

APPLICATION NOTE: Guide to Upgrading the TI 560/565 to CTI 2500 Series™



CPU

Replace with 4-slot rack (2500-R4), the 505-6860 Media Converter and either the C200 or the C300 CPU.

	<u>560/565</u>	<u>C200</u>	<u>C300</u>
Memory	176k (560T)	256k	512k
Max mem	512k		
C-bits	49k	32k	32k
Loop	64	64	512
Alarms	128	128	512
I/O pts	8192	2048 discrete 1024 analog	8192

The C200 *could* be used in most cases, but need to be aware of the reduced I/O points and if there are any extra memory cards in the 560 rack. If the only issue is the I/O, it is

possible to move some points into the lower address range of the C200 (this requires re-programming). If you do this, be wary of any HMI/SCADA accessing these points since those applications would also need to be reprogrammed. The C300 is the better fit even though the extra memory may not be needed. The number of C-bits is usually not an issue, but also be aware that each RCC came with another 2048 C-bits available.

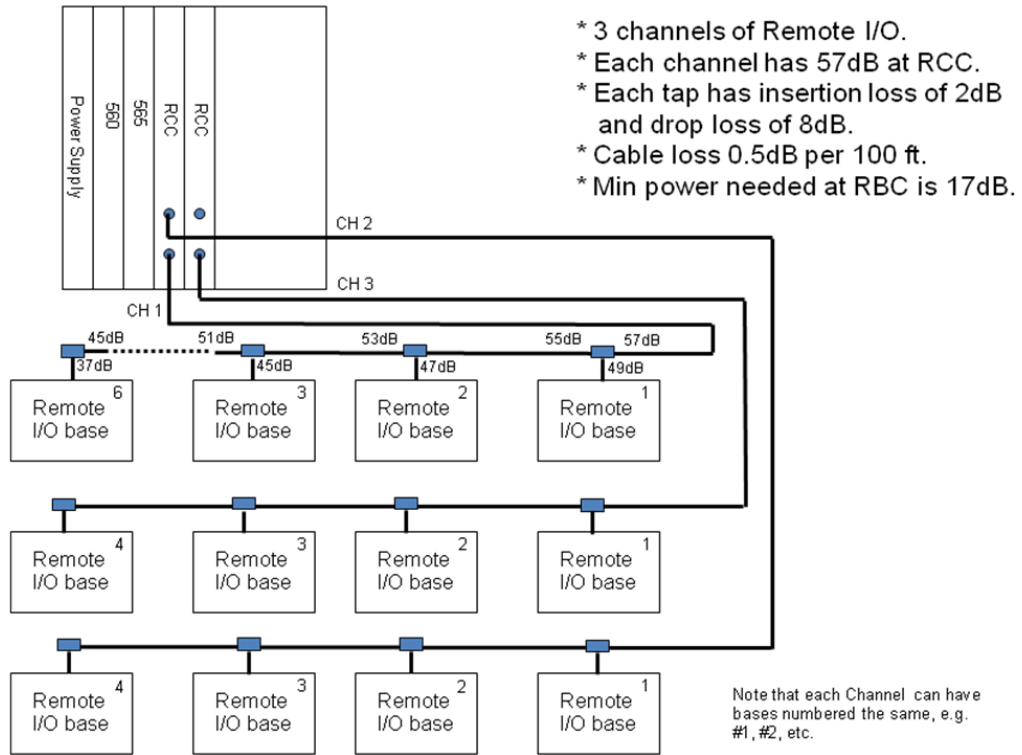
Serial ports

The 560 came with two serial ports; one RS232 (25 pin) and one RS422 (9 pin). The 565 also had two serial ports, both RS232 (9-pin) but these were for ASCII output only. The CTI 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 possible for use by a PC based application; 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.

