ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *OMRON / Delta Tau SMCC-PC* at our website: *Click HERE*

DELTA TAU DATA SYSTEMS

SMCC-VME

P/N 602163 - 101

INTERFACE CONTROL DOCUMENT

FOR

24/32 BIT BUS COMMUNICATION PROTOCOL

ON VME BUS

AND

SMCC-VME USER'S MANUAL ADDENDUM

USE SMCC MANUAL (DOC. NUMBER 602090-363)

FOR DETAILED

PROGRAMMING INFORMATION

MAY 21, 1990

DOCUMENT NUMBER 602163-361
REV. A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

INTRODUCTION 1
TERMS USED IN THIS DOCUMENT. 4
OVERALL TIMING AND SEQUENCE. 4
POWER-ON RESET 4
COMMUNICATION EXAMPLES 5
ADDRESSING OF THE SMCC-VMEs. 7
TRANSFER PROTOCOLS 8
DATA OUTPUT AND INPUT FORMATS. 10
FOR ASCII COMMUNICATION 10
FOR BINARY DMA COMMUNICATION. 13
SUPPORTING SOFTWARE. 18
SOFTWARE VARIATIONS FOR ADDRESS MAPPING. . .18
GENERATING INTERRUPTS. 19
PIN ASSIGNMENTS. 20
CONNECTOR LISTINGS
DESCRIPTION OF I/O FUNCTIONS 21A
J1 PANEL CONNECTOR 22
J2 EXPANSION CONNECTOR 23
J4 DISPLAY CONNECTOR 24
J3 RS232 CONNECTOR 25
RS232 I/O CONNECTOR DIAGRAM. 26
E POINTS, TEST POINT, AND ADDR. SELECTIONS .27
E POINTS AND TEST POINTS SCHEMATICS. 33
STANDARD STRAPPING SCHEMATICS. 34
SERVO AMP SIGNAL, PWER & MTR, ETC. DIAGRAM .35
TYPICAL POSITION ENCODER, ETC. DIAGRAM . . .36
TYPICAL HANDWHEEL ENCODER, ETC.DIAGRAM . . .37
MONITOR PROGRAM. 38
OUTLINE AND CONNECTOR PLACMENTS DIAGRAM. . .41

REVISIONS

ORIGINAL DOCUMENT	9/15/89
REVISION A - ADDED NEW DATA TO PARAGRAPH 4 AND 8	5/21/90

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

INTERFACE CONTROL DOCUMENT

SMCC-VME DATA INTERFACE TO VME TYPE HOST COMPUTER

SMCC - VME P/N 602163-100

1.0 INTRODUCTION

The purpose of this document is to describe the SMCC-VME Board, and to define the content, format, sequence, and timing of the data transfers required between the host and the SMCC-VME. Also, to describe the data transfer protocols to be used and assign programmable values for SMCC-VME address space, interrupt priority levels, and interrupt vectors. The SMCC-VME hardware is also described, together with all required I/O connections. For a complete description of motion commands and normal operations and programming, please refer to SMCC Manual.

The two-axis Smart Motion Control Card (SMCC-VME) provides all communications between the host and the servo amplifier via the VMEbus backplane. Otherwise, the SMCC-VME essentially has the same programming and operational characteristics as the standard SMCC with parabolic option. Please refer to the SMCC literature and manual for specifications and description of operational capabilities.

Even though the SMCC-VME operates on the VMEbus, the RS232 communications channel has been retained and may be used as an alternative to the VMEbus. The parallel port has been eliminated and is replaced by the VMEbus controller VLSI device which performs the required VMEbus protocol. Selection of VME vs. RS232 is done by means of DIP switch selection. All I/O functions to the amplifier and machine are provided on rows A and C of the J2/P2 connector. Additionally, connectors for manual control panel, bus expansion, and RS232 are provided on the front bezel, along with a one digit alpha numeric status display. Also, a connector is provided on the board itself for connecting LED (8 digit) and LCD (40 x 2 alpha numeric) display units capable of directly presenting position, velocity, following error, and status information.

Up to 16 SMCC-VME cards may be controlled by a single host computer, each card is assigned a separate memory and interrupt vector space. Bus communications on the SMCC-VME are handled by sixteen 8-bit mailbox data registers which can be written and read by both the SMCC and the host computer. Interrupts, in both directions, are generated by writing to specific registers.

The SMCC-VME offers only two optional features; that of increasing on-board memory size from 8K to 32K in order to allow storage of 5630 program steps instead of 1760, and that of adding the analog input conditioning module in order to allow analog signals in the range of +/-10 volts instead of just 0 to +5 volts to be used as inputs.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The SMCC-VME without the above options, has 8K of buffer memory for storing in RAM and saving in permanent memory up to 1760 program steps and is equipped with the Parabolic Path Generator capability which offers many powerful features. These include: automatic 3-point cubic smoothing of input data, 1/T encoder count measurement for smooth low velocity control, data gathering and storage at servo rates for analyzing actual servo performance of position, velocity and following error, Programmable Logic Control (PLC), and many more.

Two unique features have been added to SMCC-VME which are currently not available on SMCC:

1) In DMA mode, both standard and parabolic data may be sent. SMCC only allows parabolic.

2) An input data phase lock loop capability has been added.

The command set for the SMCC-VME is identical to SMCC equipped with parabolic, and consists of four types:

1) Non-Buffer (online) commands which are received and immediately executed.

2) Buffer commands which are received and stored in the program buffer for later execution with the step or run commands. Standard buffer size is 1760 steps where each command takes up one step, except simultaneous X and Y commands which occupy two steps. Buffer commands may also be immediately executed by placing the SMCC in the MDI mode, i02 set to one.

   Also, the buffer size may be optionally expanded to 5630 program steps. Buffer data may be continuously executed while more data is being sent to SMCC, thus allowing an infinitely long program to be executed without stopping motion.

3) Servo and other parameters (i Parameters) which are used to personalize the SMCC-VME to the particular application. These parameters, once determined, may be permanently saved and stored in the non-volatile memory. These are referred to as i Parameters. i Parameters 00 to 63 may also be made part of the buffer commands, by using "I" instead of "i."

4) PLC (Programmable Logic Control) instructions which are stored in a special section of the program buffer, are active at all times and can be used to perform conditional I/O and motion checks, as well as, mathematical operations on position, velocity, following error, and various input port values. Cycle time is 2 to 5 milliseconds and format is: IF/THEN/ELSE/AND/AND IF/THEN IF/ELSE IF.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The data communications format can be handled in several different ways:

1) ASCII data which can be transmitted to and received from the SMCC-VME either using the RS232 port (300 to 38400 baud) or the VMEbus. The SMCC-VME may be used as a standalone card if power is supplied (+5V), and only RS232 is used.

2) DMA mode binary data, with parabolic and standard data format, selected by i63 (parabolic mode select) where i631 is position only mode, two bytes of data sent, and i630 is parabolic position and velocity mode, four bytes of data sent. The DMA mode is packet oriented and allows very rapid, approximately four microseconds per character, bidirectional data transfer. This mode may be used via RS232 or the VMEbus even though when used with RS232 the speed advantage is lost. The DMA mode is entered simply by sending a (02 H) character before sending data. See SMCC-Parabolic for detailed description. An additional feature of the DMA mode is that it can be used either in MDI mode, where data is received and executed, or in normal buffer mode, where data is stored in the buffer and then executed with the "R" RUN command or the "S" STEP command.

   When used in buffer mode, a special feature was added to SMCC-VME which is currently not available in SMCC, such as to permit digital phase-lock looping of the motion execution rate (blocks per second) to the incoming data rate. For example, by setting "t" (the accel/decel time) to t17, which represents (17/1024) x 1000 = 16.6015 milliseconds per block, and creating a four step buffer, z4, which will continuously roll over, incoming data at video frame rate, 60 Hz (16.666 milliseconds per frame) will automatically cause the SMCC-VME's block execution rate to be synchronized to the incoming data rate, and lock itself to, in this case, 16.666 milliseconds per block. The data capture range is 1%. Data rates outside the range are executed normally. Maximum block per second execution rate is approximately 65 blocks/second.

3) Both in ASCII and DMA (binary) modes, it is possible to execute motion data immediately upon transmission to SMCC-VME instead of placing it in the buffer, by invoking the MDI mode (parameter i02 set to 1). The SMCC-VME then simply executes the data immediately upon reception of the move command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.0 TERMS USED IN THIS DOCUMENT

All data transfer "INPUT" and "OUTPUT" references in this document are MASTER oriented, that is, all OUTPUTs are master host outputs and all INPUTs are master host inputs. However, the use of the terms "ASSERT" and "WITHDRAW" connote action by a slave SMCC-VME to activate or deactivate a priority interrupt request.

3.0 OVERALL TIMING AND SEQUENCE

The host command outputs to the SMCC-VME Servo Network is established by the host system design ground rules. The command structure of the SMCC-VME allows bus communications in several modes:

1) MDI mode where data is taken and acted upon immediately.

2) Buffer mode where data is stored in the SMCC-VME buffer and then executed.

3) DMA mode where binary position only, or position and velocity data (parabolic) is received and sent in fixed packets. DMA mode may be used in either MDI or buffer mode.

The SMCC-VME can both generate or receive communication interrupts. Up to 16 SMCC-VMEs can be controlled by a single host. Each SMCC-VME is individually addressable and is automatically synchronized to permit precision interpolation. The 16 mailbox registers in each SMCC-VME are used to both receive data from the host, as well as send data to it. The host CPU must therefore send and receive data from each individual SMCC-VME, one at a time.

3.1 POWER-ON RESET

At power-on, the SMCC-VME remains internally reset until the end of the VME system reset period, then executes an internal register initialization routine which takes approximately 200 microseconds. No communication with the SMCC-VME must be attempted during this period.

At the completion of register initialization, each SMCC-VME will ASSERT a priority Interrupt Request to signify readiness for VME-bus communications:

```
ASSERT IREQ Level 2, Vector A0  (SMCC-VME-0 ready for OUTPUT)
ASSERT IREQ Level 2, Vector A2  (SMCC-VME-1 ready for OUTPUT)
AND SO ON..... FOR UP TO 16 SMCC-VMEs
```

(It is understood that the host may have interrupts disabled during its own initialization.)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Each IREQ will be WITHDRAWN only upon receipt of an IACKIN via the IACKIN/IACKOUT daisychain. (The SMCC-VMEs will be installed in adjacent slots of the host chassis in ascending numerical order, 0 to f.)

NOTE: ACKNOWLEDGMENT OF ALL INTERRUPT REQUESTS IS NECESSARY.

IT IS ALWAYS TRUE THAT THE STATE OF THE SMCC-VME AFTER THE ACKNOWLEDGMENT OF ANY INTERRUPT REQUEST IS "READY FOR OUTPUT," THOUGH SOME INTERRUPTS ALSO SIGNIFY THAT INPUT DATA IS AVAILABLE (A1).

THE HOST MAY OUTPUT DATA TO SMCC-VME AT ANY TIME AND CAN THUS OVERWRITE INPUT DATA WAITING TO BE PICKED UP BY THE HOST.

3.2 COMMUNICATION EXAMPLES

Each SMCC-VME may, for example, receive servo setup (i Parameters), homing, or other command OUTPUTs from the host in order to commence the servo setup and homing operations that will establish encoder reference points and set the servos to a predetermined starting position. A typical output sequence would be:

```
OUTPUT servo setup command to SMCC-VME-0
OUTPUT servo setup command to SMCC-VME-1
etc.
```

Upon completion of data reading, each SMCC-VME will again ASSERT a priority interrupt request to signify readiness for further communication:

```
ASSERT IREQ Level 2, Vector A0, (SMCC-VME-0 ready for OUTPUT)
ASSERT IREQ Level 2, Vector A2, (SMCC-VME-1 ready for OUTPUT)
etc.
```

The host may now OUTPUT more commands to each SMCC-VME.

```
OUTPUT servo homing command to SMCC-VME-0
OUTPUT servo homing command to SMCC-VME-1
```

Upon acknowledgment of these IREQs the SMCC-VMEs are ready for routine operation. For example, it is likely that the first data transfers to be conducted will be a status request OUTPUT and a status data INPUT for each SMCC-VME. For status reports from the SMCC-VME, the following command OUTPUTS should be transferred:

```
OUTPUT status data request to SMCC-VME-0
OUTPUT status data request to SMCC-VME-1
etc.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The SMCC-VME will process the status data requests, and each will write eight bytes of status data into its mailbox registers for INPUT by the host. Each will then ASSERT an interrupt request as follows:

ASSERT IREQ Level 2, Vector A0, (SMCC-VME-0 data ready for INPUT)
ASSERT IREQ Level 2, Vector A2, (SMCC-VME-1 data ready for INPUT)
etc.

Note: Vectors A0 and A2 are used, indicating data is ready for input and that further data is not available. A1 and A3 would signify that data is ready and more is to come.

Acknowledgments of these interrupts are necessary, and may be (but need not be) followed by the respective status INPUT transfers:

INPUT status data from SMCC-VME-0
INPUT status data from SMCC-VME-1
etc.

Another typical communication can include the following data transfer and interrupt operations:

OUTPUT position command to SMCC-VME-0
OUTPUT position command to SMCC-VME-1
etc.

ASSERT IREQ Level 2, Vector A0, (SMCC-VME-0 ready for OUTPUT)
ASSERT IREQ Level 2, Vector A2, (SMCC-VME-1 ready for OUTPUT)
etc.

OUTPUT position request to SMCC-VME-0
OUTPUT position request to SMCC-VME-1
etc.

ASSERT IREQ Level 2, Vector A0(A1) (SMCC-VME-0 data ready for INPUT)
ASSERT IREQ Level 2, Vector A2(A3) (SMCC-VME-1 data ready for INPUT)
etc.

INPUT position data from SMCC-VME-1
INPUT position data from SMCC-VME-2
etc.

Note: The above sequence is correct when DMA communications are used to request position. If ASCII was used, the SMCC-VME would respond with vectors A1 and A3 first, indicating more data is available, followed by A0, A2, since position data transfer in DMA requires 8 bytes only while in ASCII, 24 bytes are required and therefore the host will have to input data twice.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The actual sequence of the position INPUT operations above is governed by the response time of SMCC-VMEs in providing position data and whether position requests are interleaved between each position command. Each SMCC-VME will respond in approximately 50 microseconds in DMA mode and interrupt the host.

In general, all commands and communications on the VMEbus can be conducted as if RS232 was being used. The use of the mailbox registers and operation of the interrupt vectors is described in section 4.0.

4.0 ADDRESSING OF THE SMCC-VMEs

NOTE: ALL NUMERIC VALUES TABULATED IN THIS SECTION ARE HEXA-DECIMAL.

The SMCC-VMEs are VME A32 slave devices having D08(0) capability, allowing single-byte, odd-byte read and write transfers with 32 bit address decoding.

As described in Paragraph 8.0 below, the Address Modifier, address bus width, and base addresses are programmable by the user to fit any specific situation. The default values, as shipped from the factory, are as follows:

```
Address Modifier:     29  Short non-privileged access, or
                      2D  Short supervisory access
Address/Data Busses: A16/D08
Address bits A15-A08:A0
```

Thus the default values are the same as those discussed in this paragraph and in paragraph 5.0.

The SMCC-VMEs each have a 16 byte shared memory (mailbox registers) through which all data communications with the host are passed. The registers are mapped into the host address space by selection of DIP switch settings on the SMCC-VME, which assign card addresses A0 to Af for up to 16 cards. Once a card address is selected, using the 8 position DIP switch (SW), the 16 registers are automatically mapped into the VMEbus addresses as shown below:

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

REGI STER	SMCC - VME CARD ADDRESS VME-0	VME-1	VME-2	VME-3	VME-4	VME-5	VME-6	VME-7
0	A001	A201	A401	A601	A801	AA01	AC01	AE01
1	A003	A203	A403	A603	A803	AA03	AC03	AE03
2	A005	A205	A405	A605	A805	AA05	AC05	AE05
3	A007	A207	A407	A607	A807	AA07	AC07	AE07
4	A009	A209	A409	A609	A809	AA09	AC09	AE09
5	A00B	A20B	A40B	A60B	A80B	AA0B	AC0B	AE0B
6	A00D	A20D	A40D	A60D	A80D	AA0D	AC0D	AE0D
7	A00F	A20F	A40F	A60F	A80F	AA0F	AC0F	AE0F
8	A011	A211	A411	A611	A811	AA11	AC11	AE11
9	A013	A213	A413	A613	A813	AA13	AC13	AE13
A	A015	A215	A415	A615	A815	AA15	AC15	AE15
B	A017	A217	A417	A617	A817	AA17	AC17	AE17
C	A019	A219	A419	A619	A819	AA19	AC19	AE19
D	A01B	A21B	A41B	A61B	A81B	AA1B	AC1B	AE1B
E	A01D	A21D	A41D	A61D	A81D	AA1D	AC1D	AE1D
F	A01F	A21F	A41F	A61F	A81F	AA1F	AC1F	AE1F

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

REGISTER	<---------- SMCC - VME CARD ADDRESS ----------> VME-8	VME-9	VME-A	VME-B	VME-C	VME-D	VME-E	VME-F
0	B001	B201	B401	B601	B801	BA01	BC01	BE01
1	B003	B203	B403	B603	B803	BA03	BC03	BE03
2	B005	B205	B405	B605	B805	BA05	BC05	BE05
3	B007	B207	B407	B607	B807	BA07	BC07	BE07
4	B009	B209	B409	B609	B809	BA09	BC09	BE09
5	B00B	B20B	B40B	B60B	B80B	BA0B	BC0B	BE0B
6	B00D	B20D	B40D	B60D	B80D	BA0D	BC0D	BE0D
7	B00F	B20F	B40F	B60F	B80F	BA0F	BC0F	BE0F
8	B011	B211	B411	B611	B811	BA11	BC11	BE11
9	B013	B213	B413	B613	B813	BA13	BC13	BE13
A	B015	B215	B415	B615	B815	BA15	BC15	BE15
B	B017	B217	B417	B617	B817	BA17	BC17	BE17
C	B019	B219	B419	B619	B819	BA19	BC19	BE19
D	B01B	B21B	B41B	B61B	B81B	BA1B	BC1B	BE1B
E	B01D	B21D	B41D	B61D	B81D	BA1D	BC1D	BE1D
F	B01F	B21F	B41F	B61F	B81F	BA1F	BC1F	BE1F

Register 0 is distinguished from all others in that a write to register 0 by the host causes an interrupt in the local SMCC-VME microprocessor which causes it to read the information then residing in registers 0 and 2 through F in sequential order.

Register 1 is also unique in that a write to register 1 by the host signifies that any data previously left there for INPUT in registers 0 through F has been read by the host and that SMCC-VME may now send the balance of the data it has for the host. Please note that if the host writes into register 0, any data left in the registers is disregarded by SMCC-VME and the remaining data to be transferred is not sent. The host may therefore over-write data intended for it at any time and abort a transmission of data from SMCC-VME to the host.

5.0 TRANSFER PROTOCOLS

NOTE: ALL NUMERIC VALUES TABULATED IN THIS SECTION ARE HEXADECIMAL.

Transfer of commands to the SMCC-VME will be signified by a host write to register 0 of the SMCC-VME addressed. Therefore, when a string of bytes is written to an SMCC-VME, they must be written to registers 2 through F, and then a final write to register 0 will serve to interrupt the SMCC-VME and notify it that data is ready to be picked up from registers 2 to F.

Receipt of a command or a request OUTPUT from the host will be signified by an interrupt request level 2 asserted by the SMCC-VME addressed. Interrupt acknowledge for the SMCC-VMEs will be daisychained in 1-2 order. An interrupt vector byte will be placed on the VME data transfer bus by the responding SMCC-VME at the time of interrupt acknowledge by the host. The vector value

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

will identify the responding SMCC-VME. The vector values for these responses are as follows:

VECTOR	ASSIGNMENT
A0	(SMCC-VME-0 ready for OUTPUT)
A2	(SMCC-VME-1 ready for OUTPUT)
A4	(SMCC-VME-2 ready for OUTPUT)
A6	(SMCC-VME-3 ready for OUTPUT)
A8	(SMCC-VME-4 ready for OUTPUT)
AA	(SMCC-VME-5 ready for OUTPUT)
AC	(SMCC-VME-6 ready for OUTPUT)
AE	(SMCC-VME-7 ready for OUTPUT)
B0	(SMCC-VME-8 ready for OUTPUT)
B2	(SMCC-VME-9 ready for OUTPUT)
B4	(SMCC-VME-A ready for OUTPUT)
B6	(SMCC-VME-B ready for OUTPUT)
B8	(SMCC-VME-C ready for OUTPUT)
BA	(SMCC-VME-D ready for OUTPUT)
BC	(SMCC-VME-E ready for OUTPUT)
BE	(SMCC-VME-F ready for OUTPUT)

The above vectors are generated when the SMCC-VME has processed the host's output data and is ready for new data or when input data for the host is ready and there will not be any more to send.

Transfers of data INPUT to the host will be initiated by an interrupt request level 2 from the addressed SMCC-VME. An interrupt vector byte will be placed on the VME data transfer bus by the SMCC-VME at the time of interrupt acknowledged by the host. The vector value will not identify the type of INPUT data string residing in the registers, but it will identify the SMCC-VME which is originating transfer. The interrupt vector value assignments are as follows:

VECTOR	ASSIGNMENT
A1	SMCC-VME-0 data ready for INPUT
A3	SMCC-VME-1 data ready for INPUT
A5	SMCC-VME-2 data ready for INPUT
A7	SMCC-VME-3 data ready for INPUT
A9	SMCC-VME-4 data ready for INPUT
AB	SMCC-VME-5 data ready for INPUT
AD	SMCC-VME-6 data ready for INPUT
AF	SMCC-VME-7 data ready for INPUT
B1	SMCC-VME-8 data ready for INPUT
B3	SMCC-VME-9 data ready for INPUT
B5	SMCC-VME-A data ready for INPUT
B7	SMCC-VME-B data ready for INPUT
B9	SMCC-VME-C data ready for INPUT
BB	SMCC-VME-D data ready for INPUT
BD	SMCC-VME-E data ready for INPUT
BF	SMCC-VME-F data ready for INPUT

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The above vectors are generated when the SMCC-VME has input data ready for the host and there is more data to follow. The host should write to register 1 after data has been input to notify SMCC-VME to fetch further data.

6.0 DATA OUTPUT AND INPUT FORMATS

As mentioned previously, transmitted ASCII and binary data from host to SMCC-VME on the VMEbus, is in all respects identical to RS232, except that the mailbox registers are used to transmit data back and forth and interrupts are used to indicate completion of data transfer.

Please note that the completion of an "action" or "move" does not generate an interrupt to the host unless a PLC program is specifically written for the purpose of generating an interrupt to the host by causing the SMCC-VME to write to register 0 with accompanying data if so desired. See paragraph 9.0 for examples.

Two communications examples will be given, one in ASCII the other in binary DMA format, to demonstrate a series of communications between the host and SMCC-VME.

6.1 DATA OUTPUT AND INPUT FORMAT FOR ASCII COMMUNICATION

Assume we wish to transmit the following program to SMCC-VME's program buffer in ASCII format:

```
1)  z100          ;Clear program buffer and assign 100 lines for
                  ;program buffer.
2)  F1024         ;Set feedrate to 100% of i06.
3)  i0464         ;Set home feedrate to 25% of i06.
4)  X1000Y1000    ;Move X and Y axis to position 1000 encoder counts.
5)  DWE 256       ;Wait one quarter second, specified in "binary
                  ;milliseconds."
6)  X0Y0          ;Return X and Y to zero.
7)  END           ;End of program.
```

The communications between the host and the SMCC-VME are:

1) Host outputs data to SMCC-VME addressed at A0 (address A001 to A01F for registers 0 to F)

Register:	2	3	4	5	0
Data (ASCII):	1	0	0	CR	z
Data (Hex):	31	30	30	0D	7A

Note that the host must output data starting with register 2 to F and end with register 0 being written last, since writing to register 0 generates an interrupt. The SMCC-VME, however, reads its data starting with register 0 then 2 to F. This requires

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

that the first character of the data to be transmitted be written last into register 0.

1a) SMCC-VME asserts interrupt request IREQ level 2, vector A0 after reading the data. The SMCC-VME then clears its buffer and assigns 100 program lines to the buffer, and is ready for further outputs from host.

2) Host Outputs:

Register:	2	3	4	5	6	0
Data (ASCII):	1	0	2	4	CR	F
Data (Hex):	31	30	32	34	0D	46

2a) SMCC-VME asserts interrupt A0

3) Host Outputs:

Register:	2	3	4	5	6	0
Data (ASCII):	0	4	6	4	CR	i
Data (HEX):	30	34	36	34	0D	69

3a) SMCC-VME asserts interrupt A0

4) Host Outputs:

Register:	2	3	4	5	6	7	8	9	A	B	0
Data (ASCII):	1	0	0	0	Y	1	0	0	0	CR	X
Data (HEX):	31	30	30	30	59	31	30	30	30	0D	58

4a) SMCC-VME send interrupt A0.

5) Host Outputs:

Register:	2	3	4	5	6	7	0
Data (ASCII):	W	E	2	5	6	CR	D
Data (Hex):	57	45	32	35	36	0D	44

5a) SMCC-VME asserts interrupt A0

6) Host Outputs:

Register:	2	3	4	5	0
Data (ASCII):	0	Y	0	CR	X
Data (Hex):	30	59	30	0D	58

6a) SMCC-VME Asserts interrupt A0

7) Host Outputs:

Register:	2	3	4	0
Data (ASCII):	N	D	CR	E
Data (HEX):	78	68	0D	69

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7a) SMCC-VME Asserts interrupt A0

At this point, the data transmission is complete and the host may proceed to send any other commands such as "s" (save program in non-volatile memory), "S" (step through program one line at a time), "R" (run the program), etc. In the event that a command line is larger than 16 characters, the host simply sends the first part and continues with the second part, terminated by "CR." Similarly, the host may request status, position, and other information. Therefore, operation of the SMCC-VME may be considered to be identical to SMCC, since all SMCC commands, modes, and data formats have been transported to SMCC-VME, and the only difference in communications is the use of the mailbox registers, and interrupt structure.

An example of how the host may request data from the SMCC-VME in ASCII mode is as follows:

Host Outputs:

Register	2	0
Data (ASCII)	CR	p
Data (Hex)	0D	70

This represents a request for position data of both X and Y axis. The "p" position request character may be replaced by any other command requesting data such as:

"f" send following error, "v" send velocity, "?" send status, "inn" send parameter value, etc. (see SMCC-PARabolic manual for all commands used to request data). If the number of characters to transmit is 16 or less, SMCC-VME, after writing the requested data in registers 0 to F, asserts interrupt A0, acknowledging reception of host data, if the number of characters to transmit is 16 or less. It will assert an interrupt A1 if data exceeds 15 characters. SMCC-VME writes the requested data for position of X and Y axis in the 16 mailbox registers starting at register 0 to F in ascending order. (Note: This is different than the way the host outputs data to the SMCC-VME.)

For this example, let us assume that the X axis position is +1234 encoder counts and Y axis position is -56789 encoder counts. The normal transmission format for SMCC-VME is:

Register	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Data (ASCII)	SP	SP	SP	SP	SP	SP	1	2	3	4	SP	-	SP	SP	SP	5
Data (Hex)	20	20	20	20	20	20	31	32	33	34	20	5F	20	20	20	35

Note: The data in register 1 would be a "-" for negative position. The "space" character denotes a positive position.

This is followed by an A1 interrupt to the host signifying data is ready to be taken and there is more to come. The host inputs the data and writes into mailbox register one which interrupts the SMCC-VME and tells it to continue sending data.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

The balance of the data is then asserted as follows:

Register	0	1	2	3	4
Data (ASCII)	6	7	8	9	CR
Data (Hex)	36	37	38	39	0D

Followed by an interrupt A0 to the host signifying data is ready and transmission is complete.

6.2 DATA OUTPUT AND INPUT FORMATS, USING BINARY DMA COMMUNICATION

NOTES: 1) All numeric values tabulated in this section are hexadecimal.

2) Binary DMA communication uses parabolic or ASCII format, and may be performed in buffer mode (i020) or in MDI mode (i021). Also, DMA mode may transmit standard position data only (4 bytes) or parabolic data, consisting of position (4 bytes) and velocity data (3 bytes). Standard data mode is selected by setting i63 to 1; parabolic data mode is selected by setting i63 to zero.

For simplicity, parabolic data DMA will be assumed. In order to transmit DMA data, the host needs to output a <CNTRL B> character, (02H) to the SMCC-VME, followed by appropriate data as shown below:

POSITION AND VELOCITY COMMAND TO SMCC-VME

(Scale factors and ranges are given in section 6.2.1 and 6.2.2)

REGISTER: 2 3 4 5 6 7 8 9 A B C D E F 0
DATA: jj kk mm nn pp qq rr ss tt uu vv ww xx yy zz

jj = Least significant byte of commanded X position
kk = 2nd " " " " "
mm = 3rd " " " " "
nn = Most " " " " "
pp = Least significant byte of commanded X velocity
qq = 2nd " " " " "
rr = Most " " " " "
ss = Least significant byte of commanded Y position
tt = 2nd " " " " "
uu = 3rd " " " " "
vv = Most " " " " "
ww = Least significant byte of commanded Y velocity
xx = 2nd " " " " "
yy = Most " " " " "
zz = 02

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Note that (02H), <CNTL B>, is sent last and placed in register 0, thus interrupting the SMCC-VME, and notifying it that data is available. The same procedure is sequentially followed for all SMCC-VMEs on the bus. Data is taken by the SMCC-VME and motion is started without any further input if in MDI mode; if in buffer mode, data is placed in the buffer, ready for later execution by "R" or "S" commands.

In order to request data from the SMCC, a simplified protocol is used as follows:

STATUS REQUEST: Host outputs a <CNTRL D> character only:
==========

REGISTER: 0
DATA (ASCII) <CNTRL D>
DATA (Hex) 04

SMCC-VME responds by placing 8 bytes of status in the mailbox registers as follows:

STATUS DATA: Items marked [*] are significant to host
==========

REGISTER:			0	1	2	3	4	5	6	7
DATA:			ee	ff	gg	hh	ii	jj	kk	ll
ee byte	0	*	HOME2	Y axis homing complete						
	1	*	HOME1	X axis homing complete						
	2		CMOVE	Continuous move						
	3		BLKREQ	Block request						
	4		ADIV	Auto divide						
	5	*	FHOLD	Feed hold in progress						
	6		RUN	Program running						
	7		TIMER	Timer active						
ff byte	0		TMODE	Time mode programming						
	1		SSTEP	Single step mode (SS)						
	2		BFULL	Buffer full/Data request						
	3	*	FRATE	Parabolic move						
	4	*	LIMIT	Limit switch (closure) acknowledge						
	5		NTRDY1	X axis not ready for SS move						
	6		NTRDY2	Y axis not ready for SS move						
	7		NOTRDY	System not ready for SS move						
gg byte	0		JOGP1	Jog positive	Both = open loop				X Axis	
	1		JOGM1	Jog negative					"	
	2	*	LMTP1	Limit positive	Both = feed-				"	
	3	*	LMTM1	Limit negative	hold switch				"	
	4	*	FE1	Following error limit					"	
	5	*	12T1/	I Squared T limit					"	
	6	*	NIPOS1	Not in position					"	
	7	*	RVZ1	Zero velocity commanded					"	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

hh byte	0		JOGP2	Jog positive Both = open loop	Y Axis
	1		JOGM2	Jog negative	"
	2	*	LMTP2	Limit positive Both = feed-	"
	3	*	LMTM2	Limit negative hold switch	"
	4	*	FE2	Following error limit	"
	5	*	I2T2/	I squared T limit	"
	6	*	NIPOS2	Not in position	"
	7	*	RVZ2	Zero velocity commanded	"

ii byte	0	Edit Mode
	1	Insert Mode
	2	Extended Read
	3	Circle Mode
	4	Wait (X)
	5	Wait (Y)
	6	Backlash (X)

jj byte	0	Auto Divide Req
	1	Extended Move Flag
	2	Extended Move Flag
	3	Extended Case Flag
	4	CCW Circle
	5	Circle > 180
	6	Position Frozen
	7	Subroutine Buffer Open

kk byte	0	Servo Pointer
	1	Servo Pointer
	2	Servo Pointer
	3	Dwell Request
	4	Home in Progress
	5	Dwell in Progress
	6	Continuous Move Req
	7	Memory Request

ll byte	0	Servo Pointer
	1	Servo Pointer
	2	Servo Pointer
	3	Servo Pointer
	4	Servo Pointer
	5	Step Request
	6	Servo Pointer
	7	Servo Pointer

The SMCC-VME then sends an A0 interrupt to the host signifying that data is ready for input. In order to speed up data transfers, it is possible for the host to input the first four bytes only since they contain significant data, and disregard the rest of the data.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

To request position data, the host sends a <CNTRL C> character only.

