1.5 CLC-D Overview

CLC-D02.3M hardware

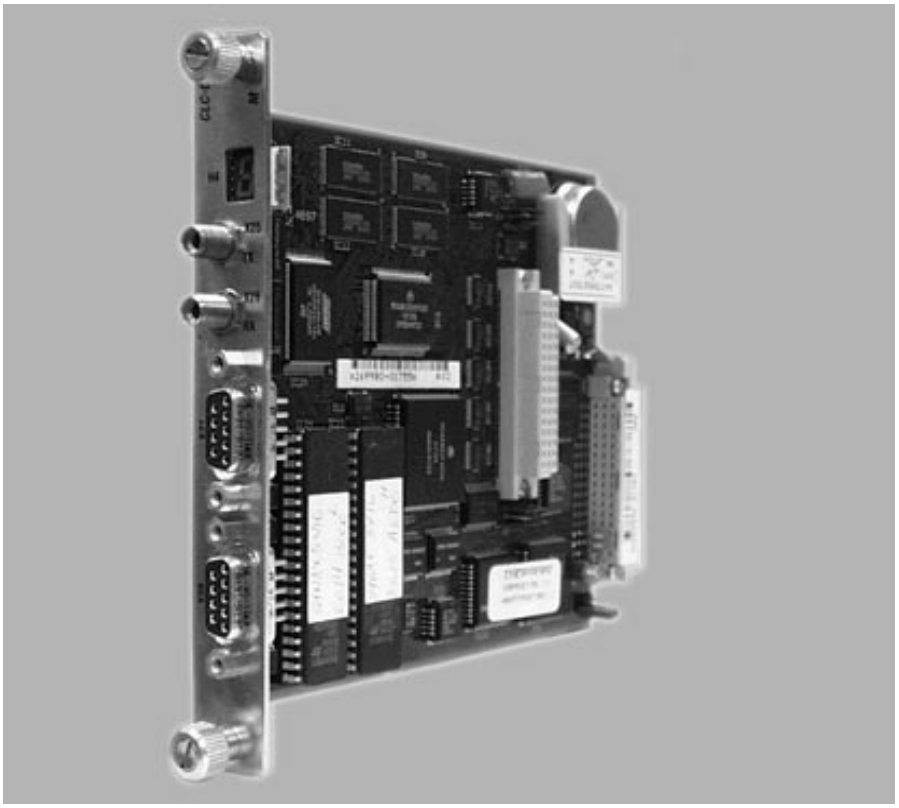

Figure 1-9: CLC-D02.3M Hardware

CLC-D Serial Communication

Port A (X27) is configured to respond to the VisualMotion ASCII Host Protocol. Port B (X28) can be configured to respond to Host Protocol, BTC06 or another interface. Both ports always operate with:

- 8 bits per character
- 1 stop bit
- no parity.

Serial Com Options	Baud Rate	Checksum	Port Mode	Protocol
Port A (X27) default	9600	enabled	RS-232	Host Protocol
Port A (X27) valid settings	300, 1200, 2400, 4800, 9600, 19200, 38400	enabled or disabled	RS-232,422,485	Host Protocol
Port B (X28) default	9600	enabled	RS-232	Host Protocol
Port B (X28) valid settings	300, 1200, 2400, 4800, 9600	enabled or disabled	RS-232,422,485	Off, Host Protocol, BTC06

Table 1-1: CLC-D configurable communication settings

CLC-D Jumper Configuration

Jumpers S1 and S2 set the default configuration for serial ports X27 and X28 respectively. If the jumper is installed, the port is configured for the default settings of RS-232 and 9600 baud.

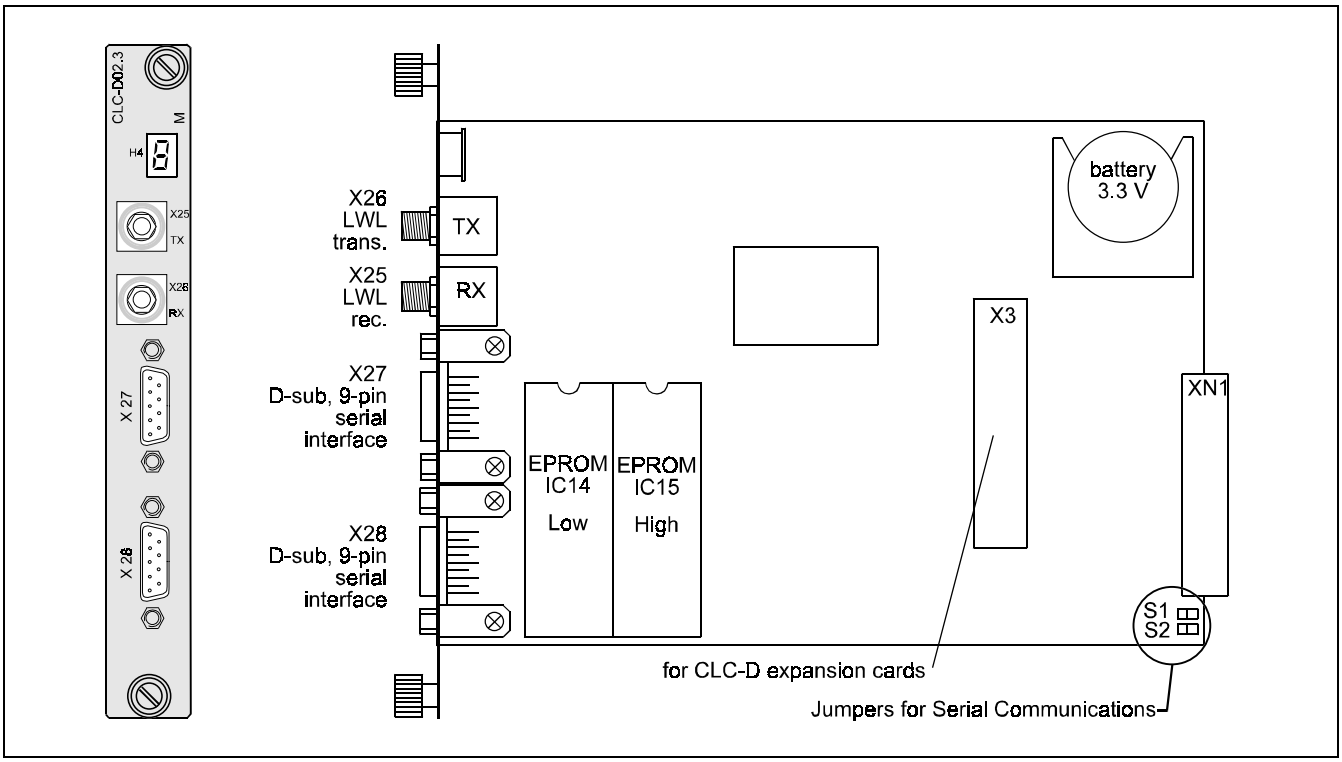

Figure 1-10: CLC-D jumper configuration

CLC-D SERCOS

The SERCOS port is used for loop-through, daisy-chained installation into a SERCOS fiber-optic ring. The output port, ***Tx***, is connected to the SERCOS input port, ***Rx***, of the next SERCOS device in the ring. Each SERCOS device is interconnected, output to input, with the output of the last device returned to the SERCOS input, ***Rx***, of the CLC-D.

