Of the modules that AMCI manufactures for the Allen-Bradley SLC 500 PLC, only some can be installed in a remote rack. The following table shows which AMCI modules can and cannot be installed in a remote rack.

Will operate in a remote rack	1531, 1532, 1541, 1541-03, 1541-12, 1542, 1561, 4501, 5504, 7551, and 7561
Will not operate in a remote rack due to M file use	2541, 8511, 8511-07, 8511-09, 8512, 8513, 8513-01, and 8523

Note: All of the modules shown in the table can be installed in an expanded local rack.

Installing an AMCI module in a Remote Rack

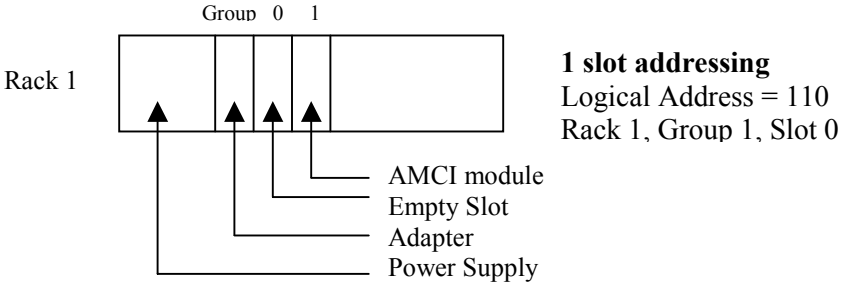
All of the AMCI modules that can be installed in a remote rack use eight input words and eight output words to communicate with the SLC PLC. In the local rack, this data is transferred directly through the input and output image tables. However, when used in a remote rack, it is necessary to use Block Transfers to send data to and from the AMCI modules. The following description shows the steps necessary to communicate with AMCI modules in a remote rack.

1. Locate the ASB Adapter module. Verify that it is series B or later. The series A version does not have the ability to perform Block Transfer operations.
2. Set the Adapter module's Specialty I/O dip switch to the Block Transfer position. It will not be possible to communicate with an AMCI module if this switch is set to the Discrete position.
3. Set the ASB module's remaining dip switches to match your system requirements. An AMCI module can be installed in a remote rack that has been configured to use 2 slot, 1 slot, or ½ slot addressing. The only restriction is that each AMCI module that you install must be assigned at least 1 byte of input and 1 byte of output space in the RIO scanner module's image tables. (These bytes are used for handshaking purposes during the Block Transfer operation.)
4. In RS Logix 500, open the I/O configuration of your RIO scanner module. Verify that the M0 and M1 data file sizes are set to their maximum values of 3300. Since this data only exists in the RIO Scanners memory, these parameters can be left at their maximum settings without affecting the system performance.
5. Click on the Edit G Data button and assign at least one byte of image table space at the location of the AMCI module in your system.
6. Exit the I/O configuration.

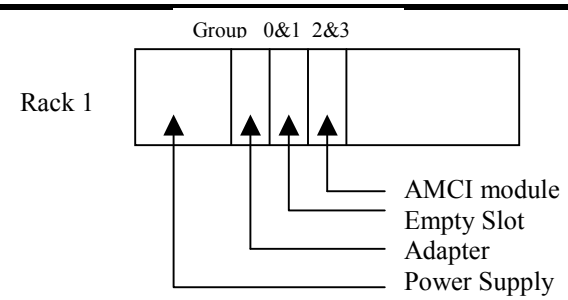
7. The block transfers are controlled through the M0 and M1 file addresses assigned to the RIO scanner module. The following table shows the M file addresses used to control and monitor the block transfer operations.

M File Address	Function
M0:e.x00/7	Block Transfer Type "1" = BTR "0" = BTW
M0:e.x00/15	Enable Bit, set to 1 to initiate block transfer
M0:e.x01	Requested number of words to transfer, eight for AMCI modules
M0:e.x02	Logical Address of AMCI module
M0:e.x10 to M0:e.x17	Data sent to AMCI module with a Block Transfer Write
M1:e.x00/12	Block Transfer Error bit, set when the block transfer could not be completed. This bit will be reset when the Enable bit is reset.
M1:e.x00/13	Block Transfer Done bit, set when the block transfer has been successfully completed. This bit will be reset when the Enable bit is reset
M1:e.x01	Number of Words transferred during the Block Transfer operation
M1:e.x02	Logical Address of AMCI module in the remote rack
M1:e.x03	Block Transfer Error Codes
M1:e.x10 to M0:e.x17	Data read from an AMCI module with a Block Transfer Read

Note 1: The "e" in the above M file addresses represents the slot number of the RIO scanner.
Note 2: The "x" in the above M file addresses represents the block transfer control addresses. This value has a range of 1 to 32, one for each of the block transfer operations. Each block transfer programmed into your system must have its own control address.
Note 3: The Logical Address parameter consists of the Logical Rack, Group, and Slot number location of the AMCI module. This parameter is entered as a decimal number, with the parameters in the following order, Logical Rack, Group, and Slot. In 1 and ½ slot addressing, the slot parameter is always equal to 0.
Note 4: Accessing the M files is an immediate data transfer. To reduce the scan time, the block transfer status bits as well as the block transfer read data should be buffered.
Note 5: The following diagrams show the Logical Addresses for the three types of rack addressing.