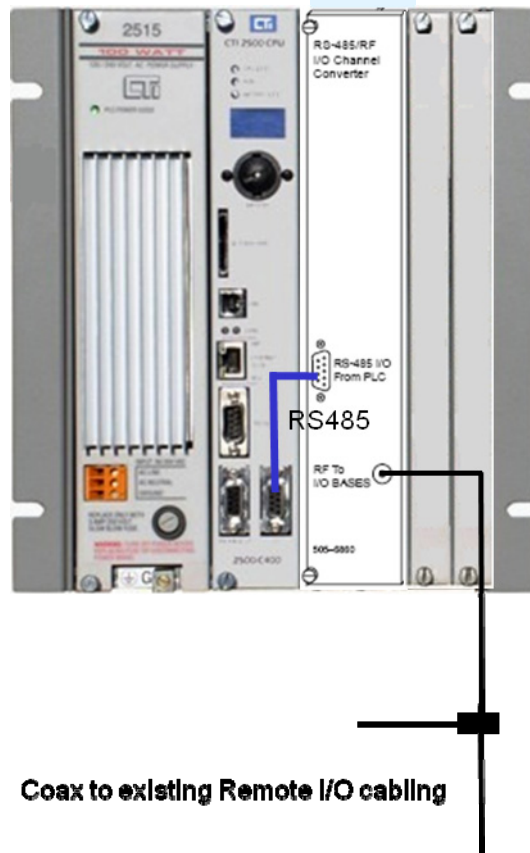
I/O

The 560/565 system used Remote Channel Controller (RCC) cards to interface to the remote I/O bases. The maximum number of I/O points is 8192, but these can be split up among several channels of I/O; each RCC had two channels with 16 bases max per channel. Very few applications ever used more than 16 remote bases (the maximum available in the CTI CPU), but many used several channels. Most applications also made use of the RF coax network as opposed to the RS485 network which was introduced later.

560/565 with 2 Remote Channel Controller cards



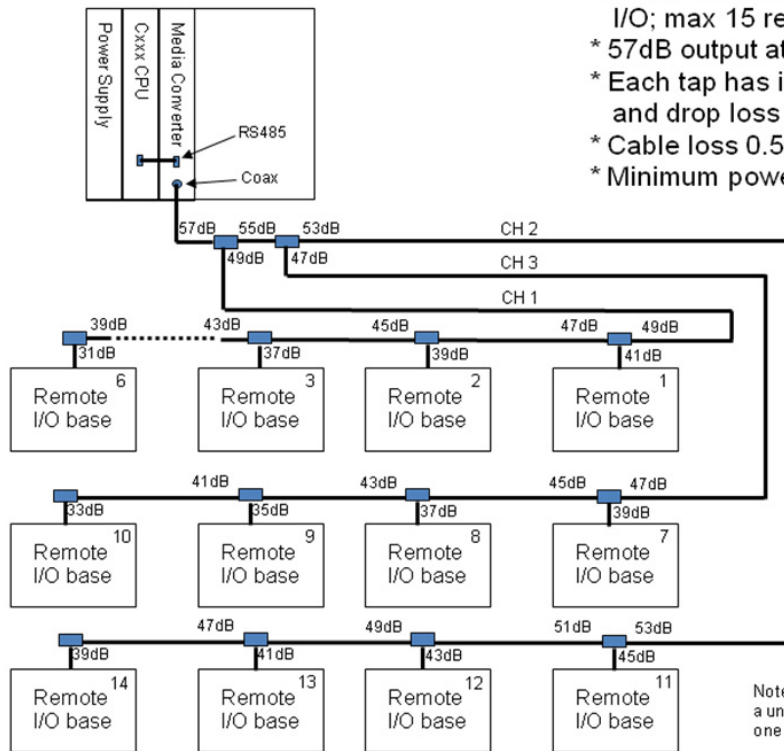
To convert an RF coax network to RS485, the 505-6860 Media Converter module is required. The RS485 Remote I/O port from the CTI CPU is connected to this module, and **one** channel of RF coax comes out.



If there are multiple channels going to the field, these must be combined into one through the use of taps or splitters. The following figure illustrates the use of taps. Splitters are **not** recommended since they divide the power. 57dB into a two channel splitter results in each channel only getting half the signal. Careful consideration must be given to ensure the last remote base has an adequate signal level.

Following is the same network converted to CTI CPU with Media Converter module.

2500-Cxxx with Media Converter module



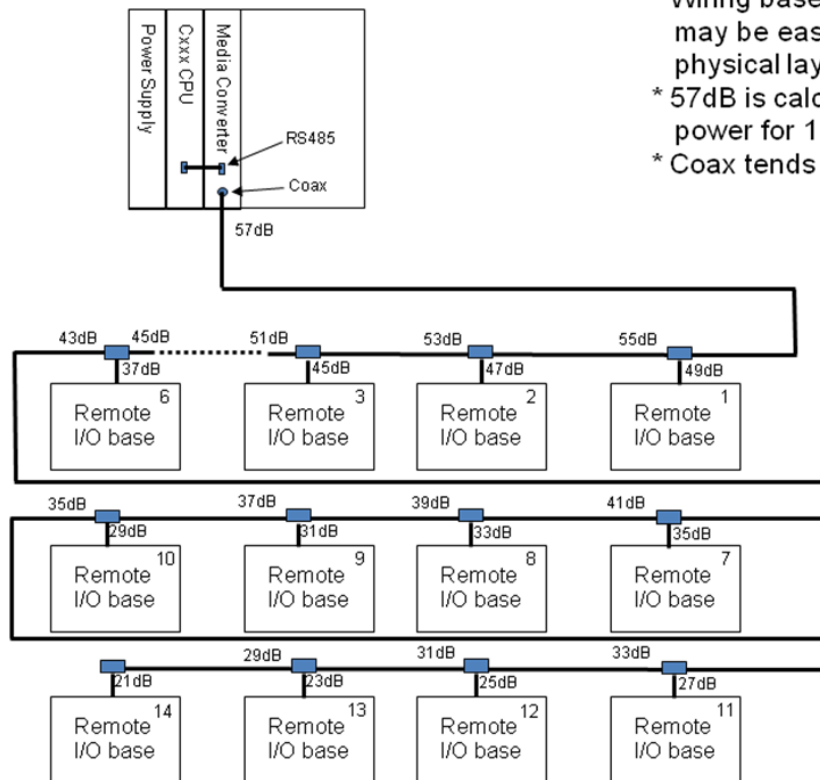
- * Media converter has 1 channel of I/O; max 15 remote bases.
- * 57dB output at Media Converter.
- * Each tap has insertion loss of 2dB and drop loss of 8dB.
- * Cable loss 0.5dB per 100 ft.
- * Minimum power at RBC is 17dB.