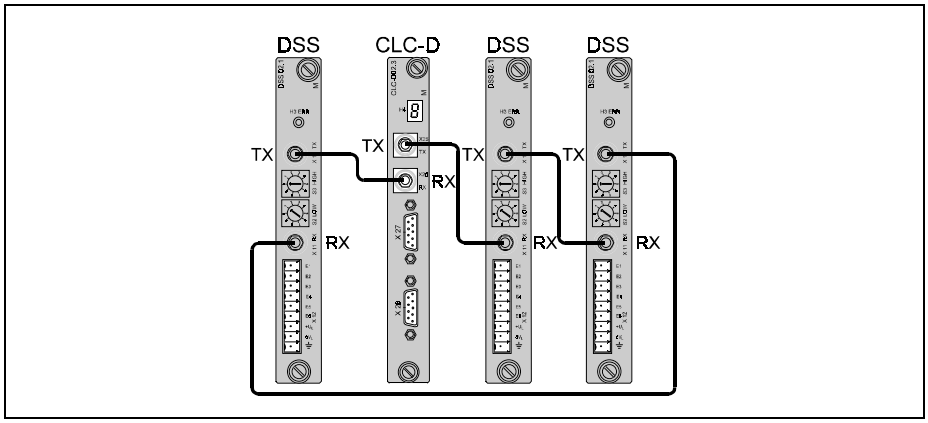

Figure 1-11: Fiber optic ring structure

On-Board Battery

This battery provides backup power for the CLC onboard SRAM when control voltage is not applied. The battery's power level is checked every time the CLC is powered up or during initialization from parameter mode to provide advanced warning of impending failure. A diagnostic message is displayed (***E206 Battery is low: replace it soon***) when the level falls below 10% of remaining capacity. Based on the lifespan table below, this could translate into less then a month before failure at 45 °C (113 °F.) It is vital for action to be taken when a Battery is low warning is issued.

Recommended actions:

- Secure a complete **archive** of the VisualMotion system data
- Order a new 3-volt Lithium button-style battery, CR2477N (MnO_2/Li).
- Indramat material number: **254284**
- Replace battery as soon as possible.

To prevent undue losses, a **Preventive Maintenance Program** should be put into place that does not rely on the batteries power level check to determine replacement period. The following lifespan table contains some general guidelines that can be used to devise an appropriate schedule.

Battery lifespan

Ambient temperature	3-shift operations	2-shift operations	1-shift operation	Storage
25 °C (77 °F)	4 years	4 years	4 years	3 years
35 °C (95 °F)	4 years	3 years	2 years	1.5 years
45 °C (113 °F)	3 years	2 years	1.2 years	9 months

Table 1-2: Battery lifespan

Warning

Loss of VisualMotion System

Failure to replace can result in lost parameters.

⇒ The following is a list of items that will be lost if the battery fails and is not replaced.

- CLC System parameters C-0-xxxx
- Axis parameters A-0-xxxx
- Task parameters
- CLC Cam tables, PLS and PID data
- Events, I/O Mapper, FieldBus Mapper
- Points tables, Variables, Zones
- Downloaded VisualMotion programs

Note: The battery is generally drained after this period and must be replaced.

Replacing the battery

Once the battery is removed, any parameters stored in SRAM memory are retained for only one minute. Replace the battery within this minute.

Procedure:

1. Remove the battery from its packaging and have it close at hand for installation
2. Before replacing the battery, **archive** the system using VisualMotion Toolkit. Refer to Chapter 2, *The File Menu - Archive*.
3. Switch power off to the system containing the CLC card
4. Remove CLC card from the system

Caution

Electro-static discharge

Sensitive electronic device

⇒ The CLC card is a sensitive electronic device, use caution when handling this board. Do not expose to Electro-static discharge or place the board directly on a conductive surface. Only handle the board by its face-plate or card edges.

5. Remove old battery by sliding it out of it's holder
6. Insert the new battery into holder (**no more than one minute later**)
7. Write the month and year on the battery's end cap for future reference. (This information should also be written on a label and place in close proximity to the CLC for easier observation)

CLC-D02.3 Front Panel Diagnostic Display

7-Segment display

The CLC-D has a 7-Segment LED display (H4). It displays the current operating and error conditions of the card.

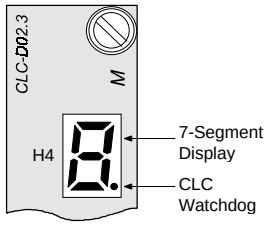

Figure 1-12: 7-segment display on the CLC-D

Normal operations

In normal operating conditions, a static display shows the current mode of the CLC.

H4 Display	Status
0	Initial display
1234	Initialization Mode, SERCOS phases 1-4
P	Parameter mode
H	No user tasks are running (Halt)
A	Task A is running
b	Task B is running
C	Task C is running
d	Task D is running

Table 1-3: Normal operating conditions

Error codes

When an error exists, the CLC-D displays an "E", indicating error, followed by a three digit diagnostic code. To the viewer, the display appears to be blinking. The following figure illustrates the chronological sequence for emergency stop condition, E400.

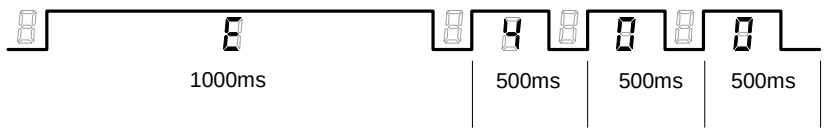

Figure 1-13: Example of an E400, Emergency Stop, error code

Code	Error Type
E200 - E399	Warning
E400 - E999	Shutdown Error

Refer to Chapter 3, Monitoring and Diagnostics, for a complete listing of the available three digit Warning and Shutdown error codes.

System Watchdog

The decimal point on the display is connected to a hardware watchdog circuit that is refreshed by the CLC every 100ms. If the microprocessor fails or if the CLC drops into the pROBE monitor, the display is blanked and the decimal point turns on. While the CLC is running, the decimal point is off.

