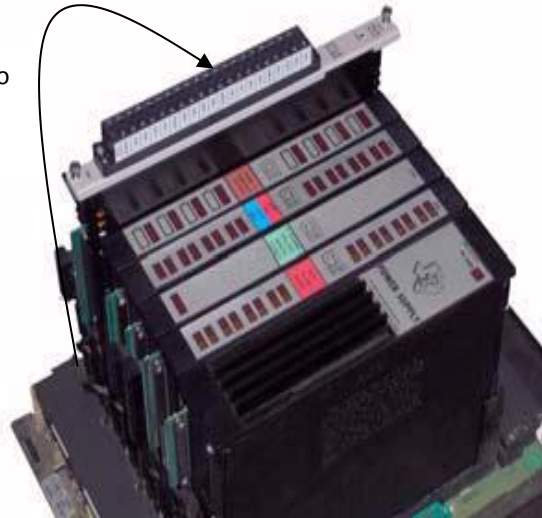


## Support of existing Series 500 I/O modules

As previously mentioned, CTI manufactures several adapters to support the existing Series 500 I/O.

The 2500-IADP replaces I/O module slots.

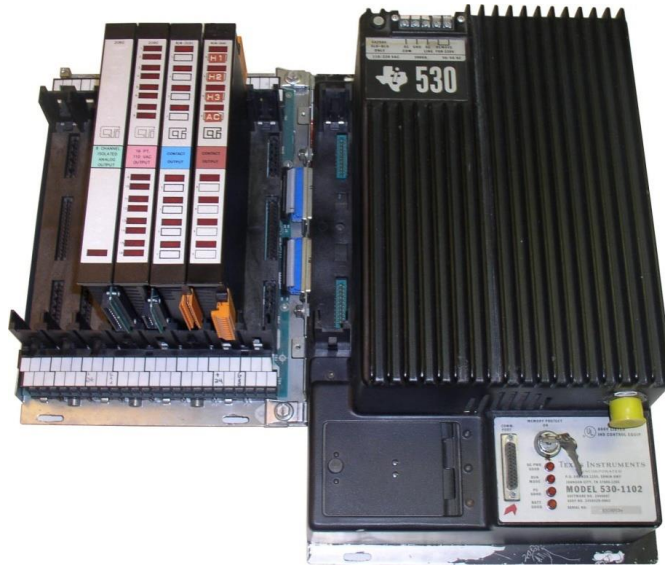
Re-wire from base to front of module.



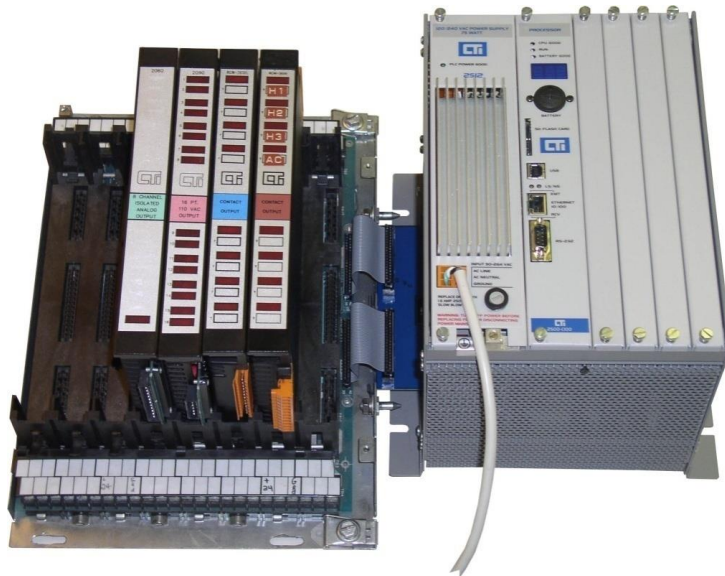
The 2500-PADP replaces the Power Supply.



Although the IOCC/DBC architecture was not a part of the 560 system (predated it), CTI also has a product to replace the very old “oil pan” format of the 520/530 PLC. This 2500-R4500 (available August 2009) can also replace the smaller Distributed Base Controllers (DBC).



Replace 530 with C100 (no Profibus or Remote I/O capability), or RBC/RIO.



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