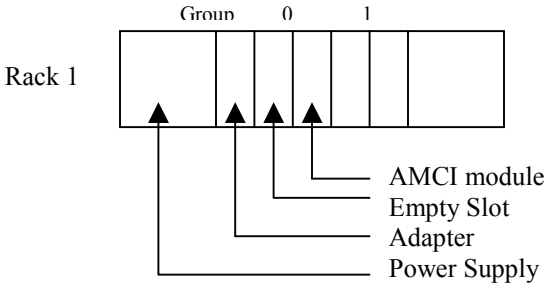


1 slot addressing
Logical Address = 110
Rack 1, Group 1, Slot 0



1/2 slot addressing
Logical Address = 120
Rack 1, Group 2, Slot 0

Note: In ½ slot addressing, the AMCI module is always addressed as the lower of the two group numbers. In the above diagram, the AMCI module is located in groups 2 and 3, but the block transfers are addressed only to group 2.



2 slot addressing
Logical Address = 101
Rack 1, Group 0, Slot 1

Note: In 2 slot addressing, a 16 or 32 point I/O module cannot be located in the same group as the AMCI module. The slot parameter is 0 for the left module in the group and 1 for the right module in the group. In the above diagram, the AMCI module is located in the right slot of group 0, so the slot parameter is set to 1.

8. Write a ladder logic program to block transfer to and from the AMCI module. Thirty integer words will be required to hold the data for controlling the block transfer operations, buffering the block transfer status bits, and storing the data sent to and from the AMCI module. The breakdown of these words is shown below.

   3 words of Block Transfer Read Control
   4 words of Block Transfer Read status
   8 words of Block Transfer Read Data

   3 words of Block Transfer Write Control
   4 words of Block Transfer Write status
   8 words of Block Transfer Write Data

9. The following text describes a block transfer sequence.

    a. The PLC writes the length and the logical address parameters to the appropriate M file registers. Since this data never changes, this operation can be performed during the first scan of the PLC program.
    b. If a Block Transfer Read is being performed set the control word's Block Transfer Type bit. If a Block Transfer Write is being performed, the PLC writes the data being sent to the AMCI module to the M files.
    c. The PLC sets the Enable bit in the control word and sends the control word to the M file register.
    d. If an error occurs during the transfer, the RIO scanner will set the Error bit.
    e. If the transfer completes without error, the RIO scanner will set the Done bit.
    f. If a Block Transfer Read is being performed, the read data will now be present in the M1 data files, and can be copied to the integer registers.
    g. When the PLC program detects that the Done bit is set, it resets the Enable bit.
    h. The RIO Scanner responds by resetting the Done bit and if necessary the Error bit. The transfer is now complete.

The ladder logic program zipped with this write up, program name SLC_Remote_Rack, is an example of how data can be block transferred to and from an AMCI module located in a remote rack. This program has the Block Transfer Reads occurring as quickly as possible and the Block Transfer Writes occurring only upon request. This program also automatically performs two Block Transfer Writes, one to program the module and the second to clear the Transmit bit.

The following addresses are used in the sample program.

RIO Scanner: Slot 7 of local rack
AMCI module: Located in slot 2 of rack 1, which is configured for 1 slot addressing

	Address	Comments
Program Control	N7:0	Set to "1" to start a Block Transfer Write Operation
	N7:10 to N7:17	Block Transfer Read data from the AMCI module
	N7:20 to N7:27	Block Transfer Write data sent to the AMCI module
	B3:0/0	Internal bit used to initiate the BTW that resets the AMCI module's Transmit Bit
BTR Control	N9:0	BTR Control Address N9:0/15 = Enable bit N9:0/7 = set to indicate a BTR operation
	N9:1	BTR length parameter, set to 8 for AMCI modules
	N9:2	BTR logical address, set to 120 in this example
	N9:3 to N9:9	Not used
	N9:10	BTR buffered status data N9:10/12 = Error Bit N9:10/13 = Done Bit
	N9:11	Reported number of BTR words transferred
	N9:12	Reported BTR logical address
	N9:13	BTR error codes
	N9:14 to N9:19	Not used
BTW Control	N9:20	BTW Control Address N9:20/15 = Enable bit N9:20/7 = reset to indicate a BTW operation
	N9:21	BTW length parameter, set to 8 for AMCI modules
	N9:22	BTW logical address, set to 120 in this example
	N9:23 to N9:29	Not used
	N9:30	BTW Status data N9:10/12 = Error Bit N9:10/13 = Done Bit
	N9:31	Reported number of BTW words transferred
	N9:32	Reported BTW logical address
	N9:33	BTW error codes

file: SLC_remote_rack.doc
date: 12/23/03