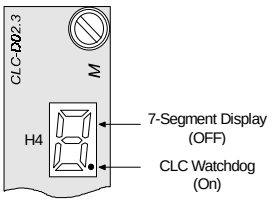

Figure 1-14: Watchdog message on the CLC

1.6 CLC-P01.1 Overview

CLC-P01.1 hardware

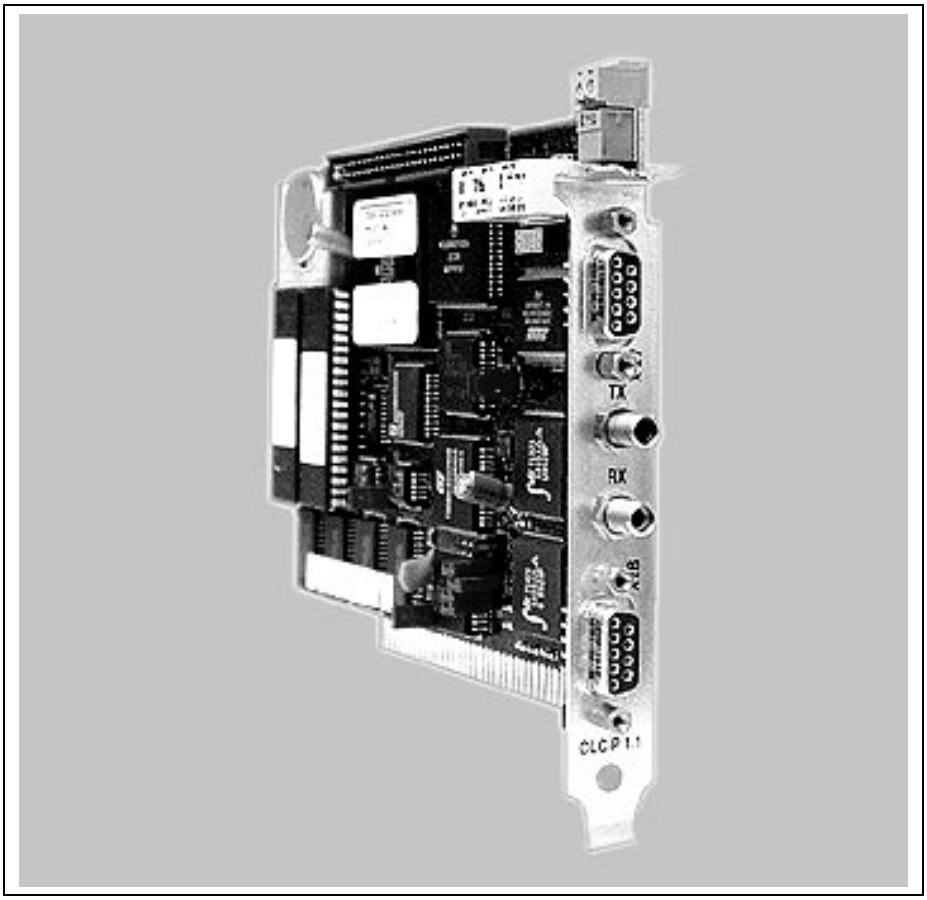

Figure 1-15: CLC-P01.1 Hardware

CLC-P Serial Communication

Port A (X27) is configured to respond to the VisualMotion ASCII Host Protocol. Port B (X28) can be configured to respond to Host Protocol, BTC06 or another interface. Both ports always operate with:

- 8 bits per character
- 1 stop bit
- no parity

For configurable communication settings, refer to Table 1-1 on page 1-14

CLC-P01.1 Jumper Configuration

Jumpers S1 and S2 set the default configuration for serial ports X27 and X28 respectively. If the jumper is installed, the port is configured for the default settings of RS-232 and 9600 baud.

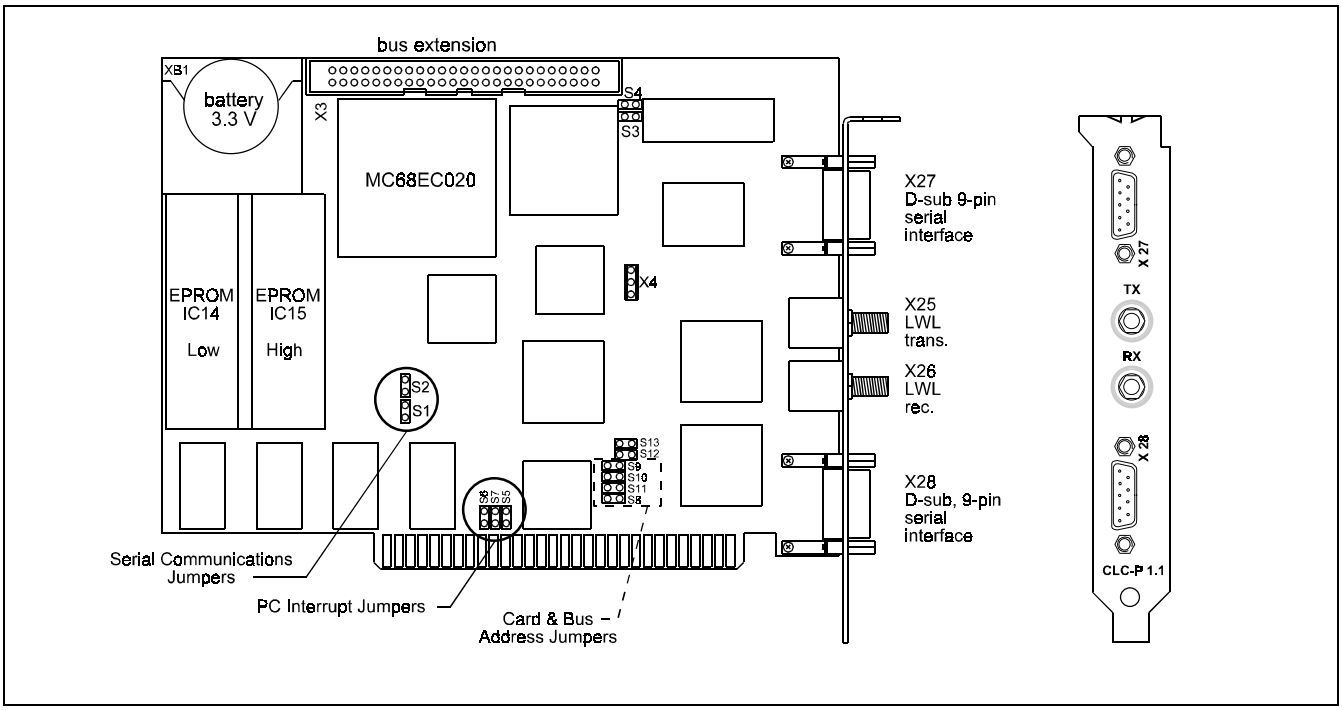

Figure 1-16: CLC-P01.1 jumper location

Jumpers S5 through S7 set the PC interrupt. Only IRQ2 (default) can be used.

PC Interrupt	S5	S6	S7
IRQ2 (IRQ9)	In	Out	Out
IRQ3	Out	In	Out
IRQ5	Out	Out	In

Table 1-4: CLC-P01.1 IRQ settings

Jumpers S8 through S11 set the base address of a 16K memory segment in the Host's RAM. This memory space is used to exchange information between the CLC and the Host.