```
REGISTER:                0
DATA (ASCII):         <CNTRL C>
DATA (Hex):              03
```

SMCC-VME responds:

POSITION DATA: (Scale factors and ranges are in section 6.2.1)

```
REGISTER: 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15
DATA:     aa bb cc dd AA BB CC DD ee ff gg  hh  ii  jj  kk  ll
```

aa = Least significant byte of instantaneous X position
bb = 2nd " " " " "
cc = 3rd " " " " "
dd = Most " " " " "
AA = Least significant byte of instantaneous Y position
BB = 2nd " " " " "
CC = 3rd " " " " "
DD = Most " " " " "
ee - ll are the same as for the status request.
This is followed by an A0 interrupt.

To request parameter data, the host sends a <CNTRL E> character only.

```
REGISTER:                0
DATA (ASCII):         <CNTRL E>
DATA (Hex):              05
```

SMCC-VME responds:

PARAMETERS:

```
REGISTER: 0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15
DATA:     -----P1---- ----P2----  ----P3------  -----P4-------
```

0 = Least significant byte of P1
1 = 2nd " " " " "
2 = 3rd " " " " "
3 = Most " " " " "
4 = Least significant byte of P2
5 = 2nd " " " " "
6 = 3rd " " " " "
7 = Most " " " " "
8 = Least significant byte of P3
9 = 2nd " " " " "
10 = 3rd " " " " "
11 = Most " " " " "
12 = Least significant byte of P4
13 = 2nd " " " " "
14 = 3rd " " " " "
15 = Most " " " " "
This is followed by an A0 interrupt.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6.2.1 POSITION OUTPUT AND INPUT SCALING AND RANGE

NOTE: ALL NUMERIC VALUES TABULATED IN THIS SECTION ARE DECIMAL.

The values of position in all position command OUTPUTs and position report INPUTs are to be expressed with 32 bit (4 byte) words in two's complement notation. The sign bit is extended left through the MSB.

The five least significant bits of the word are not used, so the value transmitted is a binary quantity equal to 32 times the actual position in encoder counts, or position shifted left five places.

The position word is diagrammed below:

MSB 4th byte								3rd byte								2nd byte								1st byte LSB							
S	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	X	X	X	X	X

S = Sign P = Significant bit or sign extension X = Don't Care

The 26 significant bits (P) allow expression of position values up to 67,108,863 encoder counts in both the positive (S=0) and negative (S=1) directions.

6.2.2 VELOCITY OUTPUT SCALING AND RANGE, USED IN PARABOLIC DMA BINARY DATA MODE

NOTE: ALL NUMERIC VALUES TABULATED IN THIS SECTION ARE DECIMAL.

The velocity command accompanying each position command will convey the commanded terminal velocity to prevail at the completion of the servo movement to the commanded position. It is expressed with a 24 bit (3-byte) binary word in two's complement notation. The sign bit is extended left through the MSB. The least significant bit represents one encoder count per second. The velocity word is diagrammed below:

MSB 3rd byte								2nd byte								1st byte LSB							
S	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V

S = Sign V = Significant bit or sign extension

The 23 significant bits (V) allow expression of velocity values up to 8,388, 607 counts/sec. of either sign (S).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7.0 SUPPORTING SOFTWARE

In order to provide assistance during initial installation and start-up of the SMCC-VME in a VMEbus, a "Monitor" program has been written, intended for residence in the VME host computer. The purpose of the "Monitor" program is to enable the host VME computer to receive and send data via its RS232 port to an IBM PC and via the VMEbus to the SMCC-VMEs on the bus.

The "Monitor" program is called SMCC.A68 and is written in "68000" Assembly language and must be adjusted to use the proper RS232 port address and program origin location by each user, depending upon the type of VME host that is being used. A listing of the "Monitor" program is attached in the Addendum. The "Monitor" program once assembled, may then be downloaded from an IBM PC to the VME host via the RS232 channel, using any commonly available modem program (such as "Freeway," from KORTEK, Inc.) Once the program is downloaded, typing "GO" on the IBM PC keyboard, activates the "Monitor" program and allows transmission of data to and from the IBM PC, through the host VME, to the SMCC-VME cards on the bus.

Using the SMCC V3.X IBM PC terminal program for the SMCC in the PC now allows a thorough and complete check-out of the VMEbus and the SMCC-VMEs.

Please note that using the SMCC-VME's RS232 port directly is also possible, but would not check out the VMEbus communications.

8.0 SOFTWARE VARIATIONS FOR ADDRESS MAPPING

Due to the fact that the SMCC-VME is used in a great variety of systems where address mapping can be unpredictable, the Address Modifier, address bus width, base addresses (including the upper 16 bits or upper 8 bits when using A32 or A24 address busses), and the Interrupt Vector are stored in the SMCC-VME EAROM, and may be modified by the user if required. The default values, as shipped, are as shown in paragraphs 4.0 and 5.0 when the DIP switch on the SMCC-VME is set for any card address, A0 thru AF. To change these parameters, the user must use the RS-232 port and the Delta Tau SMCC V3.X IBM PC terminal program to write the following EAROM memory addresses (Refer to the SMCC manual for selecting RS232 and writing to SMCC memory):

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

VME/DPRAM Setup I-Variables

I90 VME Address Modifier

Range: $00 - $FF
Units: None
Default: $39

SMCC : dff8 / fbf8

I90 controls which "address modifier" value Turbo PMAC will respond to when sent by the VME bus host. I90 takes one of three valid values in normal use, depending on the address bus width used:

- I90 = $29: 16-bit addressing
- I90 = $39: 24-bit addressing
- I90 = $09: 32-bit addressing

I90 is actually used at power-on/reset only, so to set or change the VME address modifier, change the value of I90, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

I91 VME Address Modifier Don't Care Bits

Range: $00 - $FF
Units: None
Default: $04

dff9 / fbf9

I91 controls which bits of the I90 VME address modifier are "don't care" bits. I91 is set to $04 in all normal use, which permits both non-privileged and supervisory data access by the VME host.

I91 is actually used at power-on/reset only, so to set or change the VME address modifier "don't care" bits, change the value of I91, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

I92 VME Base Address Bits A31-A24

Range: $00 - $FF
Units: None
Default: $FF

dffa / fbfa

I92 controls bits A31 through A24 of the VME bus base address of Turbo PMAC, both for the mailbox registers, and the dual-ported RAM. It is only used if 32-bit addressing has been selected with I90 and I99.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

I92 is actually used at power-on/reset only, so to set or change bits 16-23 of the VME bus base address, change the value of I92, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command

I93 VME Mailbox Base Address Bits A23-A16 ISA DPRAM Base Address Bits A23-A16

Range: $00 - $FF
Units: None
Default: $7F (VME); $0D (ISA)

On VME bus systems, I93 controls bits A23 through A16 of the VME bus base address of the mailbox registers for Turbo PMAC. Bit 7 of I93 corresponds to A23 of the base address, and bit 0 of I93 corresponds to A16. I93 is only used on VME systems if 24-bit or 32-bit addressing has been selected with I90 and I99.

On ISA bus systems (PC, PC Ultralite), I93 controls bits A23 through A16 of the ISA bus base address of the DPRAM. Bit 7 of I93 corresponds to A23 of the base address, and bit 0 of I93 corresponds to A16. A23 through A20 are only used on ISA bus systems if bit 2 of I94 is set to 1, enabling 24-bit addressing.

I93 is actually used at power-on/reset only, so to set or change the base address, change the value of I93, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

I94 VME Mailbox Base Address Bits A15-A08 ISA DPRAM Base Address Bits A15-A14 & Enable

Range: $00 - $FF
Units: None
Default: $A0 (VME); $45 (ISA)

On VME bus systems, I94 controls bits A15 through A08 of the VME bus base address of the mailbox registers of Turbo PMAC. Bit 7 of I93 corresponds to A23 of the base address, and bit 0 of I93 corresponds to A16. I94 is used whether 16-bit, 24-bit, or 32-bit addressing has been selected with I90 and I99.

On ISA bus systems (PC, PC Ultralite, Lite, and Mini), I94 controls bits A15 and A14 of the ISA bus base address of the standard 8k x 16 DPRAM of Turbo PMAC. Bit 7 of I94 corresponds to A15, and bit 6 of I94 corresponds to A14. Bits 5 and 4 must be set to 0. With the extended 32k x 8 DPRAM, bits 7 through 4 of I94 must all be set to 0.

On ISA bus systems, bit 3 of I94 is unused and should be set to 0. Bit 2 of I94 must be set to 1 to enable 24-bit addressing, permitting PC DPRAM base addresses above the 1 megabyte range. It may be set to 0 if the DPRAM base address is below 1 megabyte (it is usually placed between 640

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

kb and 1 Mb). Bit 1 must be set to 1 to enable access to the entire DPRAM, and bit 0 must be set to 1 to enable the DPRAM itself.

I94 is actually used at power-on/reset only, so to set or change bits 8 to 15 of the VME bus mailbox register base address, or of the ISA bus DPRAM configuration, change the value of I94, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

I95 VME Interrupt Level

Range: $01 - $07
Units: None
Default: $02

I95 controls which interrupt level (1 to 7) Turbo PMAC will assert on the VME bus. Multiple boards on the same VME bus may assert the same interrupt level if each one has a unique set of interrupt vectors as set by I96.

I95 is actually used at power-on/reset only, so to set or change the VME interrupt level, change the value of I95, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

I96 VME Interrupt Vector

Range: $00 - $FF
Units: None
Default: $A1

I96 controls which interrupt vectors will be provided when Turbo PMAC asserts a VME bus interrupt. If Turbo PMAC asserts the interrupt to signify that it has read a set of mailbox registers and is ready to accept another set, the interrupt vector value will be equal to (I96-1). If Turbo PMAC asserts the interrupt to signify that it has written to a set of mailbox registers and is ready for the host computer to read these, the interrupt vector value will be equal to I96. If Turbo PMAC asserts the interrupt to signify that it has put a line of text in the DPRAM ASCII response buffer and is ready for the host computer to read this, the interrupt vector value will be equal to (I96+1).

If there are multiple Turbo PMAC boards asserting the same interrupt level in the VME bus as set by I95, they each must assert a unique, non-overlapping set of interrupt vectors.

I96 is actually used at power-on/reset only, so to set or change the VME interrupt vector, change the value of I96, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

I97 VME DPRAM Base Address Bits A23-A20

Range: $00 - $FF
Units: None
Default: $00

I97 controls bits A23 through A20 of the VME bus base address of the dual-ported RAM of Turbo PMAC. Bit 3 of I93 corresponds to A20 of the base address, and bit 0 of I93 corresponds to A16. I97 is only used if 24-bit or 32-bit addressing has been selected with I90 and I99.

Bits A19 through A14 of the DPRAM VME base address must be set by the host computer after every power-on/reset by writing a byte over the bus to the "page select" register in the Turbo PMAC's VME mailbox IC at the mailbox base address + $0121. This must be done even with the single-page 8k x 16 standard DPRAM option. With the extended DPRAM option, the host computer must write to the page select register every time a new page is accessed.

I97 is actually used at power-on/reset only, so to set or change bits 8 to 15 of the VME bus DPRAM base address, change the value of I97, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

I98 VME DPRAM Enable

Range: $00 - $FF
Units: None
Default: $60

I98 controls whether VME access to the DPRAM IC on the Turbo PMAC is enabled or not. It should be set to $60 if DPRAM is not present to disable access; it should be set to $E0 if DPRAM is present to enable access.

I98 is actually used at power-on/reset only, so to set or change the DPRAM enabling, change the value of I98, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

I99 VME Address Width Control

Range: $00 - $FF
Units: None
Default: $10

I99 controls the VME bus address width, with or without DPRAM. It should take one of six values in normal use:

- I99 = $00: 32-bit addressing, no DPRAM
- I99 = $10: 24-bit addressing, no DPRAM

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

- I99 = $30: 16-bit addressing, no DPRAM
- I99 = $80: 32-bit addressing, with DPRAM
- I99 = $90: 24-bit addressing, with DPRAM
- I99 = $B0: 16-bit addressing, with DPRAM

I99 is actually used at power-on/reset only, so to set or change the VME bus address width, change the value of I99, store this new value to non-volatile flash memory with the **SAVE** command, and reset the card with the **$$$** command.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PERM. MEMORY / Options

EAROM ADDRESS 8K	EAROM ADDRESS 32K	DEFAULT DATA	DESCRIPTION
DFF8	FBF8	29H	Address modifier
DFF9	FBF9	04H	Address modifier Don't Care bits In this example, address modifier bit 2 is a Don't Care, thus allowing AM = 29 or AM = 2D
DFFA	FBFA	FFH	Address bits A31 - A24 Don't Care when using A16 or A24 address bus
DFFB	FBFB	FFH	Address bits A23 - A16 Don't Care when using A16 address bus
DFFC	FBFC	A0H	Address bits A15 - A08 Selects base address with any address bus width
DFFD	FBFD	02H	Interrupt level
DFFE	FBFE	30H	Address bus width select 30H selects A16 address bus 10H selects A24 address bus 00H selects A32 address bus
DFFF	FBFF	A0H	Interrupt vector number

Do not read these DFF8, 9, A

To write: wdff8, xx, xx, xx, xx, xx, xx, xx, xx

To save: s

In a multi-card system, all cards will be programmed to the same values. The proper register addresses and interrupt vectors will be selected by the SMCC-VME card as a function of the DIP switch settings for cards A0, A1, A2, etc.

For convenience, the permissible VME Address Modifiers and address bus widths are shown below.

APPENDIX A PERMISSIBLE ADDRESS MODIFIERS AND ADDRESS BUSSES

ADDRESS MODIFIER	PERMISSIBLE ADDRESS BUS	FUNCTION
29H	A16	Short nonprivileged access
2DH	A16	Short supervisory access
39H	A24	Standard nonprivileged data access
3AH	A24	Standard nonprivileged program access
3BH	A24	Standard nonprivileged block transfer
3DH	A24	Standard supervisory data access
3EH	A24	Standard supervisory program access
3FH	A24	Standard supervisory block transfer
09H	A32	Extended nonprivileged data access
0AH	A32	Extended nonprivileged program access
0BH	A32	Extended nonprivileged block transfer
0DH	A32	Extended supervisory data access
0EH	A32	Extended supervisory program access
0FH	A32	Extended supervisory block transfer

Note: For PROM versions 2.83V and older, memory location DFFE (FBFE for 32K) holds address bits A15 - A08; memory location DFFF (FBFF for 32K) holds the interrupt vector number. These are the only settings that may be changed in these versions. All other settings are automatically at the default settings of the above list.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

EAROM ADDRESS	DEFAULT DATA	DESCRIPTION
DFF8	29H	Address modifier
DFF9	04H	Address modifier Don't Care bits In this example, address modifier bit 2 is a Don't Care, thus allowing AM = 29 or AM = 2D
DFFA	FFH	Address bits A31 - A24 Don't Care when using A16 or A24 address bus
DFFB	FFH	Address bits A23 - A16 Don't Care when using A16 address bus
DFFC	A0H	Address bits A15 - A08 Selects base address with any address bus width
DFFD	02H	Interrupt level
DFFE	30H	Address bus width select 30H selects A16 address bus 10H selects A24 address bus 00H selects A32 address bus
DFFF	A0H	Interrupt vector number

In a multi-card system, all cards will be programmed to the same values. The proper register addresses and interrupt vectors will be selected by the SMCC-VME card as a function of the DIP switch settings for cards A0, A1, A2, etc.

For convenience, the permissible VME Address Modifiers and address bus widths are shown below.

APPENDIX A PERMISSIBLE ADDRESS MODIFIERS AND ADDRESS BUSSES

ADDRESS MODIFIER	PERMISSIBLE ADDRESS BUS	FUNCTION
29H	A16	Short nonprivileged access
2DH	A16	Short supervisory access
39H	A24	Standard nonprivileged data access
3AH	A24	Standard nonprivileged program access
3BH	A24	Standard nonprivileged block transfer
3DH	A24	Standard supervisory data access
3EH	A24	Standard supervisory program access
3FH	A24	Standard supervisory block transfer
09H	A32	Extended nonprivileged data access
0AH	A32	Extended nonprivileged program access
0BH	A32	Extended nonprivileged block transfer
0DH	A32	Extended supervisory data access
0EH	A32	Extended supervisory program access
0FH	A32	Extended supervisory block transfer

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

9.0 - GENERATING INTERRUPTS

The SMCC-VME's interrupt structure, using mailbox registers 0 and 1, generates interrupts for communications and data transfer purposes only.

It is often desirable and sometimes necessary to generate interrupts upon completion of a task so that the host computer is not burdened with polling requirements. To accomplish this is relatively simple when the PLC programming capability of the SMCC-VME is used. The following two examples can be used as typical means of generating interrupts.

1) Generate interrupt when "In Position is reached."