DO NOT USE SPLITTERS. THESE DIVIDE THE POWER. USE CATV TAPS.

Note that each Base must have a unique number, e.g. only one #1, one #2, etc.

An alternate wiring scheme puts all bases on one coax run. The choice is dependent on where the CPU is located relative to the remote bases. If the PLC is in the middle of the remote I/O run, then a splitter would be the best choice; both runs of cable get half the power.

2500-Cxxx with Media Converter module – alternate wiring



- * Wiring bases all on one coax – may be easier depending on physical layout.
- * 57dB is calculated to be enough power for 16 remote bases.
- * Coax tends to degrade over time.

Numbering of I/O bases

As the notes in the above figures mention, in the 560 system there could be multiple remote bases numbered the same since each channel was distinct. In the CTI CPU, each remote base must have a unique number since there is only one channel of I/O. This is a relatively simple procedure of reconfiguring the I/O. Using either TISoft or WorkShop, go into the I/O configuration screens and copy one of the duplicate base number configurations. Then choose any unconfigured base and input that same configuration. Remember to change the physical setting on the RBC (Remote Base Controller) to the new number. There is no re-programming required, e.g. going into the Relay Ladder Logic and changing the number of an I/O point. The system does not care where the I/O point resides as long as it is configured (virtual addressing scheme vs. physically addressed).

RF Coax vs. RS485 Remote IO and Profibus

Most of the installed 560 systems used RF coax. RS485 RCC's were available but these were introduced at a later date. Coax could go further distances but the "problem" is that coax networks tend to degrade over time. Some users have adopted a preventive maintenance schedule that re-terminates each coax run periodically. A better solution is to switch to RS485 but this has issues as well:

1. All bases must be converted at the same time. RS485 and RF coax cannot be run simultaneously.
2. Availability of any 560 product is only through the Internet with limited numbers and unknown history.

CTI has an adapter (2500-RADP) which fits into the remote base RBC slot and allows one of our RBCs to interface to the Series 500 I/O, but this is only for RS485 or Profibus.



2500-RBC Profibus

OR

2500-RIO Remote I/O

OR

2500-Cx00 CPU

A better solution is to switch to Profibus I/O. Because this is a separate I/O processor, both Profibus and RF coax can be run simultaneously. This means one base can be converted at a time with no impact on system performance. 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 another reconfiguration step, not reprogramming. If you are still using TIsoft, the COMPROFI program is used to configure the Profibus network, then a binary file is exported/imported to TIsoft. If using WorkShop, the latest version (version 4.32) has 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.

Monitoring the status of Remote Bases

In the 560 system, there were two status words that reflected the condition of the remote I/O channel. STW145 logged the number of Receive Errors, and STW146 logged the Timeout Errors. Three errors in a row without a good Remote I/O transmission in between resulted in the I/O base being logged out of the system. The PLC automatically retries and will bring the base back in when it responds, but the I/O either goes to zero or holds last state (depending on option set on the RBC) while the base is logged out.

Since coax tends to degrade over time, bases may start logging in/out which obviously can disrupt the process. CTI has added several additional status words to show the condition of each I/O base. This has proven very useful when our CPU replaces the 560 to identify possibly faulty coax connections.

STW455-469 are Receive Errors where STW455 corresponds to Base 1, etc.

STW471-485 are Abnormal Logoff Count (STW471 = Base 1, etc.). Abnormal logoffs are where the controller stopped communicating with the base due to 3-in-a-row of either Receive Errors or Timeout Errors.

STW487-501 are Timeout Errors (STW487 = Base 1, etc.)