Card Number	Base Address	S11	S10	S9	S8
0	C000	In	In	In	In
1	C400	In	In	In	Out
2	C800	In	In	Out	In
3	CC00	In	In	Out	Out
4	D000	In	Out	In	In
5	D400	In	Out	In	Out
6	D800	In	Out	Out	In
7	DC00	In	Out	Out	Out
8	E000	Out	In	In	In
9	E400	Out	In	In	Out
10	E800	Out	In	Out	In
11	EC00	Out	In	Out	Out
12	F000	Out	Out	In	In
13	F400	Out	Out	In	Out
14	F800	Out	Out	Out	In
15	FC00	Out	Out	Out	Out

Table 1-5: CLC-P base address jumper settings

On-Board Battery

This battery provides backup power for the CLC onboard SRAM when control voltage is not applied. The battery's power level is checked every time the CLC is powered up or during initialization from parameter mode to provide advanced warning of impending failure. A diagnostic message is displayed (***206 Battery is low: replace it soon***) when the level falls below 10% of remaining capacity. Based on the lifespan table on page 1-16, this could translate into less then a month before failure at 45 °C (113 °F.) It is vital for action to be taken when a Battery is low warning is issued.

Recommended actions:

- Secure a complete **archive** of the VisualMotion system data
- Order a new 3-volt Lithium button-style battery, CR2477N (MnO_2/Li).
- Indramat material number: **254284**
- Replace battery as soon as possible.

For complete details on battery lifespan and replacement, refer to On-Board Battery on page 1-16.

CLC-P SERCOS

The SERCOS port is used for loop-through, daisy-chained installation into a SERCOS fiber-optic ring. The output port, ***Tx***, is connected to the SERCOS input port, ***Rx***, of the next SERCOS device in the ring. Each SERCOS device is interconnected, output to input, with the output of the last device returned to

the SERCOS input, ***Rx***, of the CLC-P. See Figure 1-11: Fiber optic ring structure on page 1-15 for an illustration.

Viewing Error codes using VisualMotion's CLC DDE Server

Physically viewing diagnostic messages on the CLC-P hardware is not possible. Unlike the CLC-D card, which has a visible 7-Segment display (H4) for viewing error codes, the CLC-P does not have a visible display. The design of the CLC-P does not require for it to have a visible means of viewing errors. This card is generally installed in a personal computer and for this reason is normally not visible.

The monitoring and communications of error codes are handle by means of the CLC DDE Server. This Windows based Dynamic Data Exchange (DDE) Server application is used to communicate with Indramat's CLC motion control cards. Unlike the CLC-D which begins an error code with the letter "E", the DDE Server represents an error code with it's respective three digit number followed by the error's description. For example, an Emergency Stop error on CLC-D would appears as a alternating blinking "**E400**", while on the DDE Server it would simply appear as "***400 EMERGENCY STOP***."

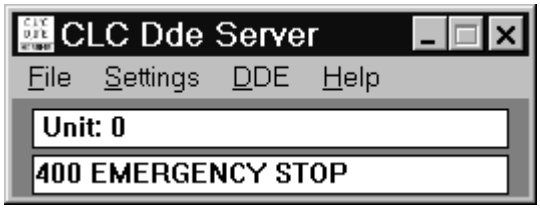

Figure 1-17: CLC DDE Server

In order to view diagnostic messages on the DDE Server, the "CLC Status Display" must be set to ***SERIAL_0***. This is accomplished by selecting ***Settings ⇒ Server Configuration*** from the CLC DDE Server's main menu. Refer to Chapter 4, CLC DDE Server for more information.

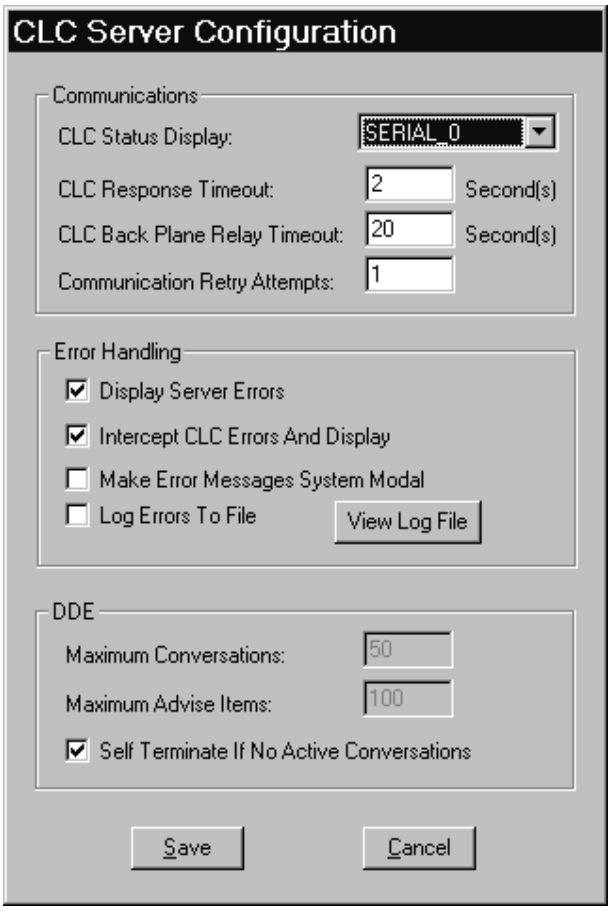

Figure 1-18: Setting SERIAL_0 for CLC Status Display - DDE Server

Viewing Error codes using VisualMotion Toolkit

To view error codes using VisualMotion, simply select the following menu selection:

Status ⇒ ***System*** from VisualMotion's main menu and the following screen appears.

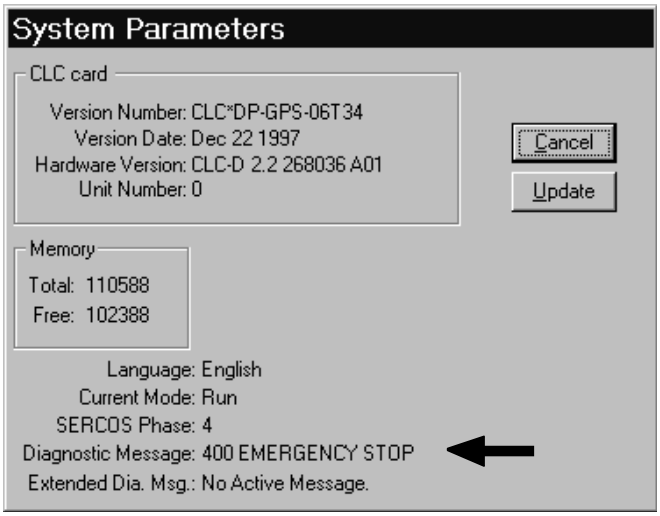

Figure 1-19: Viewing error codes using VisualMotion

1.7 CLC-P02 Overview

The CLC-P02 is a motion control on the PC/104 platform. The VisualMotion firmware on this platform includes all of the features of the CLC-P01, with improvements in the configuration and memory capacity.