```
SET C01 = ff01      ; Assign C01 to address location ff01
                    ; which is the status byte containing
                    ; the "In Position" status.
SET M00 = C01.7     ; Assign M00 to be bit 7 of ff01
                    ; Which is the "In Position" status bit
IF M00 = 0          ; check.  The "IF" starts the
                    ; PLC program.
THEN IF M01 = 1     ; Use M01 as a "One Shot."
  THEN  M01 = 0     ; Send message only once.
  AND SEND "In_Position" ; Send "In_Position" message
                    ; to the host computer.  This action
                    ; automatically causes the SMCC-VME
                    ; to generate an interrupt to the host, when
                    ; "In Position" is first reached.
  ELSE              ; Do nothing if M01 = 0.
ELSE M01 = 1        ; Otherwise, set M01=1.
END                 ; End of PLC program.
```

2) Generate an interrupt when velocity becomes constant, or no acceleration is occurring.

```
SET C50=feba        ; Assign C50 to address location feba
                    ; which is the first of 4 bytes containing
                    ; the acceleration of the move in
                    ; progress for the X axis.
IF C50,4>0          ; Check the 4 bytes of accel and
OR C50,4<0          ; determine if they are 0,no acceleration.
THEN IF M01=1       ; Do only once.
  THEN M01=0        ;
  AND SEND "NOT_AT_SPEED" ; Send "not at speed" message once,
                          ; indicating that acceleration is
                          ; occurring.  This causes an
                          ; interrupt to occur.
  ELSE              ;
ELSE IF M01=0       ; Do only once.
  THEN M01=1        ;
  AND SEND "AT_SPEED" ; Send "at speed" message, indicating
                      ; no acceleration is occurring.
                      ; This causes an interrupt to
                      ; occur.
END                 ; End of PLC program.
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SMCC-VME
J1/P1 PIN ASSIGNMENTS

PIN NUMBER	ROW a SIGNAL MNEMONIC	ROW b SIGNAL MNEMONIC	ROW c SIGNAL MNEMONIC
1	D00	BBSY/	D08
2	D01	BCLR/	D09
3	D02	ACFAIL/	D10
4	D03	BGOIN/	D11
5	D04	BGOOUT/	D12
6	D05	BG1IN/	D13
7	D06	BG1OUT/	D14
8	D07	BG2IN/	D15
9	GND	BG2OUT/	GND
10	SYSCLK	BG3IN/	SYSFAIL/
11	GND	BG3OUT/	BERR/
12	DS1/	BRO/	SYSRESET/
13	DSO/	BR1/	LWORD/
14	WRITE/	BR2/	AM5
15	GND	BR3/	A23
16	DTACK/	AMO	A22
17	GND	AM1	A21
18	AS/	AM2	A20
19	GND	AM3	A19
20	IACK/	GND	A18
21	IACKIN/	SERCLK	A17
22	IACKOUT/	SERDAT/	A16
23	AM4	GND	A15
24	A07	IRQ7/	A14
25	A06	IRQ6/	A13
26	A05	IRQ5/	A12
27	A04	IRQ4/	A11
28	A03	IRQ3/	A10
29	A02	IRQ2/	A09
30	A01	IRQ1	A08
31	-12V (1)	+5V STDBY (4)	+12V (2)
32	+5V (3)	+5V (3)	+5V (3)

Note: Power Supply consumption is as follows:

(1) -12V, +/- 5%, 50 ma., only when ANALOG SIP is used. Zero otherwise.
(2) +12V, +/- 5%, 50 ma., only when ANALOG SIP is used. Zero otherwise.
(3) +5V, +/- 5%, 850 ma. does not include encoder current requirements.
(4) +5V Standby, not used.

Please note that, if desired, the + and -12V power supplies of the VMEbus could be used to provide power to the Opto-Isolated output of SMCC-VME on P2 - Pin C25 (-15A) and P2-Pin C29 (+15A) with resultant loss of optical isolation between the SMCC-VME and the Amplifier/Power section.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SMCC-VME
J2/P2 PIN ASSIGNMENTS

PIN NUMBER	ROW a SIGNAL MNEMONIC	ROW b SIGNAL MNEMONIC	ROW c SIGNAL MNEMONIC
1	ANA3	+5V	ANA2
2	AVSS	GND	AVSS
3	CUR 1	RESERVED	CUR0
4	YPLL	A24 (5)	XPLL
5	YMIL	A25 (5)	XMIL
6	+ 5V	A26 (5)	+ 5V
7	GND	A27 (5)	GND
8	GND	A28 (5)	GND
9	MI4/	A29 (5)	MI3/
10	YUFL/	A30 (5)	XUFL/
11	YHFL/	A31 (5)	XHFL/
12	CHCY/	GND	CHCX/
13	CHCY	+5V	CHCX
14	CHBY/	D16	CHBX/
15	CHBY	D17	CHBX
16	CHAY	D18	CHAX/
17	CHAY/	D19	CHAX
18	YHWB	D20	XHWB
19	YHWB/	D21	XHWB/
20	YHWA/	D22	XHWA/
21	YHWA	D23	XHWA
22	HWY DIS/	GND	HWX DIS/
23	PHA3/	D24	PHA1/
24	PHA3	D25	PHA1
25	M05/	D26	-15A
26	M04/	D27	MI2/
27	M03/	D28	MI1/
28	M02/	D29	FERROR/*
29	M01/	D30	+15A
30	IPOS *	D31	AGND
31	SYNC/*	GND	AENA
32	INIT/*	+5V	FAULT/*

Notes:

1) J2/P2 Row b and all of J1/P1 are in accordance with Standard VMEbus requirements.
2) J2/P2 Rows a and c are used for connecting SMCC-VME to Amplifier/Machine. See individual description of all I/O signals.
3) SYNC/ and INIT/ must be daisychained on multiple card systems.
4) IPOS, FERROR/ and FAULT/ may be daisychained for providing a wire-ored common signal for all cards, or may be used independently.
5) Please refer to paragraph 8.0 of the text for operation of 32 bit VMEbus.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

****

SMCC - VME CONNECTOR LISTING

****

P2, ROW "A" - Description of I/O Functions

PIN	SYMBOL	FUNCTION	DESCRIPTION	NOTES
A1	ANA3	INPUT	ANALOG INPUT 3 }	Could be used as analog speed command. Use 0 to +5V for 0 to full scale.
A2	AVSS	INPUT	ANALOG RETURN }	
A3	CUR1	INPUT	CURRENT 1 FEED BACK	Current limiting
A4	YPLL	INPUT	Y AXIS + LIMIT SW.	Low enables the move.
A5	YMIL	INPUT	Y AXIS - LIMIT SW.	Low enables the move.
A6	+ 5V	I or O	+5VDC POWER SUPPLY	Could be used as input to card or output to encoders.
A7	GND	I or O	+5VDC RETURN	Logic GND
A8	GND	I or O	+5VDC RETURN	Logic GND
A9	MI4/	INPUT	"M" FUNCTION INPUT#4	Low True
A10	YUFL/	INPUT	Y AXIS USER FLAG	(Programmable polarity)
A11	YHFL/	INPUT	Y AXIS HOME FLAG	(Programmable polarity)
A12	CHCY/	INPUT	ENCODER "C" CH. NEG.	Y axis (Do not GND if not used)
A13	CHCY	INPUT	ENCODER "C" CH. POS.	Y axis
A14	CHBY/	INPUT	ENCODER "B" CH. NEG.	Y AXIS (Do not GND if not used)
A15	CHBY	INPUT	ENCODER "B" CH. POS.	Y AXIS
A16	CHAY/	INPUT	ENCODER "A" CH. NEG.	Y AXIS (Do not GND if not used)
A17	CHAY	INPUT	ENCODER "A" CH. POS.	Y AXIS
A18	YHWB	INPUT	HANDWHEEL "B" CH.POS.	Y AXIS
A19	YHWB/	INPUT	HANDWHEEL "B" CH. NEG.	Y AXIS (Do not GND if not used)
A20	YHWA/	INPUT	HANDWHEEL "A" CH. NEG.	Y AXIS (Do not GND if not used)
A21	YHWA	INPUT	HANDWHEEL "A" CH. POS.	Y AXIS
A22	HWYDIS/	INPUT	HANDWHEEL DISABLE	Y AXIS (Low to Disable)
*A23	PHA3/	OUTPUT	PHASE 3 COMMAND NEG.}	Analog
A24	PHA3	OUTPUT	PHASE 3 COMMAND POS.}	Differential Signal Out "Y" Axis
A25	M05/	OUTPUT	"M" FUNCTION OUTPUT #5	Open Collector Low Tru
A26	M04/	OUTPUT	"M" FUNCTION OUTPUT #4	Open Collector Low Tru

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PIN	SYMBOL	FUNCTION	DESCRIPTION	NOTES
A27	M03/	OUTPUT	"M" FUNCTION OUTPUT #3	Open Collector Low True
A28	M02/	OUTPUT	"M" FUNCTION OUTPUT #2	Open Collector Low True
A29	M01/	OUTPUT	"M" FUNCTION OUTPUT #1	Open Collector Low True
A30	IPOS	OUTPUT	IN POSITION SIGNAL	
A31	SYNC/	I/O	SYNCHRONIZATION CLOCK	From an "A0" card to all others
A32	INIT/	INPUT	Resets SMCC-VME	Low is a "RESET" will not RESET master "VME-CPU"

*NOTE: If PHA3/ is not needed for Servo Amplifier, do not tie to Amp-common (AGND).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

P2, ROW "C" - Description of I/O Functions

PIN	SYMBOL	FUNCTION	DESCRIPTION	NOTES
C1	ANA2	INPUT	ANALOG INPUT 2 }	Could be used as analog speed command. Use 0 to
C2	AVSS	INPUT	ANALOG RETURN }	+5V for 0 to full scale.
C3	CUR0	INPUT	CURRENT 0 FEEDBACK	Current Limiting
C4	XPLL	INPUT	X AXIS + LIMIT SW.	Low Enables the move.
C5	XMIL	INPUT	X AXIS - LIMIT SW.	Low Enables the move.
C6	+ 5V	I or O	+5VDC POWER SUPPLY	Could be used as input to card or output to encoders.
C7	GND	I or 0	+5VDC RETURN	Logic End.
C8	GND	I or 0	+5VDC RETURN	Logic End.
C9	MI3/	INPUT	"M" FUNCTION INPUT #3	
C10	XUFL/	INPUT	X AXIS USER FLAG	(Programmable Polarity)
C11	XHFL/	INPUT	X AXIS HOME FLAG	(Programmable Polarity)
C12	CHCX/	INPUT	ENCODER "C" CH. NEG.	X Axis (Do Not GND If not used)
C13	CHCX	INPUT	ENCODER "C" CH. POS.	X Axis
C14	CHBX/	INPUT	ENCODER "B" CH. NEG.	X Axis (Do Not GND If not used)
C15	CHBX	INPUT	ENCODER "B" CH. POS.	X Axis
C16	CHAX/	INPUT	ENCODER "A" CH. NEG.	X Axis (Do Not GND If not used)
C17	CHAY	INPUT	ENCODER "A" CH. POS.	X Axis
C18	XHWB	INPUT	HANDWHEEL "B" CH.POS.	X Axis
C19	XHWB/	INPUT	HANDWHEEL "B" CH.NEG.	X Axis (Do Not GND If not used)
C20	XHWA/	INPUT	HANDWHEEL "A" CH. NEG.	X Axis (Do Not GND If not used)
C21	XHWA	INPUT	HANDWHEEL "A" CH. POS.	X Axis
C22	HWXDIS/	INPUT	HANDWHEEL DISABLE	X Axis (Low to Disable)
*C23	PHA1/	OUTPUT	PHASE 1 COMMAND NEG.}	Analog
C24	PHA1	OUTPUT	PHASE 1 COMMAND POS.}	Differential Signal out "X" Axis
C25	-15A	INPUT	ANALOG -15V SUPPLY	Provided by Amplifier or separate power supply.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PIN	SYMBOL	FUNCTION	DESCRIPTION	NOTES
C26	MI2/	INPUT	"M" FUNCTION INPUT#2	Low True
C27	MI1/	INPUT	"M" FUNCTION INPUT#1	Low True
C28	FERROR/	OUTPUT	FOLLOWING ERROR	Open Collector Low True
C29	+15A	INPUT	ANALOG +15V SUPPLY	Provided by amplifier or separated power supply.
C30	AGND	INPUT	ANALOG GND	
C31	AENA	OUTPUT	SERVO AMP ENABLE	(Programmable Polarity)
C32	FAULT/	INPUT	SERVO AMP FAULT LIMIT	Low = Amplifier Fault

*NOTE: If PHA1/ is not needed for Servo Amplifier, do not tie to Amp-Common (AGND).