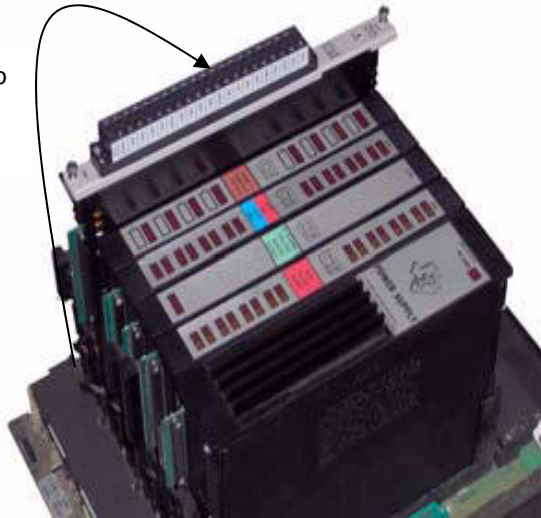
All of these status words are cumulative counts and must be reset by the user.

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.

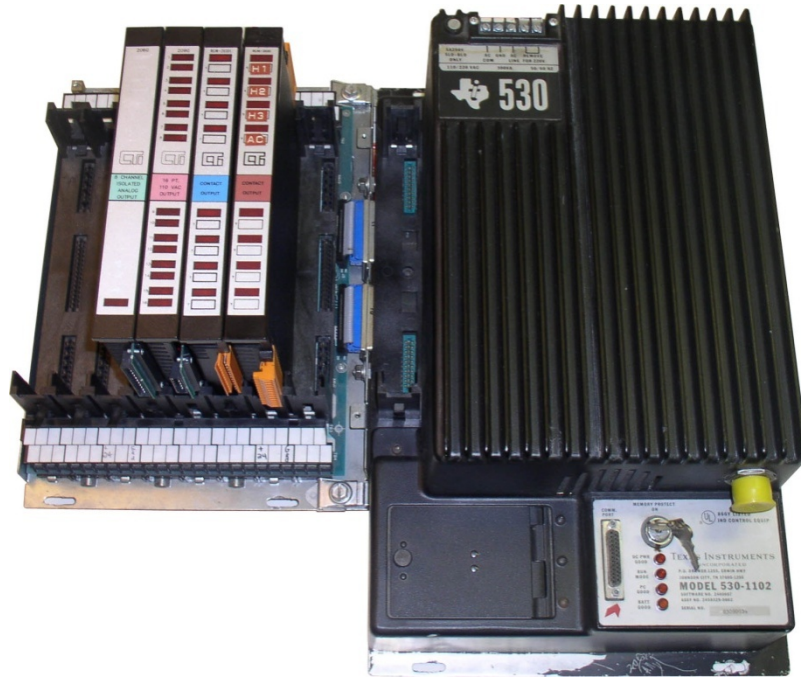
Re-wire from base to front of module.



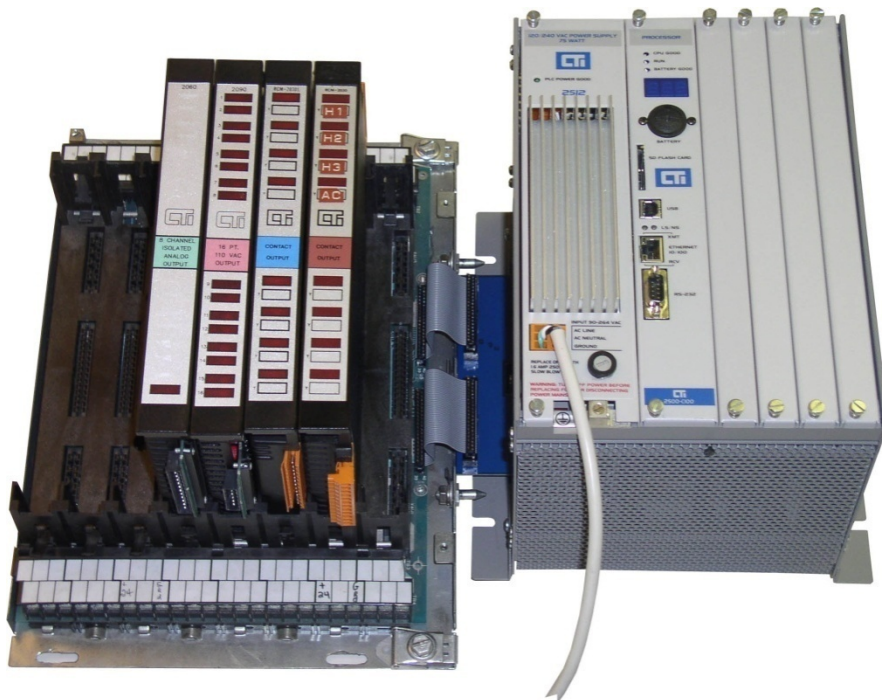
The 2500-PADP replaces the Power Supply.



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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