CLC-P02.2 hardware

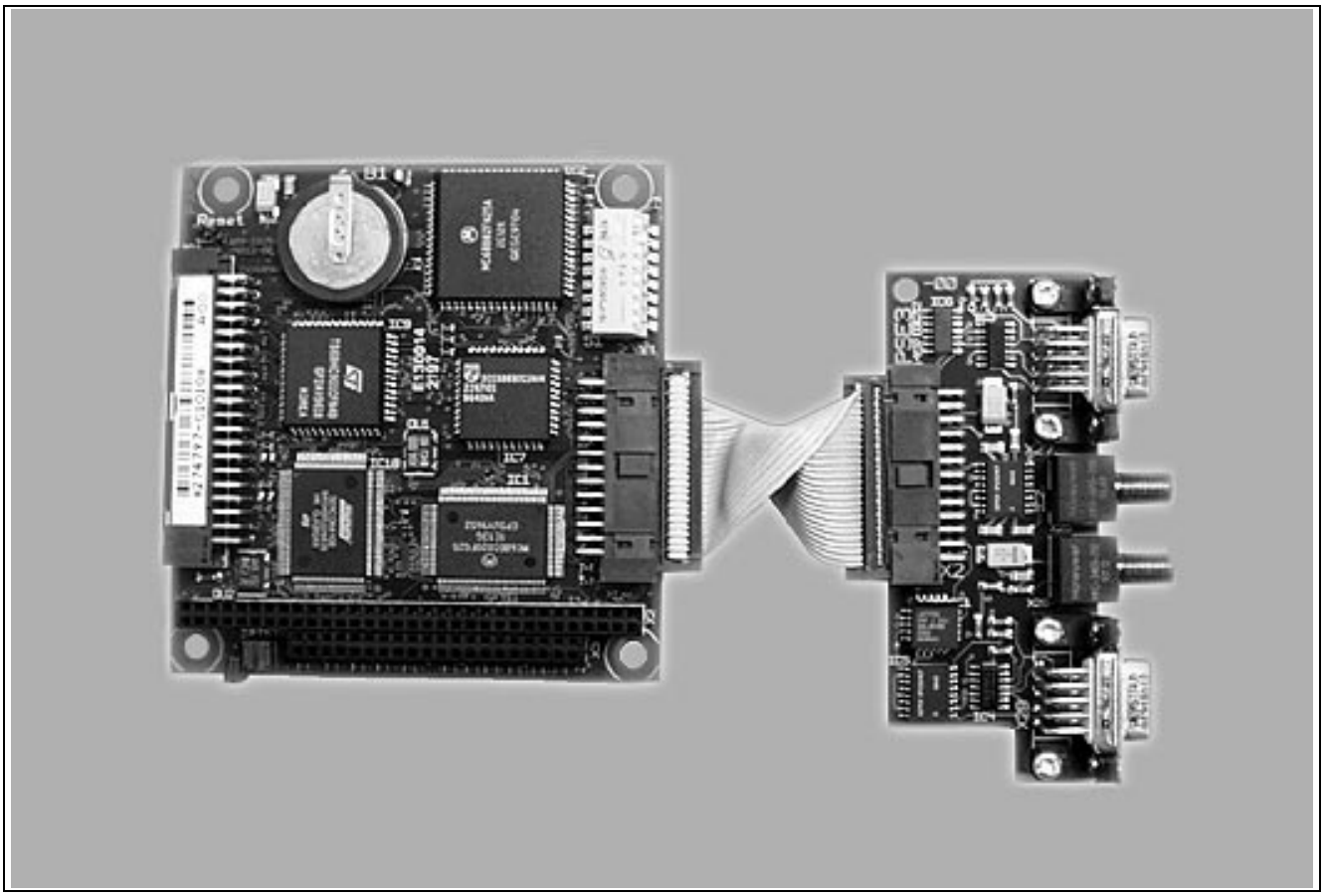

Figure 1-20: CLC-P02.2 Hardware

CLC-P02 Serial Communication

Port A (X27) is configured to respond to the VisualMotion ASCII Host Protocol. Port B (X28) can be configured to respond to Host Protocol, BTC06 or another interface. Both ports always operate with:

- 8 bits per character
- 1 stop bit
- no parity

Serial Com Options	Baud Rate	Checksum	Port Mode	Protocol
Port A (X27) default	9600	enabled	RS-232	Host Protocol
Port A (X27) valid settings	300, 1200, 2400, 4800, 9600, 19200, 38400	enabled or disabled	RS-232,422,485	Host Protocol
Port B (X28) default	9600	enabled	RS-232	Host Protocol
Port B (X28) valid settings	300, 1200, 2400, 4800, 9600	enabled or disabled	RS-232,422,485	Off, Host Protocol, BTC06

Table 1-6: CLC-P02 configurable communication settings

CLC-P02 Jumper Configuration

Jumpers I5 and I6 set the default configuration for serial ports X27 and X28 respectively. If the jumper is installed, the port is configured for the default settings of RS-232 and 9600 baud.