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

J1 PANEL CONNECTOR (26 Pin Header)

PIN #	SYMBOL	FUNCTION	DESCRIPTION	NOTES
1	PL5V	Output	+5V power	For remote panel
2	GRND	Common	SMCC-VME common	
3	YJMI/	Input	Jog Y axis in -dir	Low is "Jog Y-"
4	XJMI/	"	Jog X axis in -dir	Low is "Jog X-"
5	YJPL/	"	Jog Y axis in -dir	Low is "Jog Y-"
6	XJPL/	"	Jog X axis in -dir	Low is "Jog X-"
7	PREJ/	"	Ret. to prejog pos.	Low is "Return"
8	STRT/	"	Start program run	Low is "Start"
9	STEP/	"	Step through program	Low is "Step"
10	STOP/	"	Stop program run	Low is "Stop"
11	HOME/	"	Go Home command	Low is "Go Home"
12	HOLD/	"	Hold motion	Low is "Hold"
13	HWYD/	"	Handwh. Y disable	Low disables
14	HWXD/	"	" X "	" "
15	INIT/	"	Resets SMCC-VME	Low is a "Reset"
16	ENAX	Input	X Handwh encoder A ch.	5V TTL sq. pulse
17	IPLD/	Output	In Position Ind.	Low lights LED
18	BFLD/	"	Buffer Full ind.	" " "
19	ERLD/	"	Error indicator	" " "
20	EPLD/	"	End of program ind.	" " "
21	ITLD/	"	Current limit ind.	Low lights LED
22	ENBX	Output	Y Handwh encoder B ch.	5V TTL Sq. pulse
23	FILD/	Output	Following Error 1	" " "
24	F2LD/	"	" " 2	" " "
25	PL5V	"	+5V power	For remote panel
26	GRND	Common	SMCC-VME common	

This connector provides access to all the "Control Panel" functions of the SMCC-VME. Accessory 16 (ACC-16) may be directly plugged in to J1 (panel) and J4 (display) to provide a complete operator's control panel for manual function inputs, such as X and Y jog +/-, Step, Run, Hold, Abort, Return to prejog, etc. ACC-16 also provides a 40 x 2 LCD display and an A/B quadrature encoder for handwheel operation.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

J2 EXPANSION CONNECTOR (20 Pin Header)

PIN #	SYMBOL	FUNCTION	DESCRIPTION	NOTES
1	-15V	Output	-15V power	For expansion card
2	M Reset	"	Reset	High is "True"
3	+15V	"	+15V power	For expansion card
4	IOWR/	"	Write DATA	Low is "True"
5	GRND	"	SMCC-VME common	
6	MD3	Bidirect	Address DATA3	
7	GRND	Common	SMCC-VME common	
8	MD2	Bidirect	Address DATA2	
9	+5V	Output	+5V power	For expansion card
10	MD4	Bidirect	Address DATA4	
11	+5V	Output	+5V power	For expansion card
12	MD1	Bidirect	Address DATA1	
13	IORD/	Output	Read DATA	Low is "True"
14	MD5	Bidirect	Address DATA5	
15	DISPCS/	Output	Display Chip Select	Low is "True"
16	MDO	Bidirect	Address DATA0	
17	MALE	Output	Buffered ALE	High is "True"
18	MD6	Bidirect	Address DATA6	
19	MMCS	Output	Exp. Board Chip Sel.	High is "True"
20	MD7	Bidirect	Address DATA7	

This connector provides a means to expand the I/O capability of the SMCC-VME by connecting accessory 14 (ACC-14) to the SMCC-VME card. ACC-14 provides up to 48 digital I/O lines and via ISBx connectors, allows the use of a great variety of devices such as A/D, D/A converters, speech generators and most importantly, the use of R/D converters for handling single or double (geared) resolvers for positioning.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

J4 DISPLAY CONNECTOR (14 Pin Header)

PIN #	SYMBOL	FUNCTION	DESCRIPTION	NOTES
1	PL5V	Output	+5V power	
2	GRND	Common	SMCC-VME common	
3	RSTR	Output	Read strobe	5V TTL
4	CONT	"	Contrast adjust. VEE	0 to +5VDC
5	EX	"	X display Enable	High is "Enable"
6	RDWR	"	Always GND	
7	DAB1	"	Display DATA1	5V TTL
8	" 0	"	" " 0	" "
9	" 3	"	" " 3	" "
10	" 2	"	" " 2	" "
11	" 5	"	" " 5	" "
12	" 4	"	" " 4	" "
13	" 7	"	" " 7	" "
14	" 6	"	" " 6	" "

This display connector is located on the SMCC-VME board itself and provides the ability to connect Accessory 12,12A, or 12B for displaying position, velocity, following error, and status.

ACC-12 is an 8 digit LED display which only displays position.

ACC-12A is a 24 x 2 digit LCD display and displays all the variables for one axis or some of the variables for both axes.

ACC-12B is a 40 x 2 digit LCD display which displays all the variables for both axis.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

J3 RS-232 CONNECTOR

PIN #	SYMBOL	FUNCTION	DESCRIPTION	NOTES
1	N/C	N/A	N/A	
2	TXD/	RS-232	Transmit Data	From Terminal to SMCC-VME
3	RXD/	"	Receive Data	From SMCC-VME to Terminal
4	RTS	"	Ready to Send	From Terminal to SMCC-VME
5	CTS	"	Clear to Send	From SMCC-VME to Terminal
6	DSR	"	Data Set Ready	Jumpered to "DTR" on SMCC-VME
7	GND	Common	"RS-232" GND	
8	BF/	Output	Buffer Full	TTL, Low "True"
9	EROR/	"	Error(SMCC-VME)	" " "
10	INIT/	Input	Resets SMCC-VME	Low is a "Reset"
11	GND	Common	SMCC-VME Common	
12	GND	"	" " "	
13	GND	"	" " "	
14	SP5V	Output	Switched +5VDC	Jumper "E3" For 5VDC Output on this Pin
15	N/C	N/A	N/A	
16	N/C	N/A	N/A	
17	N/C	N/A	N/A	
18	N/C	N/A	N/A	
19	N/C	N/A	N/A	
20	DTR	RS-232	Data Ter. Ready	Jumpered to "DSR" on SMCC-VME
21	N/C	N/A	N/A	
22	IPOS	Output	In Pos.(Bussed)	High is "In Position"
23	BTXD	In/Output	Buffered "TXD"	For RS-232 Daisychain
24	BRTS	" "	" "RTS"	" "
25	SYNC/	" "	Synchronizer	Card "A0" is master all others are slave
26	PL5V	Output	+5VDC	Power Supply Out

The RS232 connector may be used to communicate with the SMCC-VME. Communication mode selection, RS232 versus VME, is accomplished by means of the "SW" DIP switch on the SMCC-VME.

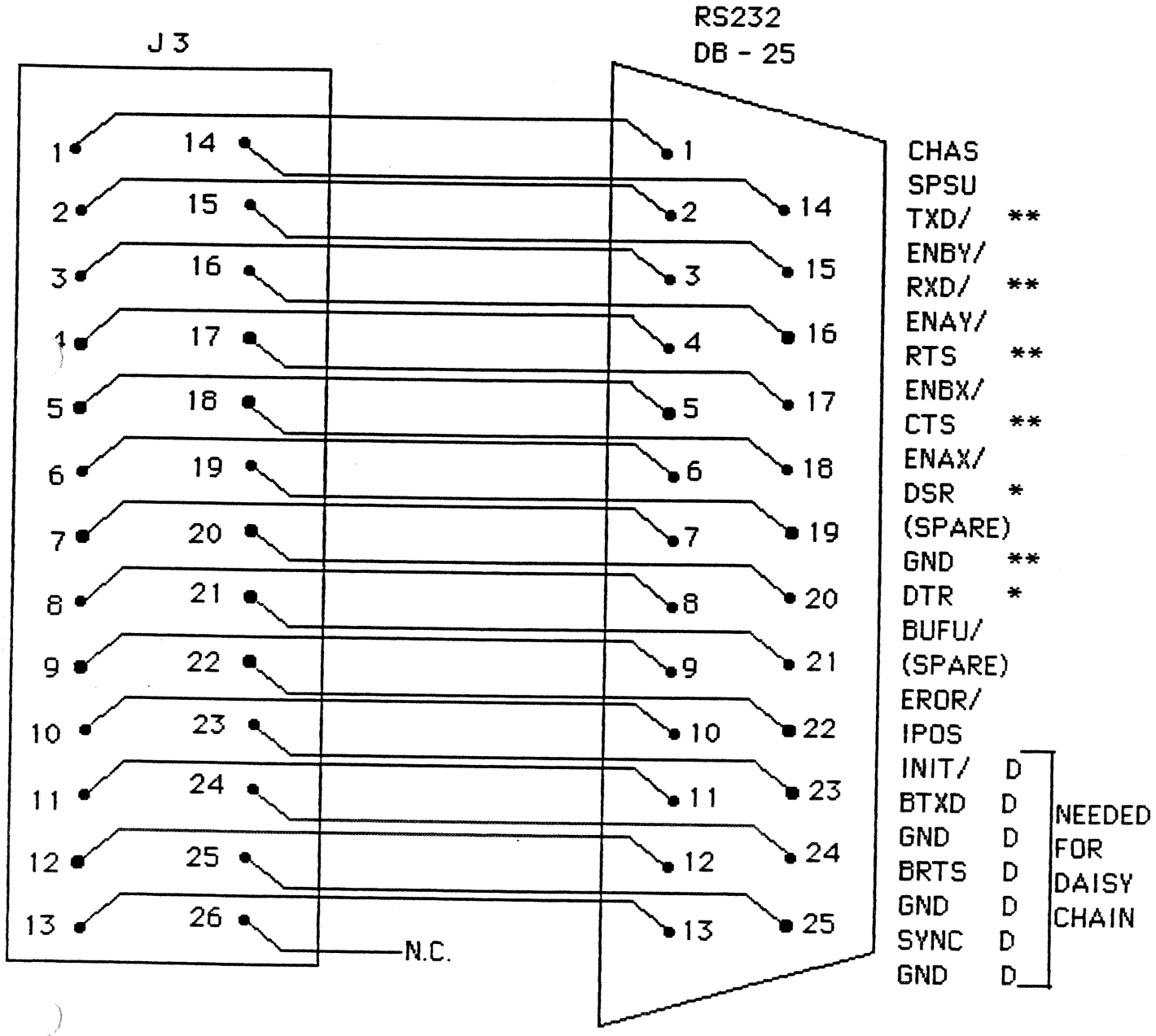
The RS232 protocol is: 1 Start Bit, 1 Stop Bit, 8 Data Bits, No Parity. Select baud rate by using "SW" DIP switch, 300 to 38,400 baud.

When RS232 is selected, the SMCC-VME may be used standalone, and daisychaining the RS232 cable achieves automatic synchronization between cards.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SMCC-VME
RS232 I/O CONNECTOR
(FLAT CABLE)

** NEEDED FOR RS232
* OPTIONAL FOR HOST ONLY.



(SMCC-VME RS232)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

****

SMCC-VME E POINTS, TEST POINTS AND ADDRESS SELECTIONS
(HARDWARE CONFIGURATION)

****

E POINT	PHYSICAL LAYOUT	LOC.	DESCRIPTION	DEFAULT
E1	2 1 * *	D8	JUMP Pin 1 to Pin 2 to increase gain of phase 1 output. No short is +/- 5 volts out, short is +/- 10 volts out. See E9 also. Normally used at +/- 10 volts out for single ended output and +/- 5 volts out when output is used differentially.	Jumper installed +/- 10 volts out
E2	1 2 * * * * 3 4	D3	JUMP 1 to 2 to allow RTS to be output, J3 pin 5	1-2 Jumper installed
			JUMP 3 to 4 to allow CTS to be input, J3 pin 4	3-4 Jumper installed
			JUMP 1 to 3 to allow RTS to be input, J3 PIN 5	RTS is output
			JUMP 2 to 4 to allow CTS to be output, J3 PIN 4	CTS is input
			Use E2 in conjunction with E4 for proper configuration.	
E3	*1 *2	D2	JUMP Pin 1 to Pin 2 to allow +5V to go to J3 pin 14	No Jumper installed

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E POINT	PHYSICAL LAYOUT	LOC.	DESCRIPTION	DEFAULT
E4	1 2 * * * * 3 4	D4	JUMP 1 to 2 to allow RXD/ as output J3 Pin 3	1-2 Jumper installed
			JUMP 3 to 4 to allow TXD/ as input J3 Pin 2	3-4 Jumper installed
			JUMP 1 to 3 to allow RXD/ as input J3 Pin 3	RXD/ is output
			JUMP 2 to 4 to allow TXD/ as output J3 Pin 2	TXD/ is input
			E2 and E4 are used to in effect swap pins 2 & 3 and 4 & 5 on a standard RS232 connector to accomodate various host configurations as Data Set or Data Terminal.	
E5	1 2 * *	D3	JUMP Pin 1 to Pin 2. With jumper installed, EA/ (Pin 51) of CPU is grounded, which causes the CPU to use external memory only. Otherwise, EA/ (Pin 51) is pulled up to +5 volts, CPU then uses internal and external memory.	No Jumper installed
E6	1 2 * *	C6	Same as E7, but for Y axis.	1-2 Jumper installed (Y encoder not 1/T)
E7	2 1 * *	C6	JUMP Pin 1 to Pin 2 to obtain normal X encoder operation. Remove Jumper for digital tach (1/T). X encoder operation.	1-2 Jumper installed (X encoder not 1/T)
E8	*1 *2	C7	JUMP Pin 1 to Pin 2 to allow -14 VA to come from P1 (Ties Amplifier and SMCC-VME power supply together. Defeats OPTO coupling).	No jumper installed
			Note that if E8 is changed, E13 and E25 must also be changed.	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E POINT	PHYSICAL LAYOUT	LOC.	DESCRIPTION	DEFAULT
E9	1 2 * *	C7	JUMP Pin 1 to Pin 2 to increase gain of Phase 3 (See E1)	Jumper installed +/- 10 volts out
E10	*3 *2 *1	C4	JUMP Pin 2 to Pin 3 to allow U16 (Pin 26) SRAM and U16A (Pin 26) EAROM to input +5V. for 8KX8 parts.	2-3 Jumper installed card is configured for 8KX8 parts
E11	1 2 3 * * *	B7	When short removed from 1 & 2 and placed on 2 and 3, provides X axis unipolar analog error output, with direction bit on SIGNMX/. (U17-83) (See E15 for Y axis.)	1-2 Jumper installed
E12	3 2 1 * * *	B7	JUMP Pin 1 to Pin 2 to allow AMPENA/signal (low true) JUMP Pin 2 to Pin 3 to allow AMPENA/signal (High true)	1-2 Jumper installed
E13	*1 *2	C7	JUMP Pin 1 to Pin 2 to allow analog GND to come from P1 (Ties amplifier and SMCC-VME GND together. Defeats OPTO coupling.) Note that if E13 is changed, E8 and E25 must also be changed.	No Jumper installed
E14	*1 *2 *3	B3	Same as E22, but for Y handwheel.	2-3 Jumper installed (Y-HW Enc Non-diff.)
E15	*1 *2 *3	B8	When short removed from 1-2 and placed on 2-3, provides Y axis unipolar error output with direction bit on SIGNMY/ (U17-82) (See E11 for X axis).	1-2 Jumper installed

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E POINT	PHYSICAL LAYOUT	LOC.	DESCRIPTION	DEFAULT
E16	*1 *2	B2	Jumper Pin 1 to Pin 2 to tie X-handwheel and Y-handwheel together for input from a front panel at J1-22 for Chan. B. (Same as E19 for Chan. A.) Note: Both E16 and E19 must be changed for proper operation.	No jumper installed
E17	1 2 3 * * *	B4	JUMP Pin 2 to Pin 3 to allow phasing without hall effects. JUMP Pin 1 to 2 to phase with hall effects.	2-3 Jumper installed
E18	2 1	B6	X axis, selects the ANALOG SIP/ Polarity. I2T polarity selector open = positive input shorted = negative input	No Jumper installed positive polarity
E19	2 1 * *	B3	Jumper Pin 1 to Pin 2 to tie X-handwheel and Y-handwheel together for input from a front panel at J1-16 for Chan. A. (Same as E16 for Channel B)	No Jumper installed
E20	2 1 * *	B6	Y axis, selects the ANALOG SIP Polarity. I2T polarity selector open = positive input shorted = negative input	No Jumper installed positive polarity
E21	1 2 * *	B2	Used to allow the hard following error (i00), as well as the soft following error (i10), to control output FERROR/ on P2 Pin C28. Installing E21 causes either (i00) <u>OR</u> (i10) to output FERROR/.	No Jumper installed

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E POINT	PHYSICAL LAYOUT	LOC.	DESCRIPTION	DEFAULT
E22	*1 *2 *3	A3	JUMP Pin 1 to Pin 2 to obtain differential X hand wheel input mode. JUMP Pin 2 to Pin 3 to obtain non-differential X handwheel input mode, this will bias X-HW negative inputs to 1/2 VCC = 2.5V	2-3 Jumper installed (X - HW Enc Non-diff.)
E23	*3 *2 *1	A7	JUMP Pin 1 to Pin 2 to obtain differential Y Position encoder input mode. (See E24)	2-3 Jumper installed (Y encoder Non-Diff.)
E24	*1 *2 *3	A7	JUMP Pin 1 to Pin 2 to obtain differential X position encoder input mode. JUMP Pin 2 to Pin 3 to obtain non-differential X encoder input mode, this will bias X encoder negative inputs To 1/2 VCC = 2.5 V. (See E23)	2-3 Jumper installed (X encoder Non-diff.)
E25	*2 *1	A5	JUMP Pin 1 to Pin 2 to allow +14 VA to come from P1 (Ties Amplifier and SMCC-VME power supply together. Defeats OPTO-coupling). Note that if E25 is changed, E8 and E13 must also be changed.	No Jumper installed
TP1		D5	6 MHz Clock.	
TP2		D6	Watch dog timer (Low = ok)	
TP3		C4	12 MHz clock	
TP4		C6	P3/} (Not Used)	
TP5		C6	P2/} (Not Used)	
TP6		B7	YENCA TP (Y ENCODER CHANNEL A T.P.)	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E POINT	PHYSICAL LAYOUT	LOC.	DESCRIPTION
TP7		B6	XENCB TP (X ENCODER CHANNEL B T.P.)
TP8		A7	YENCB TP (Y ENCODER CHANNEL A T.P.)
TP9		A6	XENCA TP (X ENCODER CHANNEL A T.P.)
TP10		A3	LDTK/ - Local Data Ack. (U39)
TP11		A6	YENCC TP (Y ENCODER CHANNEL C T.P.)
TP12		A1	10 MHz Clock.
TP13		A8	PHASE 1 TP = X AXIS COMMAND SIGNAL or X AXIS PHASE 1 SIGNAL
TP14		A8	PHASE 3 TP = Y AXIS COMMAND SIGNAL or X AXIS PHASE 3 SIGNAL
TP15		A6	XENCC TP (X ENCODER CHANNEL C T.P.)
TP16		A6	INIT/ RESET INPUT TP, LOW = RESET CONDITION HIGH= NON-RESET CONDITION

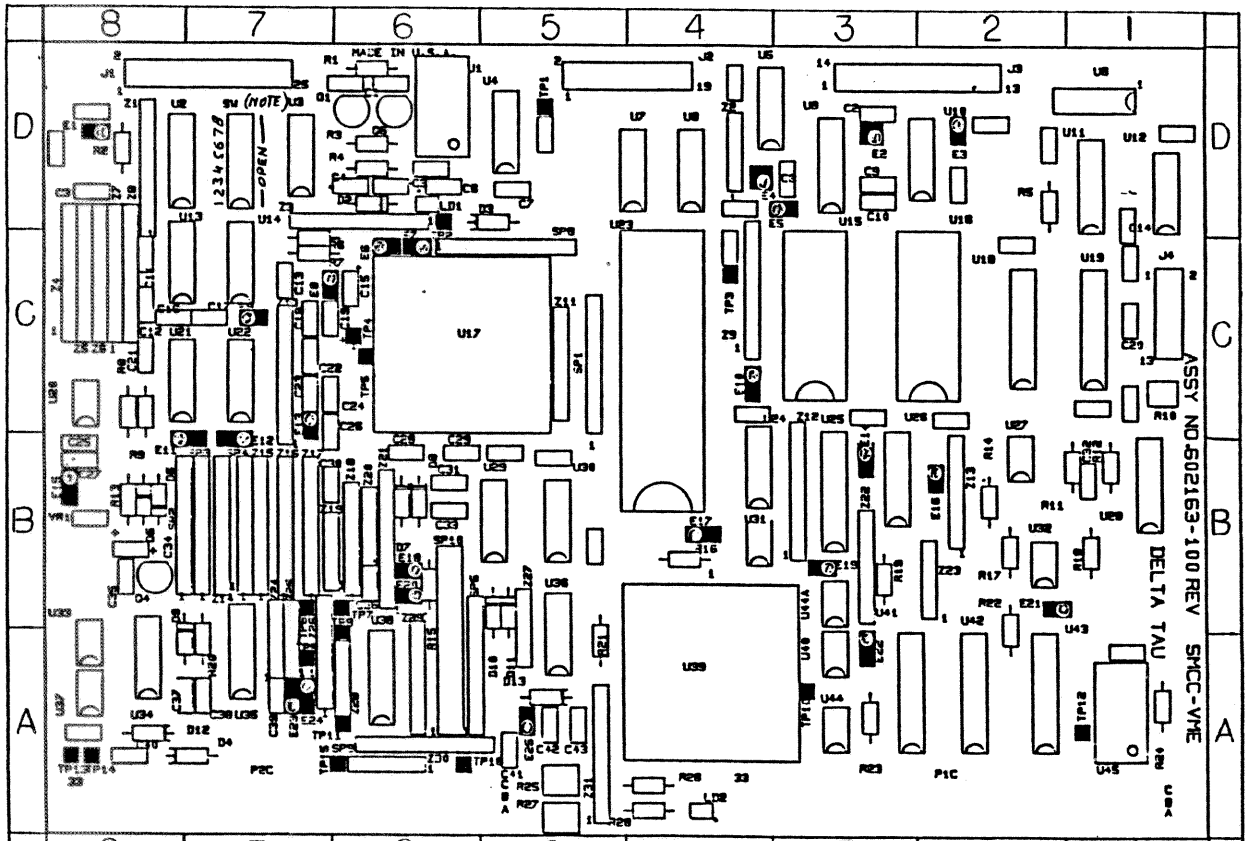
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DWG. NO.	SH	REV.

REVISIONS

REV.	DESCRIPTION	DATE	APPROVED



#	E-POINT	LOCATION
1	E1	D8
2	E2	D3
3	E3	D2
4	E4	D4
5	E5	D3
6	E6	C6
7	E7	C6
8	E8	C7
9	E9	C7
10	E10	C4
11	E11	B7
12	E12	B7
13	E13	C7
14	E14	B3
15	E15	B8
16	E16	B2
17	E17	B4
18	E18	B6
19	E19	B3
20	E20	B6
21	E21	B2
22	E22	A3
23	E23	A7
24	E24	A7
25	E25	A5

CARD ADDRESS	SW1	SW2	SW3	SW4
0	0	0	0	0
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0
7	1	1	1	0
8	0	0	0	1
9	1	0	0	1
10	0	1	0	1
11	1	1	0	1
12	0	0	1	1
13	1	0	1	1
14	0	1	1	1
15	1	1	1	1

FUNCTION	SW5
SAVE EN	0
SAVE DIS	1

BAUD	SW6	SW7	SW8
9600	0	0	0
4800	1	0	0
2400	0	1	0
1200	1	1	0
VME	0	0	1
300	1	0	1
38400	0	1	1
19200	1	1	1

#	TP	LOCATION
1	TP1	D5
2	TP2	D6
3	TP3	C4
4	TP4	C6
5	TP5	C6
6	TP6	B7
7	TP7	B6
8	TP8	A7
9	TP9	A6
10	TP10	A3
11	TP11	A6
12	TP12	A1
13	TP13	A8
14	TP14	A8
15	TP15	A6
16	TP16	A6

Note: TO SET A SWITCH ON "SW" (D7)
PUSH ON "OPEN" SIDE TO SET TO A "1".
PUSH ON OTHER SIDE TO SET TO A "0".

QTY REQD	FSCM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION

PARTS LIST

NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±
MATERIAL
FINISH
DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN	
CHECKED	
ISSUED	

DELTA TAU DATA SYSTEMS

VME E-POINTS AND TEST POINTS

SIZE	FSCM NO.	DWG. NO.	REV.
B		602168-000	11/c

SCALE | SHEET 1 of 1

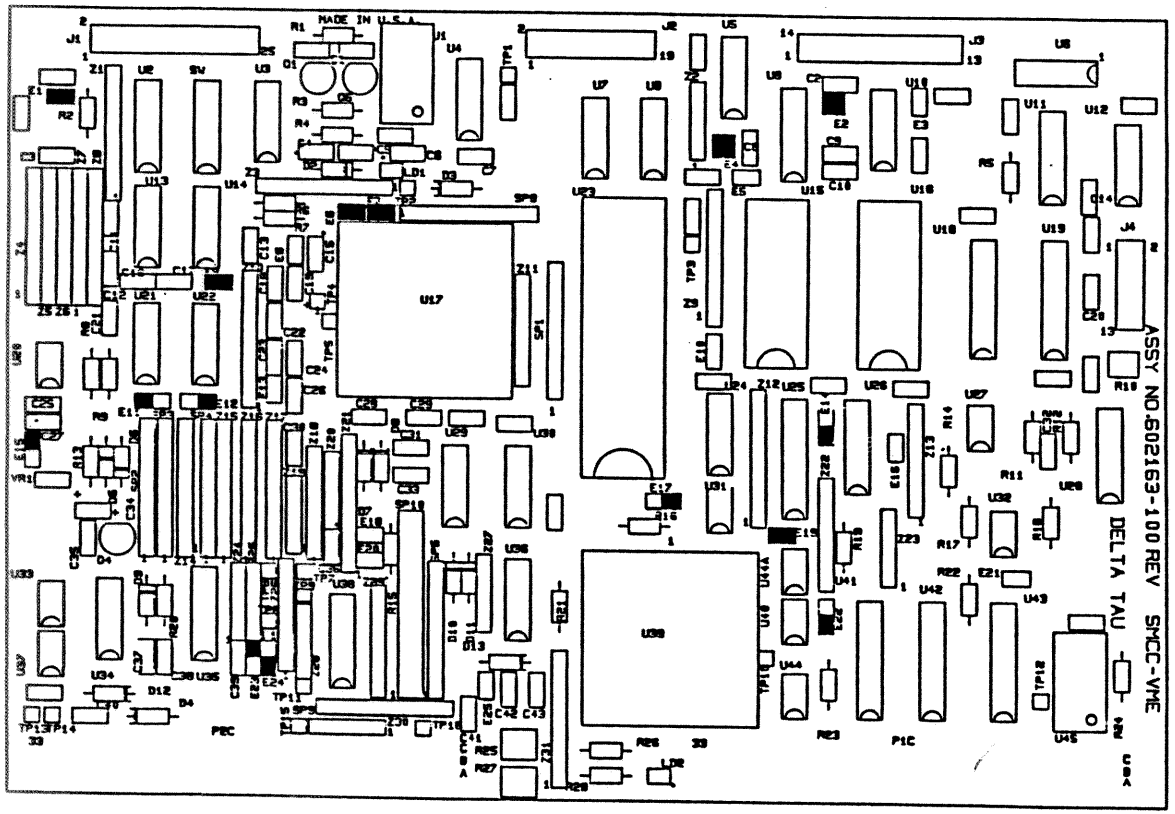
BIS KIP GRAPHICS/ACCUPRESS
REORDER NO. A-4343

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

DWG. NO.	SH	REV.

REVISIONS

REV.	DESCRIPTION	DATE	APPROVED



	QTY REQD	FSCM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN	
CHECKED	
ISSUED	

DELTA TAU DATA SYSTEMS

VME STANDARD STRAPPING

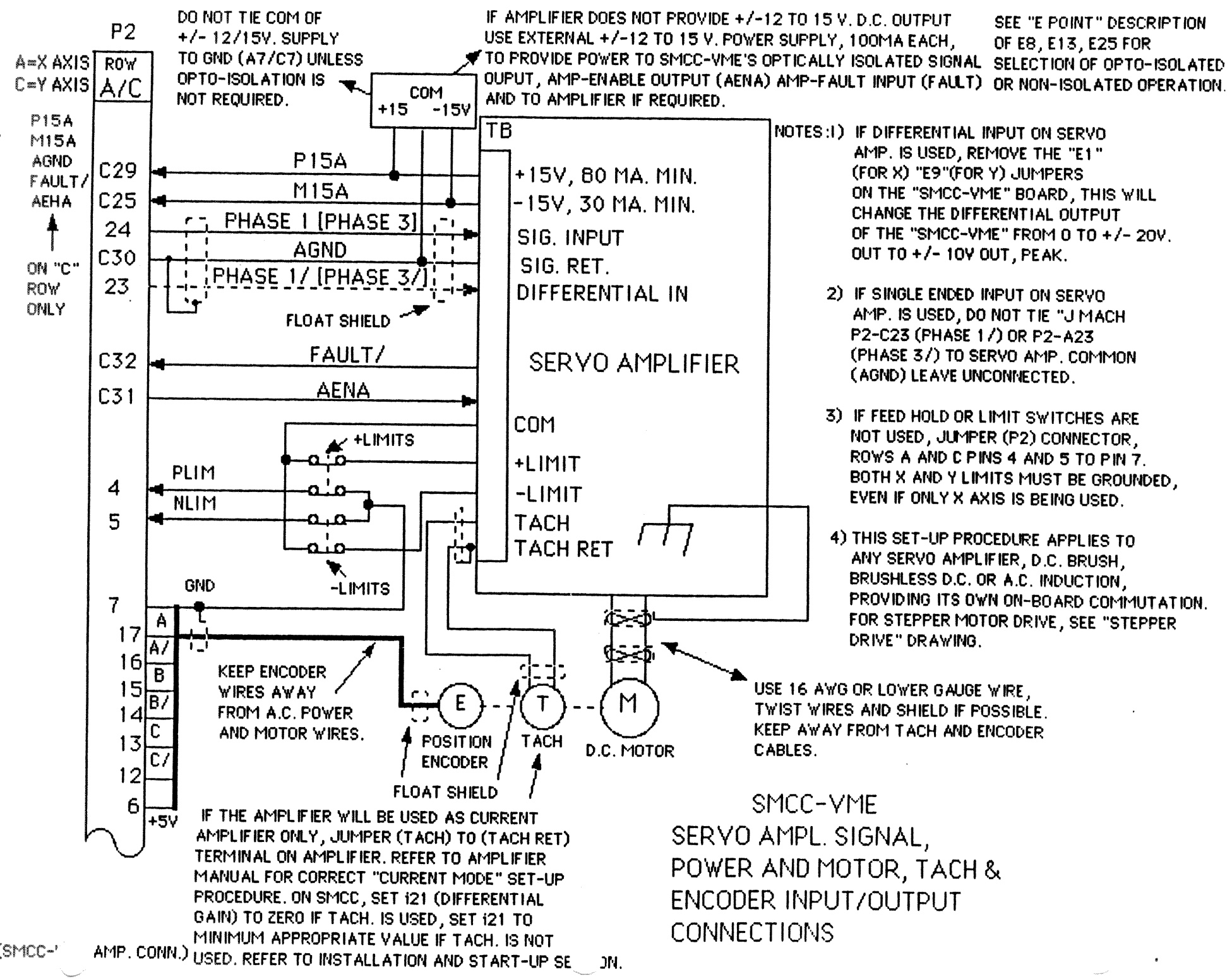
SIZE	FSCM NO.	DWG. NO.	REV
B		602168-001	