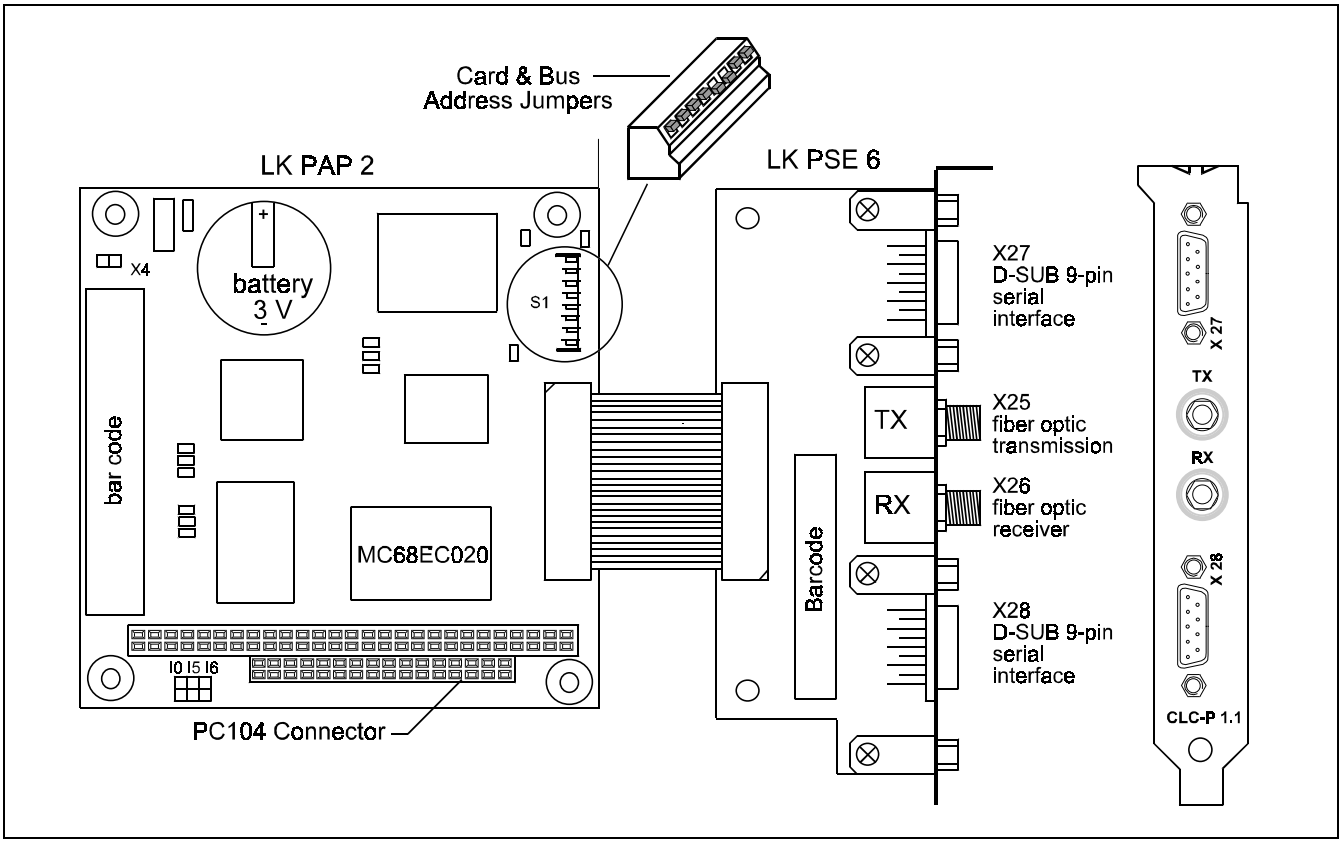

Figure 1-21: CLC-P02 jumper configuration

PC/104 Memory Address Selection

Switches 1 through 4 set the base address of a 1MB memory segment in the Host's RAM. This memory space is used to exchange information between the CLC and the Host.

Card Number	Base Address	1	2	3	4
0	D000:0000	OFF	ON	ON	ON
1	D000:2000	OFF	ON	ON	OFF
2	D000:4000	OFF	ON	OFF	ON
3	D000:6000	OFF	ON	OFF	OFF
4	D000:8000	OFF	OFF	ON	ON
5	D000:A000	OFF	OFF	ON	OFF
6	D000:C000	OFF	OFF	OFF	ON
7	D000:E000	OFF	OFF	OFF	OFF
8	E000:0000	ON	ON	ON	ON
9	E000:2000	ON	ON	ON	OFF
10	E000:4000	ON	ON	OFF	ON
11	E000:6000	ON	ON	OFF	OFF
12	E000:8000	ON	OFF	ON	ON
13	E000:A000	ON	OFF	ON	OFF
14	E000:C000	ON	OFF	OFF	ON
15	E000:E000	ON	OFF	OFF	OFF

Table 1-7: CLC-P02 base address switch settings

PC/104 Interrupt Selection

Switches 5 through 8 on the S1 DIP switch, selects the interrupt line for the CLC to PC interrupt.

Note: Only one of these switches can be on at a time, or there will be an interrupt conflict.

PC Interrupt	5	6	7	8
IRQ10	OFF	OFF	OFF	ON
IRQ11	OFF	OFF	ON	OFF
IRQ12	OFF	ON	OFF	OFF
IRQ15	ON	OFF	OFF	OFF
None	OFF	OFF	OFF	OFF

Table 1-8: CLC-P02 IRQ settings

CLC-P02 On-Board Backup Power (Accumulator)

The backup power device on the CLC-P02 is not a battery, but an accumulator which provides power to the onboard SRAM when control voltage is not applied.

Note: A defective accumulator cannot be replaced by the customer. Since the accumulator is soldered to the board, the card must be returned to INDRAMAT for maintenance repair.

A fully charged accumulator will provide approximately 6 months of SRAM buffering at an ambient temperature of 25 °C (77 °F) if the card is not in operation.

At 45 °C (113 °F), the accumulator backup power will last approximately 3 months.

If the accumulator is completely discharged, it will require approximately 50 hours of online power to fully charge.

Note: ***Charge time***:
1 hour of recharging will provide about 100 hours of buffering at 25 °C (77 °F.)

Lifetime Expectancy:
The lifetime expectancy of the accumulator on a CLC-P02 card that is powered for 8 hours and off for 16 hours is at least 7 - 10 years.

A diagnostic message is displayed (***206 Battery is low: replace it soon***) when the level falls below 10% of the remaining capacity. Diagnostic messages can be viewed by selecting ***Status ⇒ System*** from VisualMotion Toolkits' main menu. The diagnostic message field within the System Parameters window is read from CLC card parameter C-0-0122.

Note: A "***206 Battery is low: replace it soon***" error does not necessarily mean that the accumulator is defective. Unlike batteries, accumulators can be re-charged by applying and maintaining power for a few days. If the error returns after the re-charging period, and power is still applied to the system, send the card in to INDRAMAT for repairs.

Recommended actions:

- Secure a complete **archive** of the VisualMotion system data
- Re-charge the accumulator by powering the card for a few days
- If error persist, return the card to INDRAMAT for repairs

CLC-P SERCOS

The SERCOS port is used for loop-through, daisy-chained installation into a SERCOS fiber-optic ring. The output port, ***Tx***, is connected to the SERCOS input port, ***Rx***, of the next SERCOS device in the ring. Each SERCOS device is interconnected, output to input, with the output of the last device returned to the SERCOS input, ***Rx***, of the CLC-P. See Figure 1-11: Fiber optic ring structure on page 1-15 for an illustration.

1.8 CLC-V Overview

CLC-V02.3 hardware

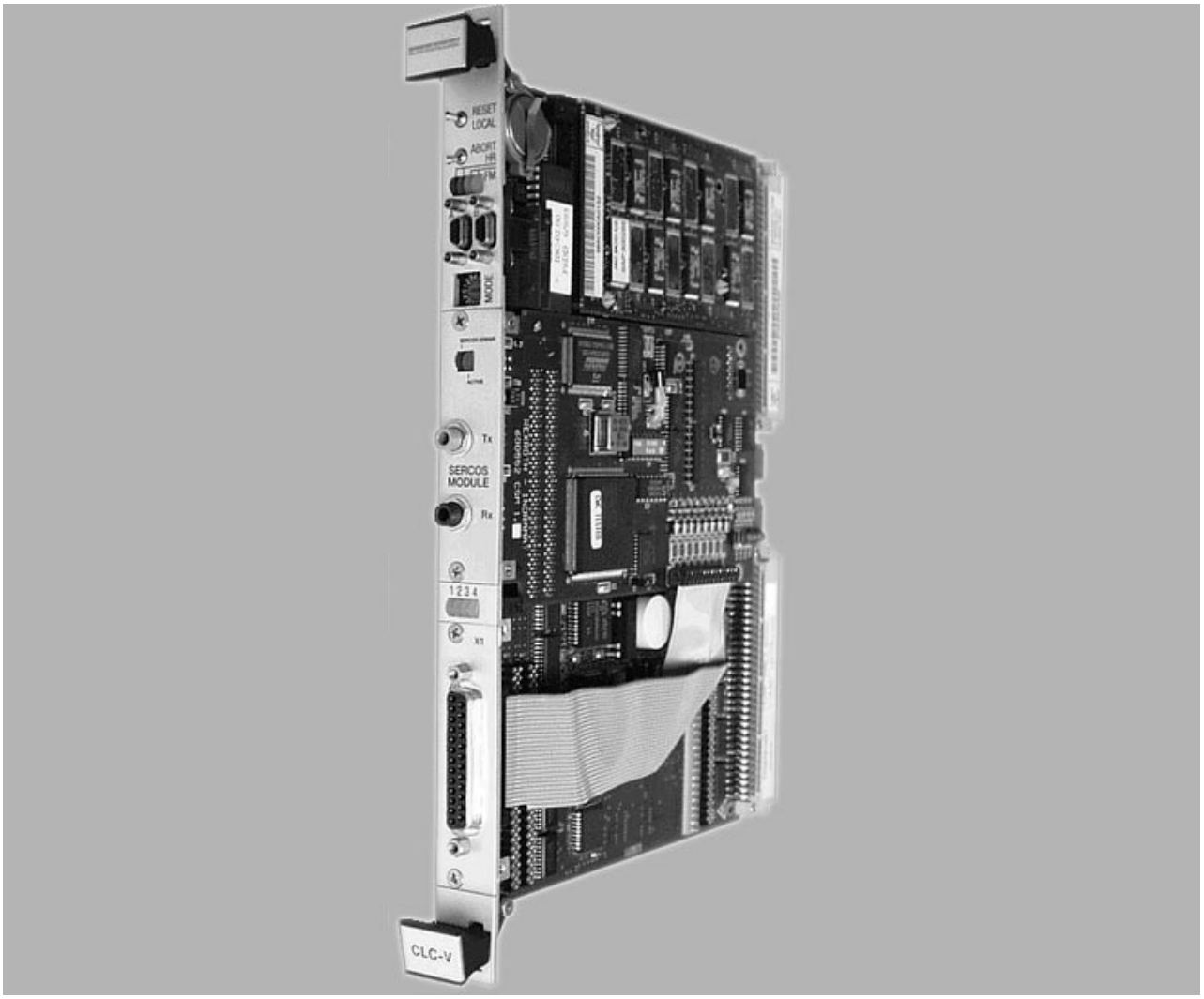

Figure 1-22: CLC-V02.3 Hardware

CLC-V Serial Communication

Port A (X27) is configured to respond to the VisualMotion ASCII Host Protocol. Port B (X28) can be configured to respond to Host Protocol, BTC06 or another interface. The serial interface is compatible with EIA RS-232C and supports signals for both AT and XT type Host PCs. Both ports always operate with:

- 9600 baud
- 8 bits per character
- 1 stop bit
- no parity.

For configurable communication settings, refer to Table 1-1 on page 1-14

CLC-V SERCOS

The SERCOS port is used for loop-through, daisy-chained installation into a SERCOS fiber-optic ring. The output port, ***Tx***, is connected to the SERCOS input port, ***Rx***, of the next SERCOS device in the ring. Each SERCOS device is interconnected, output to input, with the output of the last device returned to the SERCOS input, ***Rx***, of the CLC-V. See Figure 1-11: Fiber optic ring structure on page 1-15 for an illustration.

CLC-V Configuration Switches

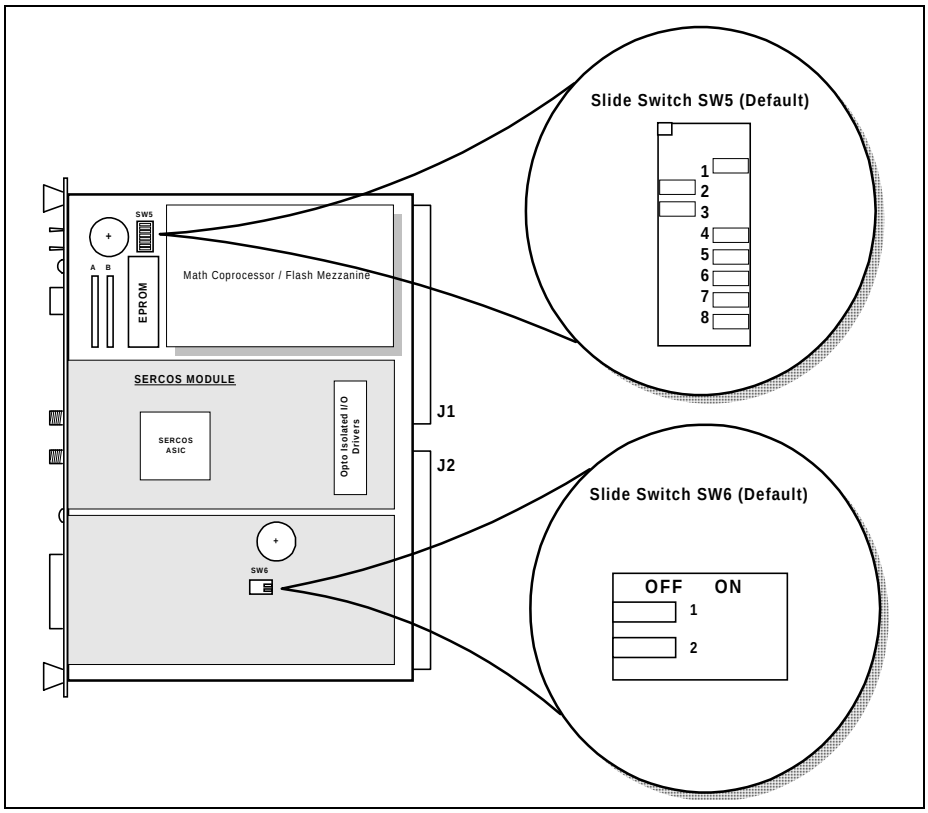

Figure 1-23: CLC-V Configuration Switches

Configuration Switch - SW5

SW5 Position	Default	Function
1	ON	ON - Programming of the local Flash EPROM enabled OFF - Local Flash EPROM write protected
2	OFF	ON - CLC-V Drives VME SYSRESET OFF - SYSRESET not driven
3	OFF	ON - CLC-V Accepts SYSRESET from VME OFF - SYSRESET not received
4	ON	ON - Power-fail reset voltage set to 4.8V OFF - Power-fail reset voltage set to 4.2V
5	ON	ON - Programming of Flash EPROM enabled OFF - Flash EPROM write protected
		6 & 7 Select the CLC's VME Bus request level: BR0 BR1 BR2 BR3
6	ON	OFF OFF ON ON
7	ON	OFF ON OFF ON
8	ON	ON - VME Slot 1 functions enabled OFF - VME Slot 1 functions disabled

Table 1-9: Configuration switch - SW5

Configuration Switch - SW6

Both switches SW6-1 and SW6-2 are functionally used as one switch. Both must have the same setting, ON or OFF.