SCALE | SHEET

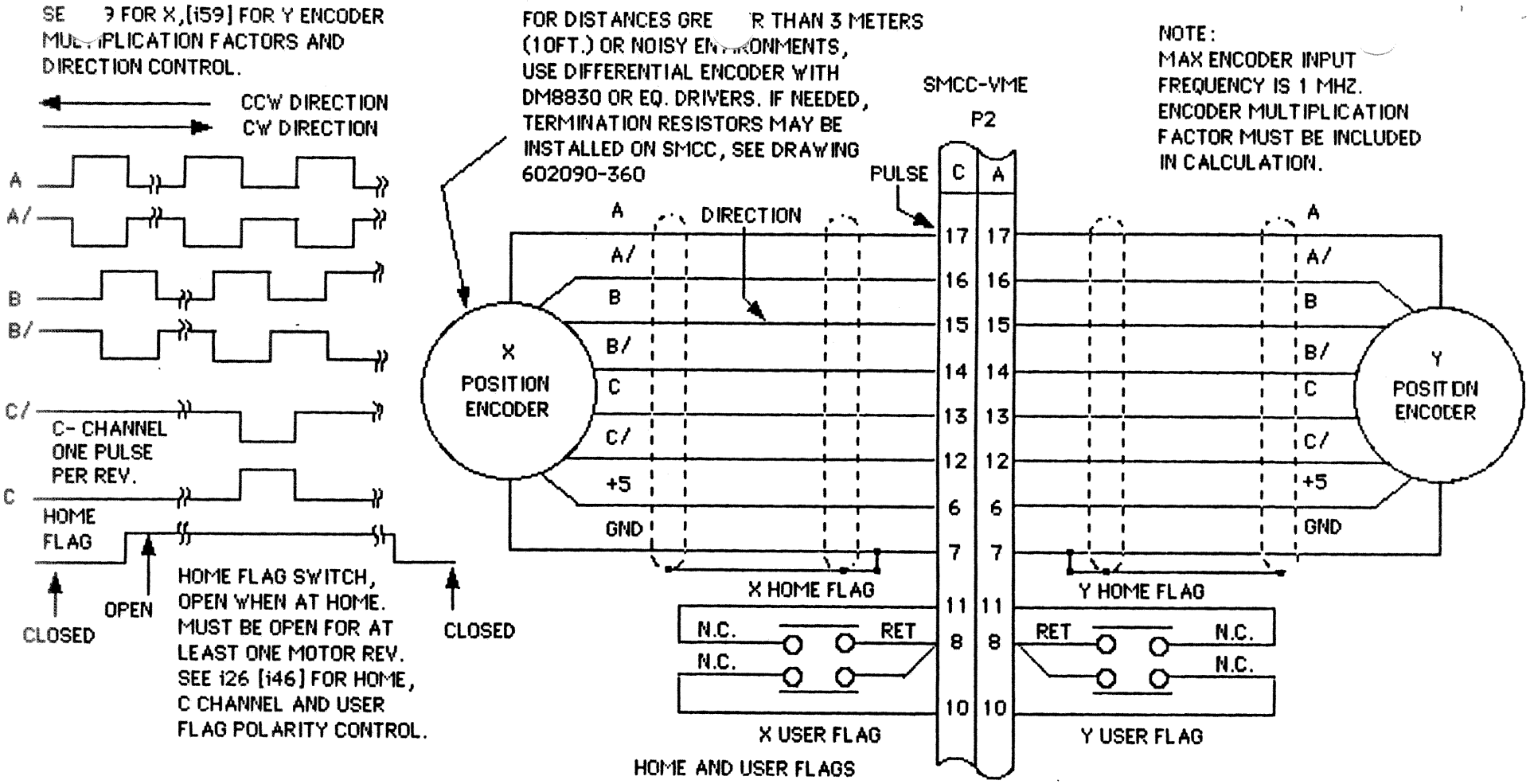
NEXT ASSY	USED ON

APPLICATION

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-4343



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



1) ENCODER LEADS "MUST BE" SHIELDED. SHIELD MUST BE INSULATED AND GROUNDED AT SMCC-VME ONLY. HAVE SHIELD AT ENCODER END UNGROUNDED. DO NOT RUN ENCODER WIRES IN SAME CONDUIT AS A.C. POWER OR AMPL. OUTPUT WIRES.

2) JUMP E24 PIN 1 TO PIN 2 FOR DIFFERENTIAL X ENCODER INPUT
JUMP E23 PIN 1 TO PIN 2 FOR DIFFERENTIAL Y ENCODER INPUT

3) FOR SINGLE ENDED OPERATION, USE A,B, AND C INPUTS ONLY, LEAVE A/, B/, AND C/ OPEN, DO NOT TIE TO GND.
JUMP E24 PIN 2 TO PIN 3 FOR "X"
JUMP E23 PIN 2 TO PIN 3 FOR "Y"

4) SEE i24, i25 FOR X AND [i44][i45] FOR Y HOMING FUNCTION CONTROL

5) FOR ABSOLUTE POSITION ENCODER, OR RESOLVER, ACC 14 MUST BE INSTALLED.

6) REFER TO SMCC MANUAL FOR MORE DETAILS

7) WHEN ENCODER IS A PULSE AND DIRECTION DEVICE, P2C17 / P2A17 IS USED AS PULSE INPUT, AND P2C15 / P2A15 IS USED AS DIRECTION. HI= +DIRECTION:

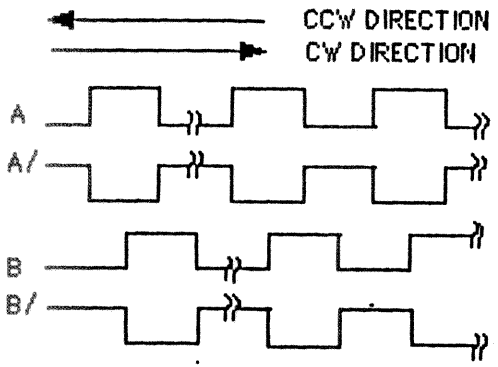
SMCC-VME

TYPICAL POSITION ENCODER CONNECTIONS DIFFERENTIAL DRIVER OR OPEN COLLECTOR OUTPUT A/B QUADRATURE

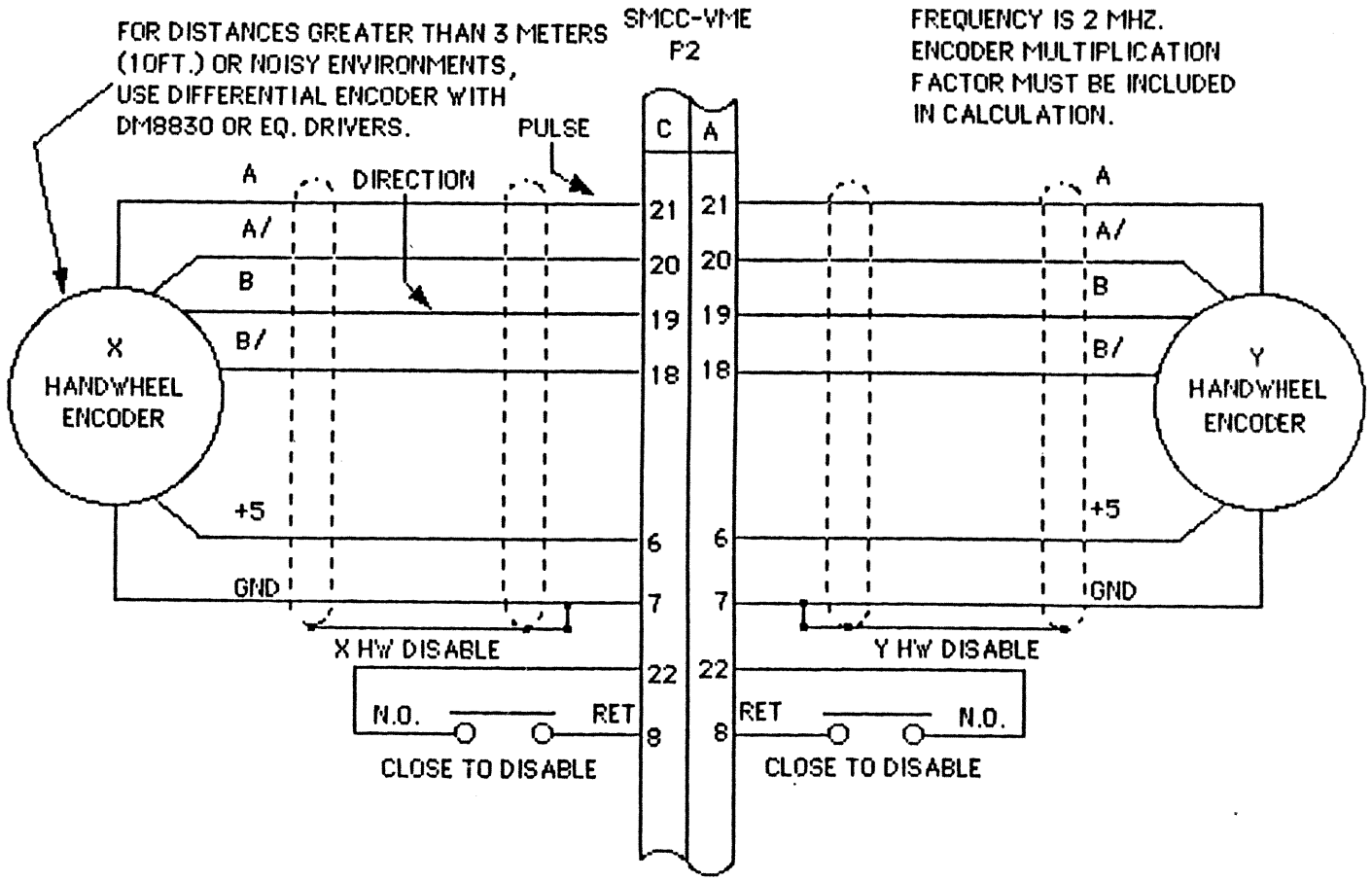
(POSITION ENC. SMCC-VME)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SEE i29 FOR X, [i49] FOR Y HANDWHEEL ENCODER MULTIPLICATION FACTORS AND DIRECTION CONTROL.



NOTE:
MAX ENCODER INPUT FREQUENCY IS 2 MHZ. ENCODER MULTIPLICATION FACTOR MUST BE INCLUDED IN CALCULATION.



1) ENCODER LEADS "MUST BE" SHIELDED. SHIELD MUST BE INSULATED AND GROUNDED AT SMCC-VME ONLY. HAVE SHIELD AT ENCODER END UNGROUNDED. DO NOT RUN ENCODER WIRES IN SAME CONDUIT AS A.C. POWER OR AMPL. OUTPUT WIRES.

2) JUMP E22 PIN 1 TO PIN 2 FOR DIFFERENTIAL X HANDWHEEL ENCODER INPUT
JUMP E14 PIN 1 TO PIN 2 FOR DIFFERENTIAL Y HANDWHEEL ENCODER INPUT

3) FOR SINGLE ENDED OPERATION, USE A,B, AND C INPUTS ONLY, LEAVE A/, B/, AND C/ OPEN, DO NOT TIE TO GND.
JUMP E22 PIN 2 TO PIN 3 FOR "X"
'UMP E14 PIN 2 TO PIN 3 FOR "Y"

4) HANDWHEEL SCALE FACTOR i27, [i47]
HANDWHEEL MODE CONTROL i28, [i48] AND i16

5) WHEN ENCODER IS A PULSE AND DIRECTION DEVICE, P2C21/P2A21 IS USED AS PULSE INPUT, AND P2C19/P2A19 IS USED AS DIRECTION. HI= +DIRECTION.

6) FOR INFORMATION ABOUT HANDWHEEL OPERATING MODES REFER TO SMCC MANUAL.

SMCC-VME

TYPICAL HANDWHEEL ENCODER CONNECTIONS DIFFERENTIAL DRIVER OR OPEN COLLECTOR OUTPUT A/B QUADRATURE

(HANDWHEEL ENC. SMCC-VME)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
00000280                                1.              ORG     4*$A0           ; INTERRUPT   VECTORS
00000280    00002096                    2.              DC.L    CARDA00
00000284    0000213A                    3.              DC.L    CARDA01
00000288    000020A0                    4.              DC.L    CARDA10
0000028C    00002144                    5.              DC.L    CARDA11
00000290    000020AA                    6.              DC.L    CARDA20
00000294    0000214E                    7.              DC.L    CARDA21
00000298    000020B4                    8.              DC.L    CARDA30
0000029C    00002158                    9.              DC.L    CARDA31
000002A0    000020BE                   10.              DC.L    CARDA40
000002A4    00002162                   11.              DC.L    CARDA41
000002A8    000020C8                   12.              DC.L    CARDA50
000002AC    0000216C                   13.              DC.L    CARDA51
000002B0    000020D2                   14.              DC.L    CARDA60
000002B4    00002176                   15.              DC.L    CARDA61
000002B8    000020DC                   16.              DC.L    CARDA70
000002BC    00002180                   17.              DC.L    CARDA71
000002C0    000020E6                   18.              DC.L    CARDA80
000002C4    0000218A                   19.              DC.L    CARDA81
000002C8    000020F0                   20.              DC.L    CARDA90
000002CC    00002194                   21.              DC.L    CARDA91
000002D0    000020FA                   22.              DC.L    CARDAA0
000002D4    0000219E                   23.              DC.L    CARDAA1
000002D8    00002104                   24.              DC.L    CARDAB0
000002DC    000021A8                   25.              DC.L    CARDAB1
000002E0    0000210E                   26.              DC.L    CARDAC0
000002E4    000021B2                   27.              DC.L    CARDAC1
000002E8    00002118                   28.              DC.L    CARDAD0
000002EC    000021BC                   29.              DC.L    CARDAD1
000002F0    00002122                   30.              DC.L    CARDAE0
000002F4    000021C6                   31.              DC.L    CARDAE1
000002F8    0000212C                   32.              DC.L    CARDAF0
000002FC    000021D0                   33.              DC.L    CARDAF1
                                       34.
00002000                               35.              ORG     $2000
00002000    287C  00FE0000             36.  INIT        MOVE.L  #$FE0000,A4   ; POINT  TO  BASE  ADDRESS  OF  SCN68681  DUART
00002006    267C  00FFA000             37.              MOVE.L  #$FFA000,A3   ; POINT  TO  CARD  #0  BASE  ADDRESS
0000200C    4283                       38.              CLR.L   D3            ; ADDRESS  CARD  #0
0000200E    007C  0700                 39.              ORI     #$0700,SR
00002012    027C  F1FF                 40.              ANDI    #$F1FF,SR     ; UNMASK  LEVEL  2  INTERRUPTS
                                       41.
00002016    082C  0000  0003           42.  MAIN        BTST    #0,3(A4)      ; WAIT  FOR  RxRDY
0000201C    67  F8                     43.              BEQ     MAIN
0000201E    102C  0007                 44.              MOVE.B  7(A4),D0
00002022    B03C  0040                 45.              CMP.B   #'@',D0       ; IF  ADDRESS  CHARACTER
00002026    6700  0036                 46.              BEQ     MAINADRES     ; THEN  GO  GET  ADDRESS
0000202A    B03C  000D                 47.              CMP.B   #13,D0        ; CHECK  FOR  <CR>
0000202E    6700  000E                 48.              BEQ     MAINEND       ; IF  NOT  <CR>
00002032    17BC  0006  3003           49.              MOVE.B  #6,3(A3,D3)   ; THEN  PUT  ACK  IN  BUFFER
00002038    1780  3001                 50.              MOVE.B  D0,1(A3,D3)   ; SEND  CHRARCTER  TO  CARD
0000203C    60  D8                     51.              BRA     MAIN
0000203E                               52.  MAINEND
0000203E    1780  3001                 53.              MOVE.B  D0,1(A3,D3)   ; SEND  <CR>  TO  CARD
00002042                               54.  MAINWAIT1
00002042    082C  0002  0003           55.              BTST    #2,3(A4)      ; WAIT  FOR  TxRDY
00002048    67  F8                     56.              BEQ     MAINWAIT1
0000204A    1940  0007                 57.              MOVE.B  D0,7(A4)      ; SEND  <CR>  TO  RS232
0000204E                               58.  MAINWAIT2
0000204E    082C  0002  0003           59.              BTST    #2,3(A4)      ; WAIT  FOR  TxRDY
00002054    67  F8                     60.              BEQ     MAINWAIT2
00002056    197C  000A  0007           61.              MOVE.B  #10,7(A4)     ; SEND  <LF>  AFTER  <CR>
0000205C    60  B8                     62.              BRA     MAIN
0000205E                               63.  MAINADRES
0000205E    1940  0007                 64.              MOVE.B  D0,7(A4)      ; ECHO  ADDRESS  CHARACTER
00002062                               65.  MAINADRESWAIT
00002062    082C  0000  0003           66.              BTST    #0,3(A4)      ; WAIT  FOR  RxRDY
00002068    67  F8                     67.              BEQ     MAINADRESWA
0000206A    102C  0007                 68.              MOVE.B  7(A4),D0      ; READ  ADDRESS
0000206E    1940  0007                 69.              MOVE.B  D0,7(A4)      ; ECHO  ADDRESS
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