SW6 Position	Setting	Function
1 2	OFF (default) OFF (default)	Disables the CLC-V's on-board secondary battery. Backup battery is provided through the VME bus STDBY line.
1 2	ON ON	Enables the CLC-V's on-board secondary battery and disconnects the CLC-V from the VME bus STDBY line. Both positions of SW6 must be ON to enable the on-board secondary battery and disconnect the CLC-V from the VME bus STDBY line.
CAUTION: *Leave both switch positions OFF, as set by the factory. The VME card cage is the required source of battery back-up. Damage to the CLC-V's on-board secondary battery may occur if a VME card cage supplies battery backup and either position of SW6 is set ON.*		

Table 1-10: Configuration switch - SW6

On-Board Battery

This battery provides backup power for the CLC onboard SRAM and the real time clock (RTC) when control voltage is not applied. The battery's power level is checked every time the CLC is powered up or during initialization from parameter mode to provide advanced warning of impending failure. A diagnostic message is displayed (***206 Battery is low: replace it soon***) when the level falls below 10% of remaining capacity. It is vital for action to be taken when a Battery is low warning is issued.

Recommended actions:

- Secure a complete **archive** of the VisualMotion system data
- Order a new 3-volt Lithium button-style battery, CR2032 (MnO_2/Li).
- Indramat material number: **600482**
- Replace battery as soon as possible.

2 Using VisualMotion Toolkit for diagnosing

2.1 VisualMotion Toolkit 6

VisualMotion Toolkit 6 (VMT) is Indramat's Windows ™ based development environment for programming the VisualMotion Controller (VMC) cards. Along with VMT's programming capabilities, it can also be used to help diagnose system, drive and card diagnostics.

Note: This chapter is intended to help trained operating and maintenance personnel diagnose error codes using VisualMotion Toolkit. For a complete description of VisualMotion Toolkit, please refer to the following documentation.

- VisualMotion GPS 6.0, Start Up Guide
  - DOK-VISMOT-VM*06VRS**-PRJ1-AE-P, Material No. 282762
- VisualMotion GPS 6.0, Reference Manual
  - DOK-VISMOT-VM*06VRS**-FKB1-AE-P, Material No. 280585

2.2 VisualMotion to PC connection

To establish communications between the VisualMotion CLC-D cards and a PC, use the IKS0061 standard RS-232 serial communication cable. For the CLC-V, use the IKS0110 standard RS-232 serial communication cable.

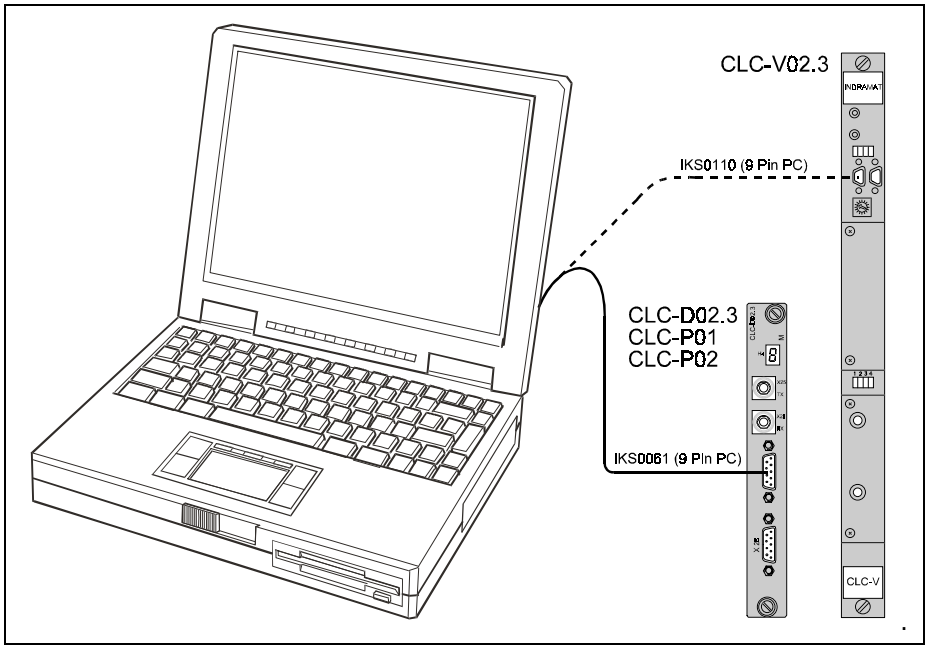

Figure 2-1: VisualMotion to PC connection diagram

Once the hardware connections have been made, use the following procedure to confirm communications.

⇒ Connect communication cable between CLC port X28 and the PC's com port.

⇒ Power-up VisualMotion System (drives, CLC cards, motors, etc.)

⇒ Open VisualMotion Toolkit windows program (Refer to the VisualMotion Start-up Guide for installation instructions)

⇒ From the VisualMotion Toolkit main menu, select ***Status ⇒ System***. If the System Parameters screen loads with information, communications have been established.

The user is now ready to use VisualMotion Toolkit.

2.3 The File menu

The file menu allows the user to perform standard windows file commands such as new, open, save, etc. This menu also has functions for compiling CLC programs, archiving user programs and variables and printing CLC programs. For the purpose of this manual, only Program Management will be covered in this section. For a complete description of all the File menu selections, refer to the VisualMotion Reference manual.

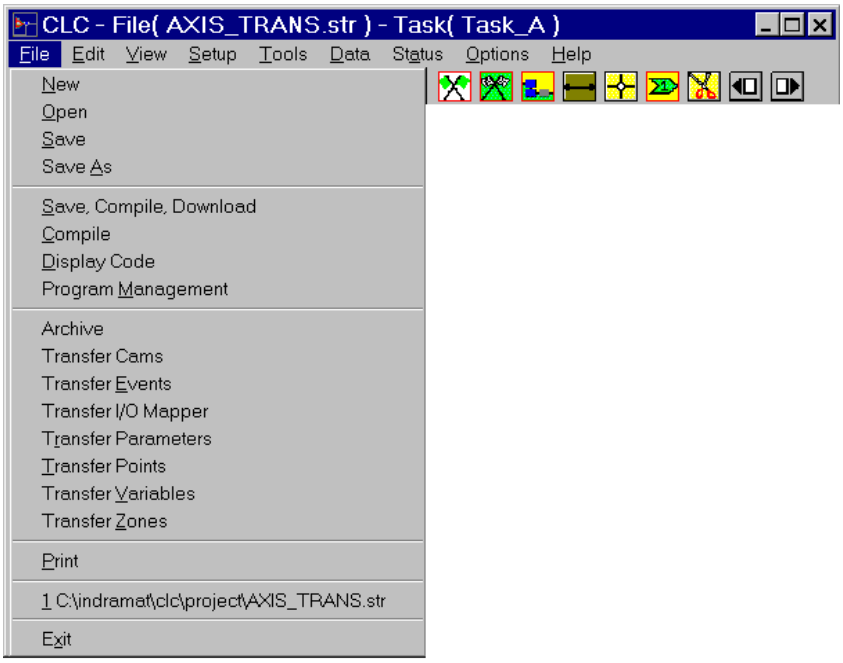

Figure 2-2: VisualMotion File Menu screen