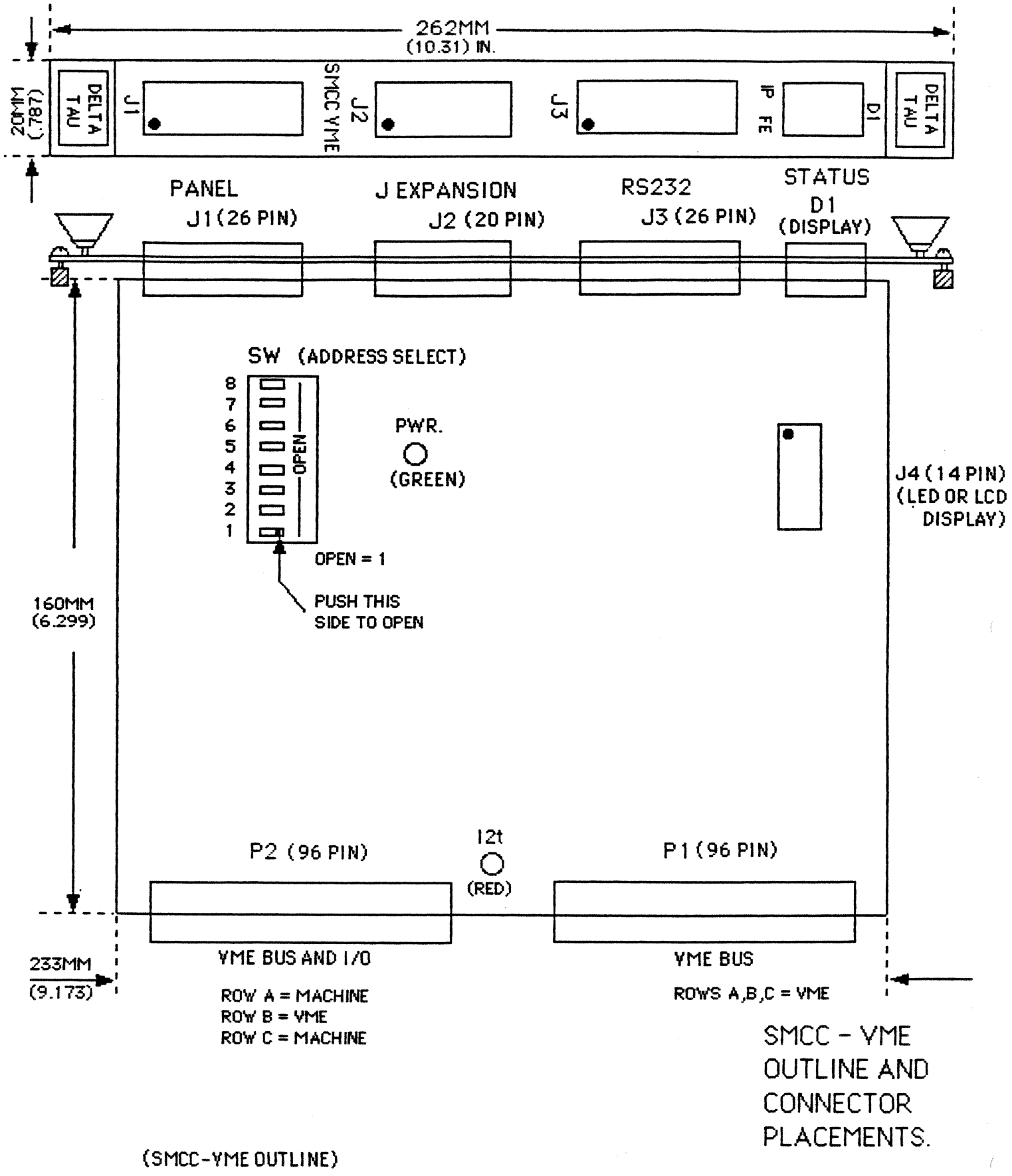
```
00002072  903C 0030          70.            SUB.B   #'0',D0         ; >= '0'
00002076  65 9E              71.            BCS     MAIN            ; NO
00002078  B03C 000A          72.            CMP.B   #10,D0          ; <= '9'
0000207C  6500 0010          73.            BCS     MAINADDRESSE    ; YES
00002080  5F00               74.            SUB.B   #7,D0
00002082  B03C 000A          75.            CMP.B   #10,D0          ; >= 'A'
00002086  65 8E              76.            BCS     MAIN            ; NO
00002088  B03C 0010          77.            CMP.B   #16,D0          ; <= 'F'
0000208C  64 88              78.            BCC     MAIN            ; NO
0000208E                     79.  MAINADDRESSET
0000208E  C0FC 0200          80.            MULU    #$200,D0        ; FORM OFFSET TO BASE ADDRESS OF CARD
00002092  3600               81.            MOVE    D0,D3           ; SAVE IN OFFSET REGISTER
00002094  60 80              82.            BRA     MAIN
                             83.
00002096  2C7C 00FFA000      84.  CARDA00   MOVE.L  #$FFA000,A6     ; POINT TO CARD #0 BASE ADDRESS
0000209C  6000 0094          85.            BRA     CARDI0
000020A0  2C7C 00FFA200      86.  CARDA10   MOVE.L  #$FFA200,A6     ; POINT TO CARD #1 BASE ADDRESS
000020A6  6000 008A          87.            BRA     CARDI0
000020AA  2C7C 00FFA400      88.  CARDA20   MOVE.L  #$FFA400,A6     ; POINT TO CARD #2 BASE ADDRESS
000020B0  6000 0080          89.            BRA     CARDI0
000020B4  2C7C 00FFA600      90.  CARDA30   MOVE.L  #$FFA600,A6     ; POINT TO CARD #3 BASE ADDRESS
000020BA  6000 0076          91.            BRA     CARDI0
000020BE  2C7C 00FFA800      92.  CARDA40   MOVE.L  #$FFA800,A6     ; POINT TO CARD #4 BASE ADDRESS
000020C4  6000 006C          93.            BRA     CARDI0
000020C8  2C7C 00FFAA00      94.  CARDA50   MOVE.L  #$FFAA00,A6     ; POINT TO CARD #5 BASE ADDRESS
000020CE  6000 0062          95.            BRA     CARDI0
000020D2  2C7C 00FFAC00      96.  CARDA60   MOVE.L  #$FFAC00,A6     ; POINT TO CARD #6 BASE ADDRESS
000020D8  6000 0058          97.            BRA     CARDI0
000020DC  2C7C 00FFAE00      98.  CARDA70   MOVE.L  #$FFAE00,A6     ; POINT TO CARD #7 BASE ADDRESS
000020E2  6000 004E          99.            BRA     CARDI0
000020E6  2C7C 00FFB000     100.  CARDA80   MOVE.L  #$FFB000,A6     ; POINT TO CARD #8 BASE ADDRESS
000020EC  6000 0044         101.            BRA     CARDI0
000020F0  2C7C 00FFB200     102.  CARDA90   MOVE.L  #$FFB200,A6     ; POINT TO CARD #9 BASE ADDRESS
000020F6  6000 003A         103.            BRA     CARDI0
000020FA  2C7C 00FFB400     104.  CARDAA0   MOVE.L  #$FFB400,A6     ; POINT TO CARD #10 BASE ADDRESS
00002100  6000 0030         105.            BRA     CARDI0
00002104  2C7C 00FFB600     106.  CARDAB0   MOVE.L  #$FFB600,A6     ; POINT TO CARD #11 BASE ADDRESS
0000210A  6000 0026         107.            BRA     CARDI0
0000210E  2C7C 00FFB800     108.  CARDAC0   MOVE.L  #$FFB800,A6     ; POINT TO CARD #12 BASE ADDRESS
00002114  6000 001C         109.            BRA     CARDI0
00002118  2C7C 00FFBA00     110.  CARDAD0   MOVE.L  #$FFBA00,A6     ; POINT TO CARD #13 BASE ADDRESS
0000211E  6000 0012         111.            BRA     CARDI0
00002122  2C7C 00FFBC00     112.  CARDAE0   MOVE.L  #$FFBC00,A6     ; POINT TO CARD #14 BASE ADDRESS
00002128  6000 0008         113.            BRA     CARDI0
0000212C  2C7C 00FFBE00     114.  CARDAF0   MOVE.L  #$FFBE00,A6     ; POINT TO CARD #15 BASE ADDRESS
00002132  4286              115.  CARDI0    CLR.L   D6
00002134  6100 00BC         116.            BSR     READSMCC
00002138  4E73              117.            RTE
                            118.
0000213A  2C7C 00FFA000     119.  CARDA01   MOVE.L  #$FFA000,A6     ; POINT TO CARD #0 BASE ADDRESS
00002140  6000 0094         120.            BRA     CARDI1
00002144  2C7C 00FFA200     121.  CARDA11   MOVE.L  #$FFA200,A6     ; POINT TO CARD #1 BASE ADDRESS
0000214A  6000 008A         122.            BRA     CARDI1
0000214E  2C7C 00FFA400     123.  CARDA21   MOVE.L  #$FFA400,A6     ; POINT TO CARD #2 BASE ADDRESS
00002154  6000 0080         124.            BRA     CARDI1
00002158  2C7C 00FFA600     125.  CARDA31   MOVE.L  #$FFA600,A6     ; POINT TO CARD #3 BASE ADDRESS
0000215E  6000 0076         126.            BRA     CARDI1
00002162  2C7C 00FFA800     127.  CARDA41   MOVE.L  #$FFA800,A6     ; POINT TO CARD #4 BASE ADDRESS
00002168  6000 006C         128.            BRA     CARDI1
0000216C  2C7C 00FFAA00     129.  CARDA51   MOVE.L  #$FFAA00,A6     ; POINT TO CARD #5 BASE ADDRESS
00002172  6000 0062         130.            BRA     CARDI1
00002176  2C7C 00FFAC00     131.  CARDA61   MOVE.L  #$FFAC00,A6     ; POINT TO CARD #6 BASE ADDRESS
0000217C  6000 0058         132.            BRA     CARDI1
00002180  2C7C 00FFAE00     133.  CARDA71   MOVE.L  #$FFAE00,A6     ; POINT TO CARD #7 BASE ADDRESS
00002186  6000 004E         134.            BRA     CARDI1
0000218A  2C7C 00FFB000     135.  CARDA81   MOVE.L  #$FFB000,A6     ; POINT TO CARD #8 BASE ADDRESS
00002190  6000 0044         136.            BRA     CARDI1
00002194  2C7C 00FFB200     137.  CARDA91   MOVE.L  #$FFB200,A6     ; POINT TO CARD #9 BASE ADDRESS
0000219A  6000 003A         138.            BRA     CARDI1
0000219E  2C7C 00FFB400     139.  CARDAA1   MOVE.L  #$FFB400,A6     ; POINT TO CARD #10 BASE ADDRESS
000021A4  6000 0030         140.            BRA     CARDI1
000021A8  2C7C 00FFB600     141.  CARDAB1   MOVE.L  #$FFB600,A6     ; POINT TO CARD #11 BASE ADDRESS
000021AE  6000 0026         142.            BRA     CARDI1
000021B2  2C7C 00FFB800     143.  CARDAC1   MOVE.L  #$FFB800,A6     ; POINT TO CARD #12 BASE ADDRESS
```


Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

```
000021B8  6000 001C          144.            BRA     CARDI1
000021BC  2C7C 00FFBA00      145.  CARDAD1   MOVE.L  #$FFBA00,A6    ; POINT TO CARD #13 BASE ADDRESS
000021C2  6000 0012          146.            BRA     CARDI1
000021C6  2C7C 00FFBC00      147.  CARDAE1   MOVE.L  #$FFBC00,A6    ; POINT TO CARD #14 BASE ADDRESS
000021CC  6000 0008          148.            BRA     CARDI1
000021D0  2C7C 00FFBE00      149.  CARDAF1   MOVE.L  #$FFBE00,A6    ; POINT TO CARD #15 BASE ADDRESS
000021D6  4286               150.  CARDI1    CLR.L   D6
000021D8  6100 0018          151.            BSR     READSMCC
000021DC  1D7C 0006 0003     152.            MOVE.B  #6,3(A6)        ; SEND INTERRUPT TO CARD FOR MORE DATA
000021E2  4E73               153.            RTE
                             154.
000021E4                     155.  READSMCCNEXT
000021E4  1947 0007          156.            MOVE.B  D7,7(A4)        ; SEND CHARACTER TO RS232
000021E8  5446               157.            ADDQ    #2,D6           ; MOVE POINTER
000021EA  BC3C 0020          158.            CMP.B   #32,D6          ; CHECK FOR END OF BUFFER
000021EE  6700 0038          159.            BEQ     READSMCCEXIT
000021F2                     160.  READSMCC
000021F2  082C 0002 0003     161.            BTST    #2,3(A4)        ; WAIT FOR TxRDY
000021F8  67 F8              162.            BEQ     READSMCC
000021FA  1E36 6001          163.            MOVE.B  1(A6,D6),D7     ; READ BYTES AT ODD ADDRESS
000021FE  BE3C 0006          164.            CMP.B   #6,D7           ; CHECK FOR ACK
00002202  6700 0024          165.            BEQ     READSMCCEXIT
00002206  BE3C 0007          166.            CMP.B   #7,D7           ; CHECK FOR BEL
0000220A  6700 0018          167.            BEQ     READSMCCERROR
0000220E  BE3C 000D          168.            CMP.B   #13,D7          ; CHECK FOR <CR>
00002212  66 D0              169.            BNE     READSMCCNEXT
00002214  1947 0007          170.            MOVE.B  D7,7(A4)        ; SEND <CR> TO RS232
00002218                     171.  READSMCCWAIT
00002218  082C 0002 0003     172.            BTST    #2,3(A4)        ; WAIT FOR TxRDY
0000221E  67 F8              173.            BEQ     READSMCCWAIT
00002220  1E3C 000A          174.            MOVE.B  #10,D7          ; SEND <LF> AFTER <CR>
00002224                     175.  READSMCCERROR
00002224  1947 0007          176.            MOVE.B  D7,7(A4)        ; SEND CHARACTER TO RS232
00002228                     177.  READSMCCEXIT
00002228  4E75               178.            RTS
                             179.
0000222A                     180.            END
    0 Errors
```

:smcc1.vme

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com



SMCC - VME
OUTLINE AND
CONNECTOR
PLACEMENTS.

(SMCC-VME OUTLINE)

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP