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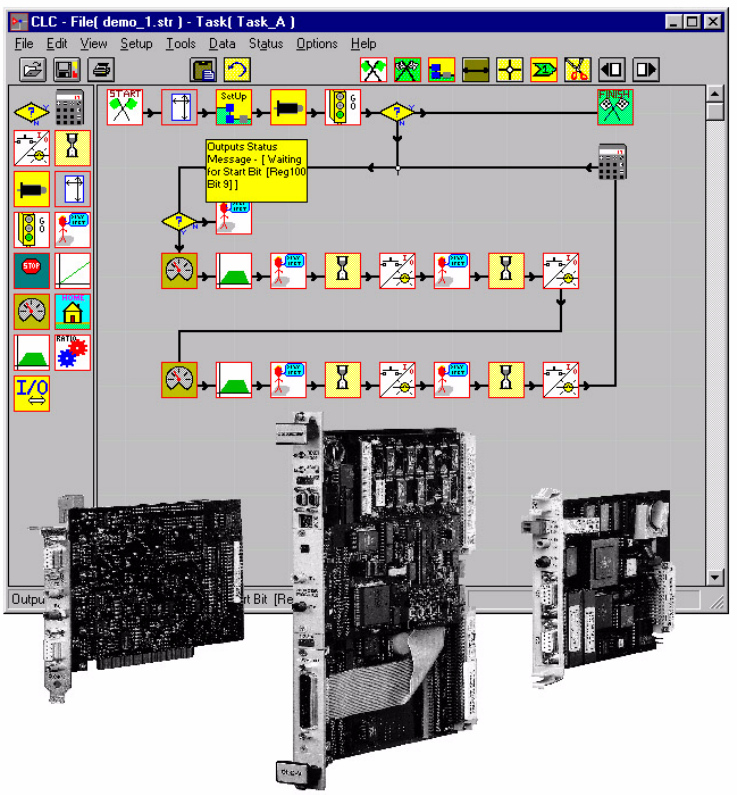

VisualMotion 6.0

Trouble Shooting Guide

Rexroth
Indramat

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Purpose of this document

This document describes ....

- the VisualMotion System components
- the use of VisualMotion Toolkit for assistance in diagnostics
- the proper steps for identifying diagnostic faults
- suggested remedies for clearing faults
- the use of the BTC06 Teach Pendant

Record of revisions

Revision	Date	Remarks
01	12/98	New release for version 6
02	03/99	Updated CLC-P2 info.

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1 Introduction and Overview

1.1 Purpose of Manual

This manual is a trouble shooting guide for the VisualMotion ™ control system. VisualMotion is a combination of integrated digital multi-tasking motion control components, drives and motors used together to create a complete motion control solution. For information pertaining to digital drives and motors, refer to the following documentation:

- DIAX03 Drives with Electronic Gear Function, Documentation Set
  - DOK-DIAX03-ELS-04VRS**-50M1-EN-P, Material No. 273438
  - DOK-DIAX03-ELS-05VRS**-50M1-EN-P, Material No. 276238
- DIAX04 Drives with Electronic Gear Function, Documentation Set
  - DOK-DIAX04-ELS-05VRS**-60M1-EN-P, Material No. 276252
- ECODRIVE DKC02.1 SSE SERCOS Function, Documentation set
  - DOK-ECODRV-SSE-03VRS****-57M1-EN-P, Material No. 274825

This manual is intended to assist and guide trained operating and maintenance personnel with the proper methods for identifying and remedying diagnostics faults and errors. Together with the CLC motion control card and the Windows based VisualMotion software program, the user will be able to determine diagnostic messages and error codes and the proper steps required for clearing such faults. It is assumed that the VisualMotion components and digital drives are installed properly and that all corresponding hard wiring has been completed. For more information, refer to the following VisualMotion Manuals:

- 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

1.2 Manual Overview

Chapter 1 - Introduction	*Describes VisualMotion's components and the CLC's general theory of operation and its motion capabilities.*
Chapter 2 - VisualMotion	*Provides a description and illustration of the more common operations within VisualMotion for end users.*
Chapter 3 - CLC Monitoring and Diagnostics	*Provides a description of Status, Warning and Shutdown messages and how to troubleshoot errors and faults.*
Chapter 4 - VisualMotion's CLC DDE Server	*Describes the usage and functionality of the DDE Server: a program that allows communication to take place between the CLC card and other applications.*
Chapter 5 - HMI devices (BTC06)	*Describes the usage and functionality of the Human Machine Interface used with VisualMotion.*

1.3 VisualMotion Overview

The term VisualMotion is not only used to describe the Windows based program for creating motion control programs but also for all the components required for a complete motion control system. These components range from the CLC motion control card to the GPS firmware to the communications between the CLC card and all external components.

VisualMotion System Components

The VisualMotion system is composed of CLC control cards, GPS firmware *(software for the CLC cards)*, VisualMotion Toolkit (VMT) program, DDE Server *(communications protocol between windows programs and other applications),* BTC06 Handheld Teach Pendant (optional) and up to 40 intelligent digital drives all communicating over the SERCOS fiber optic ring.

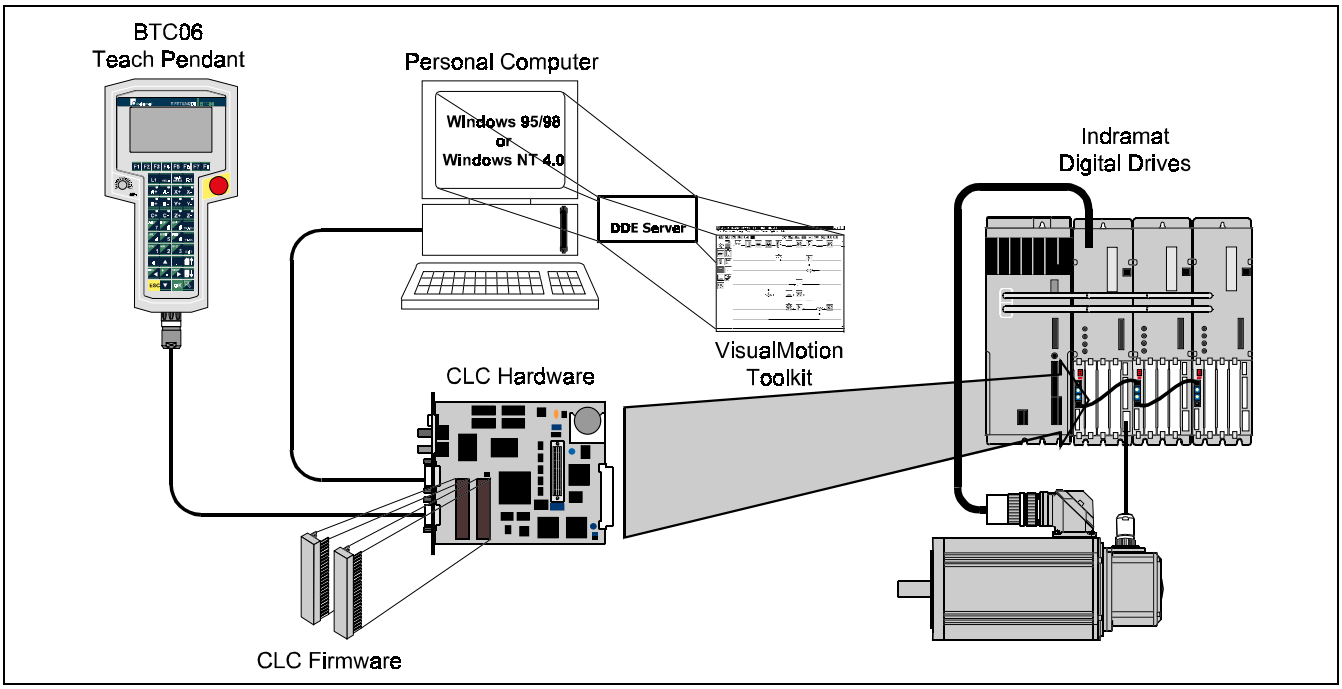


Figure 1-1: VisualMotion System components

Indramat's digital drives are made up of drive controllers and their associated motors. The digital drive families DIAX03, DIAX04 and ECODRIVE with CCD box are fully capable of using the functions available with the CLC motion control card.

DIAX03 digital drive controllers

The following digital drives make up the DIAX03 drive family.

- **DDS3.2:**
  Modular unit with two slots for plug-in cards and a continuous drive output of up to approximately 3 kW.
- **DDS2.2:**
  Modular unit with four slots for plug-in cards and a continuous drive output of up to approximately 12 kW.
- **DKR3.1:**
  Compact unit with four slots for plug-in cards and a continuous drive output of up to approximately 30 kW.
- **DKR2.1:**
  Compact unit with four slots for plug-in cards and a continuous drive output of up to approximately 50 kW.
- **DKR4.1:**
  Compact unit with four slots for plug-in cards and a continuous drive output of up to approximately 90 kW.
- **DKR5.1:**
  Compact unit with four slots for plug-in cards and a continuous drive output of up to approximately 224 kW.

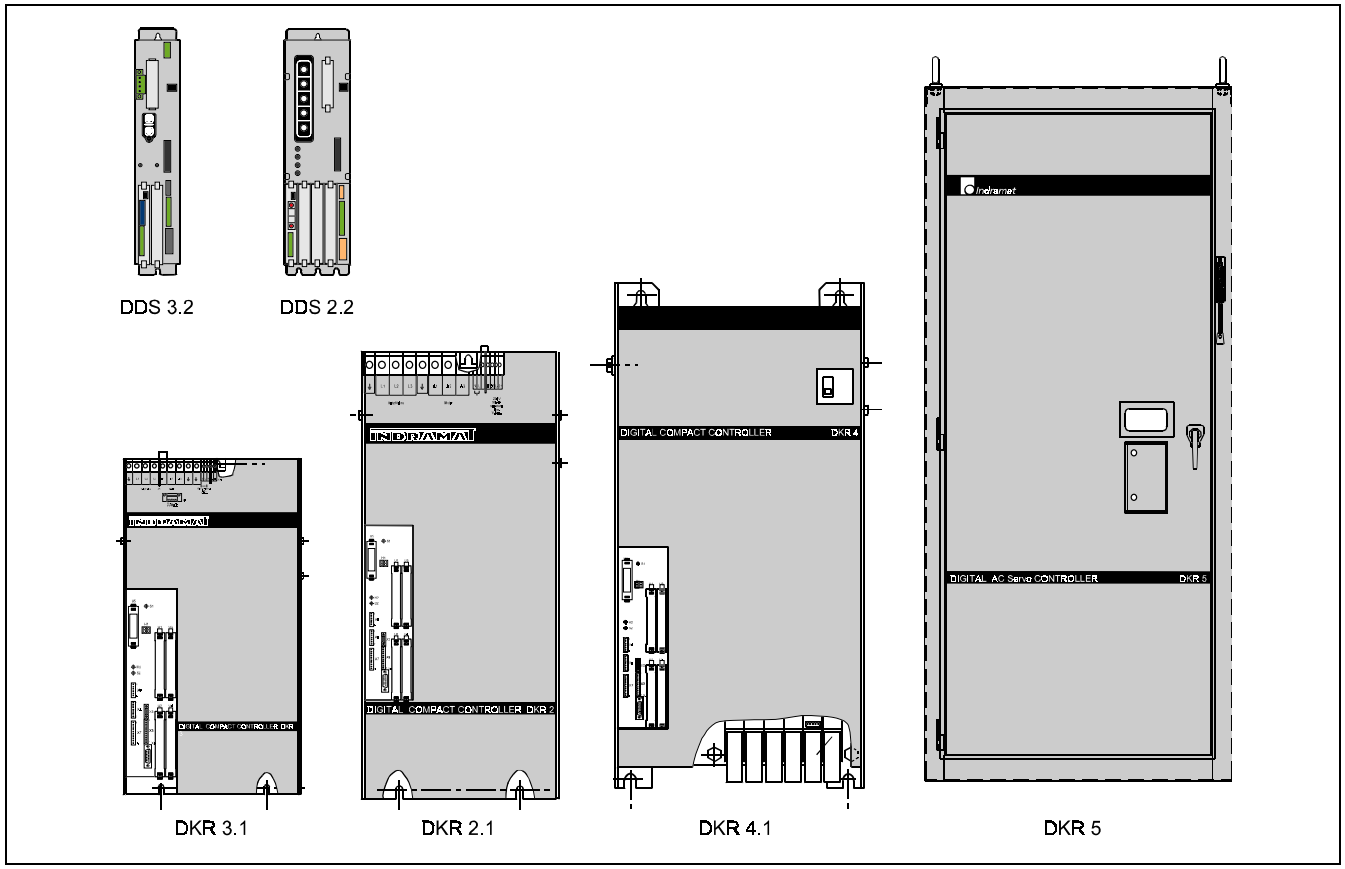


Figure 1-2: DIAX03 drive family

Motors used with DIAX03

All DIAX03 drive controllers are capable of operating all rotating and linear motors of the MDD, 2AD, 1MB, MBW, LAR and LAF series.

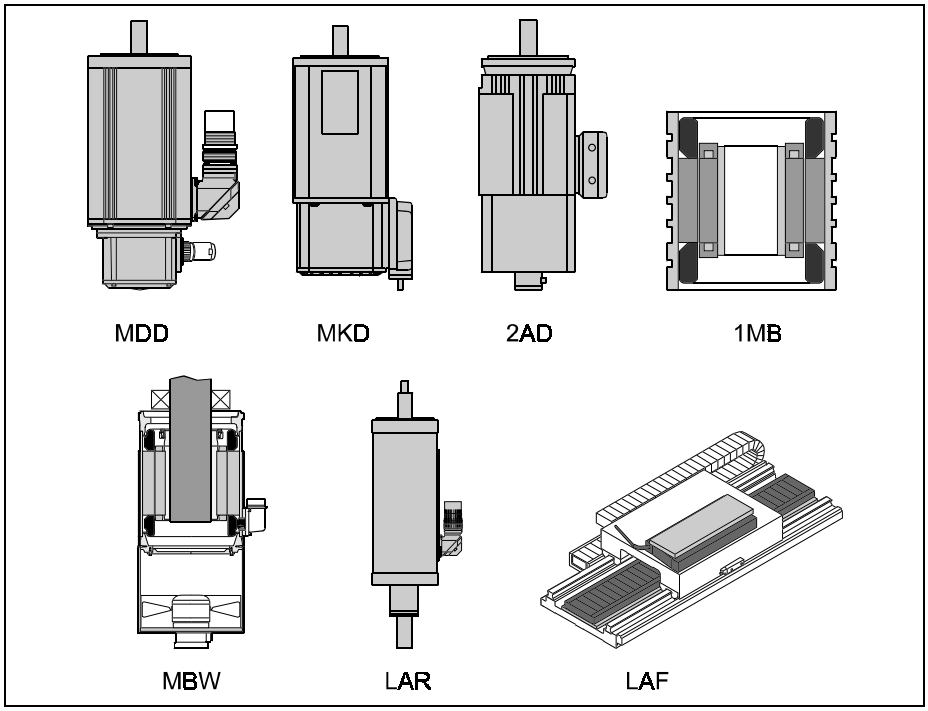


Figure 1-3: Motors used with DIAX03

DIAX04 digital drive controllers

The following digital drives make up the DIAX04 drive family.

- **HDD2.2:**
  A dual axes modular unit with two slots for plug-in cards per axis and a continuous drive output of up to approximately 2.5 kW.
- **HDS2.2:**
  Modular unit with four slots for plug-in cards and a continuous drive output of up to approximately 6.5 kW.
- **HDS3.2:**
  Modular unit with four slots for plug-in cards and a continuous drive output of up to approximately 15.5 kW.
- **HDS4.2:**
  Modular unit with four slots for plug-in cards and a continuous drive output of up to approximately 35 kW.

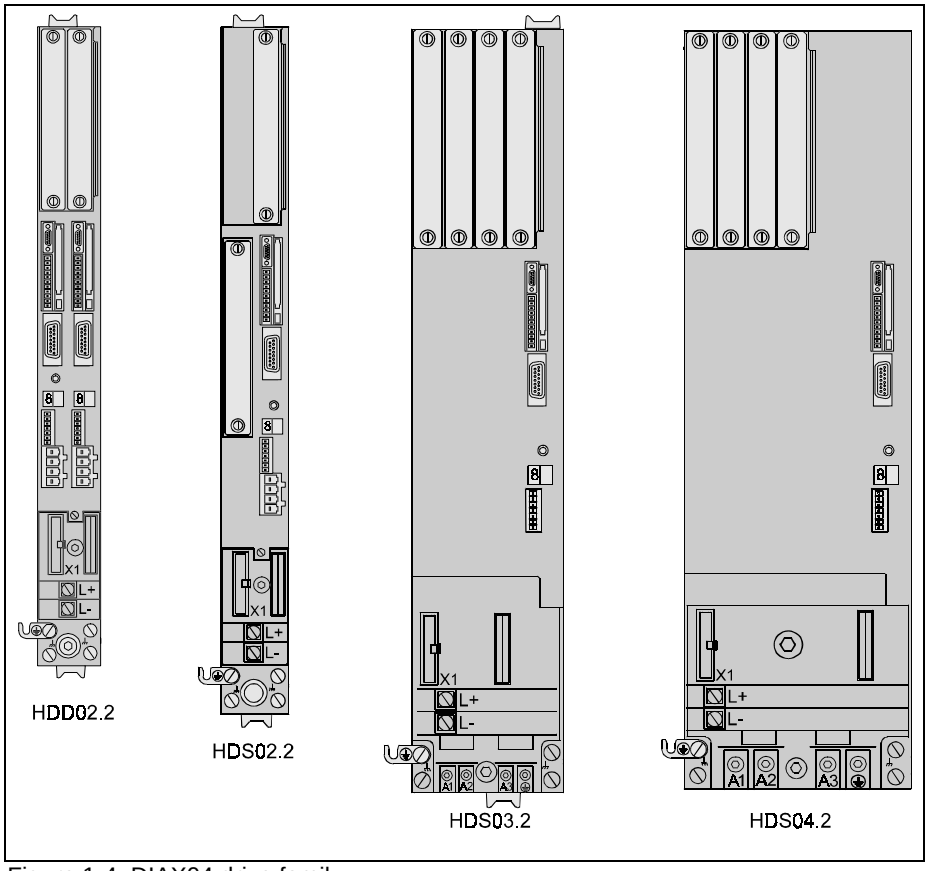


Figure 1-4: DIAX04 drive family

Motors used with DIAX04

All DIAX04 drive controllers are capable of operating all rotating and linear motors of the MHD, MKE, MKD, 2AD, 1MB, MBW, LAR and LAF series.

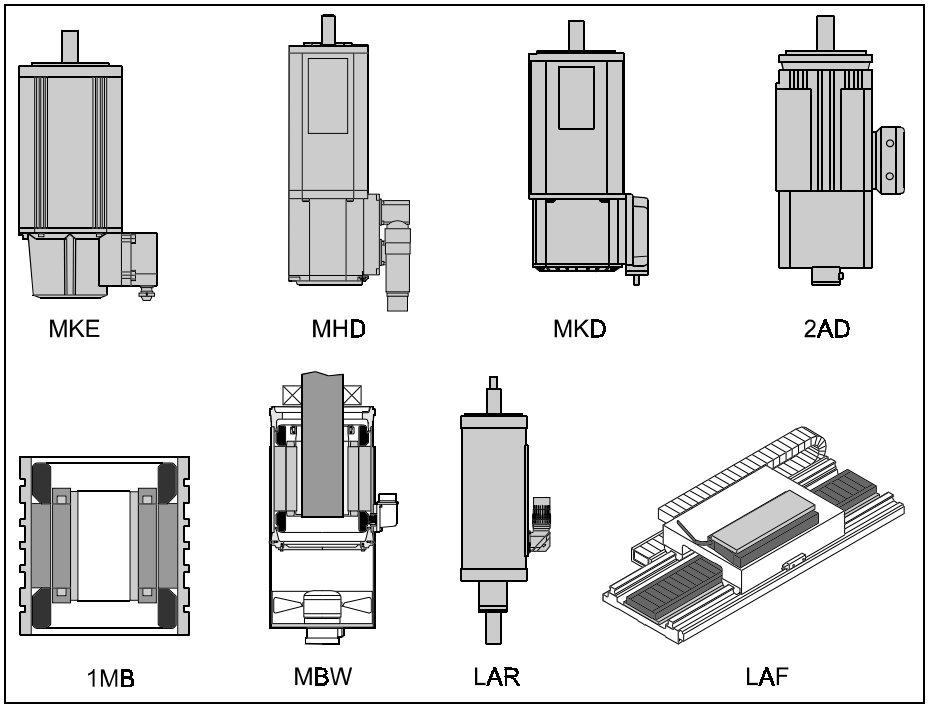


Figure 1-5: Motors used with DIAX04

ECODRIVE 3 digital drive controllers

The following digital drives make up the ECODRIVE 3 drive family. DKC drives have no slots available for plug-in cards; however, when combined with the stand alone CCD box, an ECODRIVE 3 system can have up to four slots available for plug-in cards.

- **DKCx.3-040:**
  can provide continuous drive output of up to approximately 1.5 kW.
- **DKCx.3-100:**
  can provide continuous drive output of up to approximately 4.0 kW.

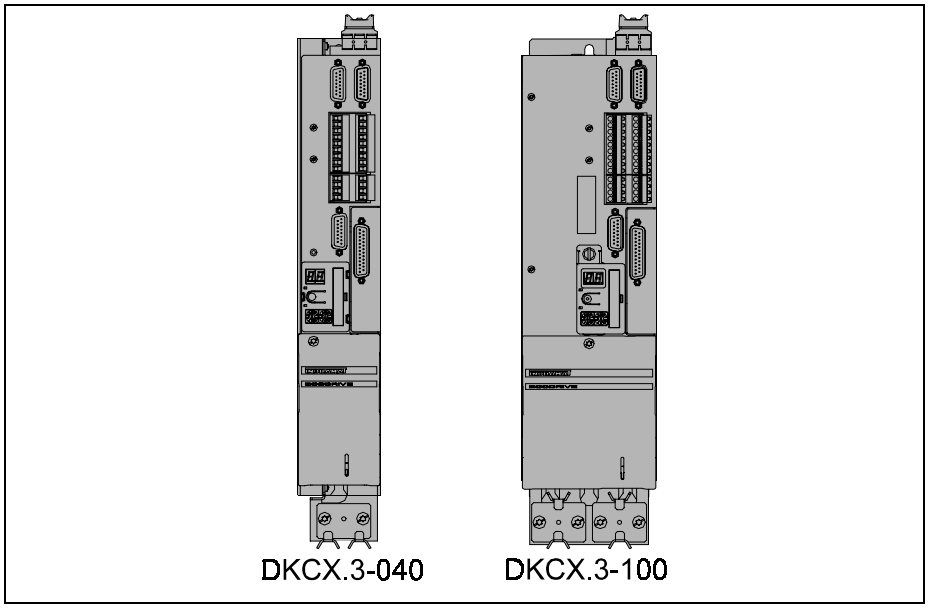


Figure 1-6: ECODRIVE 3 drive family

- **CCD Box:**
  provides 24V backplane power for CLC-D02.3 in combination with DEA 28/29/30 I/O cards.

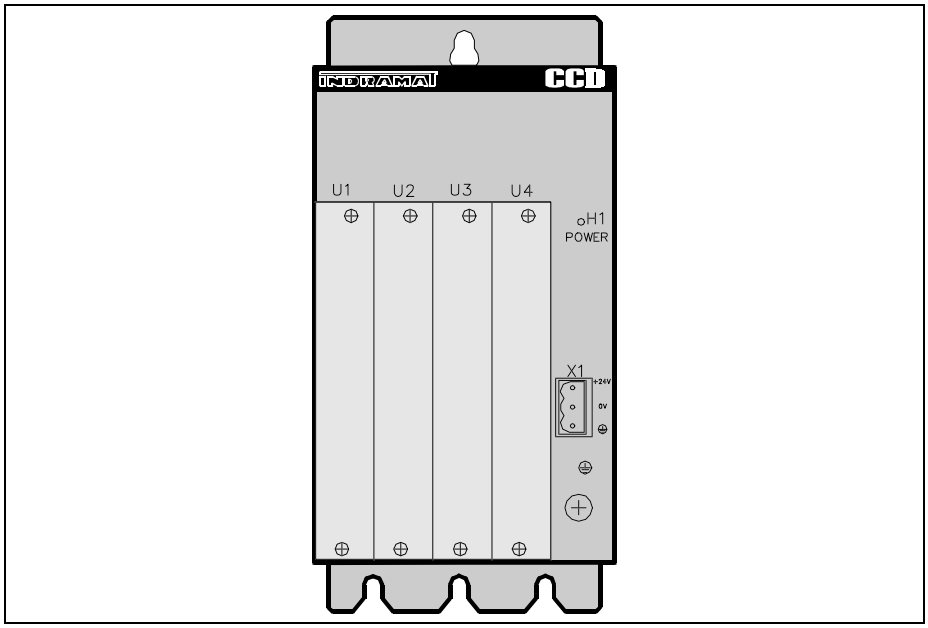


Figure 1-7: CCD Box

CLC System Architecture

The CLC card is a part of a larger motion control system which also includes digital servo drives and SERCOS, a fiber-optic communication system. The VM Controller can provide multi-axis coordinated and non-coordinated motion control with tightly integrated I/O logic control functions. The flexibility of the VM System allows it to be used for a wide variety of applications, from general motion control to sophisticated multi-axis electronic line shafting (ELS) to robotics.

CLC controls use SERCOS (**SE**rial **R**ealtime **CO**mmunications **S**ystem) fiber-optic interface to interconnect with Indramat drives. The SERCOS interface is an internationally accepted standard for real-time high-speed digital communication.

- requires only a single daisy-chained fiber-optic cable interconnecting the drives with the control
- Synchronous data protocol guarantees response time
- provides continuous monitoring and diagnostics for all devices and includes comprehensive standardized definitions for control loop functions
- High noise immunity and electrical isolation

The CLC-P/V open bus architecture provides easy I/O interfacing to virtually any manufacturer's PLC's and I/O cards. Both digital and analog I/O are available. Interrupt-type inputs can be used to provide minimum response time recognition of external events.

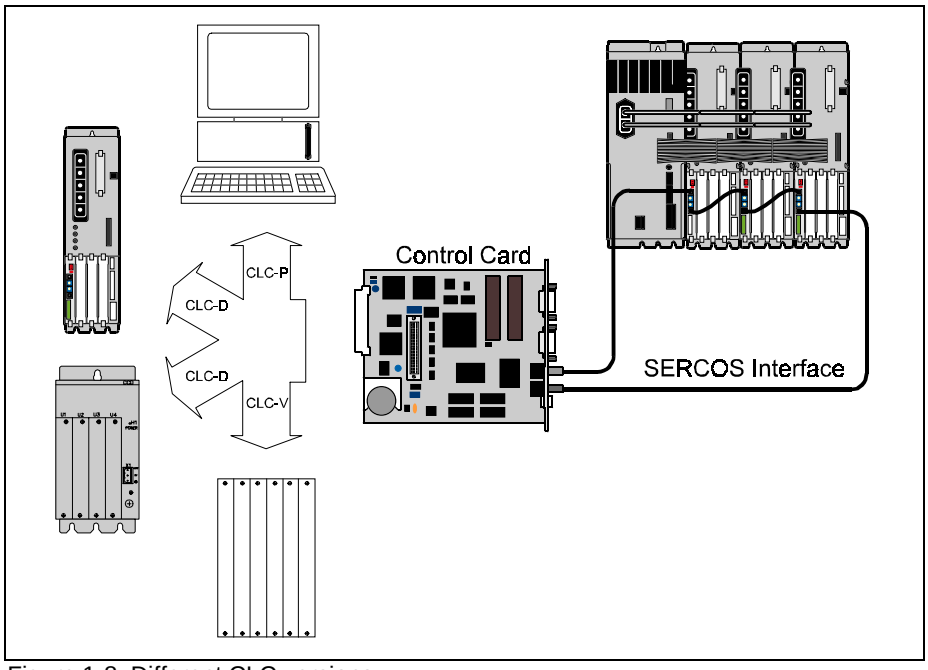


Figure 1-8: Different CLC versions

Four versions of the CLC card are currently available:

CLC-D

Plugs into Indramat's digital drives, providing an exceptional cost-effective motion control solution.

CLC-P01

IBM PC-AT bus architecture.

CLC-P02

PC/104 bus architecture.

CLC-V

VME bus architecture.

Indramat's VisualMotion® Programming Interface

The CLC motion control card combines an integrated multi-tasking environment with a unique graphical Windows based programming interface - VisualMotion ® (VM). VM provides simplified point-and-click programming, operation and management. With this software, system builders have a flexible and comprehensive environment, including easy DDE integration with applications such as Wonderware, InTouch or Visual Basic programs.

BTC06

An optional BTC06 can also be used to control CLC operation and adjust CLC parameters. The BTC06 is a hand-held instrument with 16 x 40 character display and a 48-key sealed membrane keypad. The pendant provides a convenient operation and position programming interface for Indramat CLC Motion Control. **Refer to *Chapter 5, Human Machine VisualMotion Interfaces* for more information.**

CLC Operating System

The VM Controller can simultaneously control up to four independent user tasks (A, B, C & D). Each task can control a coordinated group of two or three axes and any number of independent motion axes. Depending on the application, a single CLC can control up to 40 axes.

Tasks

VisualMotion can have up to 4 tasks running in each program. Tasks A-D run simultaneously and are given equal priority. A task is a process that the user runs in his machine. Using VisualMotion, the user can have 4 separate processes or task running simultaneously and each task can be independent of each other.

Multitasking is cooperative and can consecutively execute one instruction from each task. Special event functions preempt normal multitasking for real-time response and are prioritized according to the hierarchy of the event's associated task (Task A - highest priority, Task D - lowest priority). Two additional executive tasks manage the user interfaces through serial communication ports. One controls communication to the Host PC, the other controls the BTC06 when used.

Each task also has a queue for events, permitting asynchronous initiation of multiple independent events within each task. VM Controller events are a privileged form of subroutine, suspending all program tasks until pending events are done. Each task may have up to four events active at one time. The CLC provides several event types including time-based, distance-based, and position-based events, and others.

Events

Events are basically interrupt driven subroutines. They can be triggered by a variety of methods, such as transition of an input, repeating timer, position trigger, etc.

The Event system is pre-emptive, giving task A events the highest priority, while events associated with Task D have the lowest priority. Therefore, an event currently being executed within Task C will be suspended by an event from Task B. Once the active events are completed the suspended program tasks automatically re-activate and resume execution.

1.4 VM System Motion Capabilities

The VM Controller supports three kinds of motion (non-coordinated, coordinated, and electronic line shaft) and several modes of each type.

Non-Coordinated Motion

Non-coordinated motion is primarily used to control a single independent axis. There are two modes of non-coordinated motion: Single Axis, for linear positioning required to achieve point-to-point movement, and Velocity Mode, as might be used for some spindle motor drives.

Single axis Single axis motion commands within a user program are interpreted by the VM Controller and sent to the DDS drive. The user program tells the DDS drive the speed, and/or distance and acceleration it should use to internally develop a velocity profile, which is then maintained and controlled within the intelligent DDS drive. Consequently, single axis motion does not require continuous calculation by the VM Controller and consumes minimum CPU resources.

Velocity Mode Velocity mode controls only the speed of the axis, without any position information. The intelligent DDS-2 drive maintains torque and velocity loops internally, updating the internal loops every 250 microseconds.

Ratioed Axes A special form of non-coordinated motion permits linking two axes by relating the number of revolutions of a slave axis to a master axis. For example, a ratio might be required when the positioning axis of a gantry robot, having a motor on each side of its supporting track, must travel along a circular track.

Coordinated Motion

The VM Controller defines multi-axis coordinated motion in terms of a path composed of standard straight line and circular geometry segments. Point positions, (x, y, z), are used to establish the start, middle or end of a geometry segment. Two points define a line, three points define a circle. The path combines these standard geometry segments so that the start of the next segment begins at the end of the previous segment. A path, therefore, is nothing more than a collection of connected segments.

Since each segment has an end point specifying speed, acceleration, deceleration and jerk, each segment can have a unique rate profile curve. A special type of segment, called a blend segment, can be used to join two standard geometry segments. Blend segments provide the capability of continuous smooth motion from one standard segment to another without stopping. They reduce calculation cycle time as well as provide a means of optimal path shaping.

The VM System is capable of calculating a path in any of several different modes:

Constant Speed

Constant Speed mode is always active and tries to maintain a constant speed between any two connecting segments in the path. This mode is constrained by the system's acceleration and deceleration. Constant speed is the optimum path motion for applying adhesives or paint, and welding and some forms of cutting such as laser or water-jet, etc.

Linear Interpolation

A coordinated motion straight line segment is defined by two points. The motion is calculated from the end point of the last segment, or the current position if the system is not in motion, to the new end point. Multi-axis coordinated motion is used when a relationship must be maintained between two or more axes during motion.

Circular Interpolation

A coordinated motion circular segment is defined by three points. Circular motion begins with the end point of the last segment executed, or the current system position if the system is not in motion, moves in a circular arc through an intermediate point, and terminates at the specified endpoint.

Kinematics

In addition to the standard linear and circular segments, the VM Controller has the capability of executing forward and inverse kinematic movement by using an application-specific library of kinematic functions.

Kinematics must be developed by Indramat to customer specifications. Contact Indramat Applications Engineering to inquire about applications which could benefit from kinematics.

Electronic Line Shaft (ELS)

An Electronic Line Shaft is used to synchronize one or more slave axes to a master axis. An ELS master can be a real or virtual axis. A real master can be another axis in the system, or an external feedback device such as an encoder. A virtual master is a command generated by the VM System. *(See ELS Icon, Chapter 6 of the VisualMotion 6.0 Reference manual)* Each slave axis can use either **velocity**, **phase** or **cam synchronization**. An ELS also includes the capability to jog each axis synchronously or independently, and to adjust phase offset and velocity while the program is running.

Velocity synchronization relates slave axes to a master in terms of rotational rate. It is used when axis velocities are most critical, as in paper processing operations in which two or more motors act on a single piece of fragile material.

Phase synchronization maintains the same relative position among axes, but adjusts the lead or lag of the slaves to the master in terms of degrees. It is used when the positions of axes are most critical. For example, to achieve proper registration in printing operations, the axis controlling the print head may be programmed for a particular phase offset relative to some locating device, such as a proximity switch.

Cam synchronization is used when custom position, velocity or acceleration profiles are needed at a slave axis. These special profiles are developed at the slave by sending position commands every SERCOS cycle.

A cam is an (x, y) table of positions that relate a master axis to a slave. Cams can be stored on the CLC card or on the digital drive. CLC cams have more adjustment options and can work with any SERCOS drive. Drive cams are more efficient and can be applied to more axes. The same programming commands and utilities are used for both drive-resident and card-resident cams.

See Appendix C - ELS Configuration of the VisualMotion 6.0 Reference manual for more information.

1.5 CLC-D Overview

CLC-D02.3M hardware

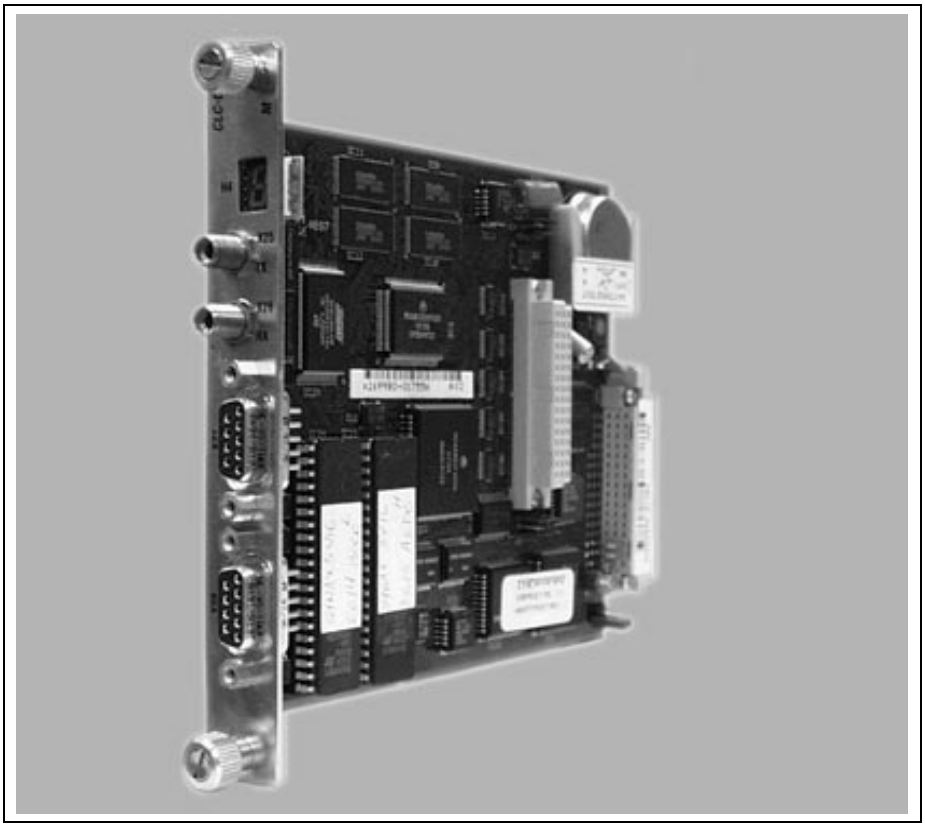


Figure 1-9: CLC-D02.3M Hardware

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.

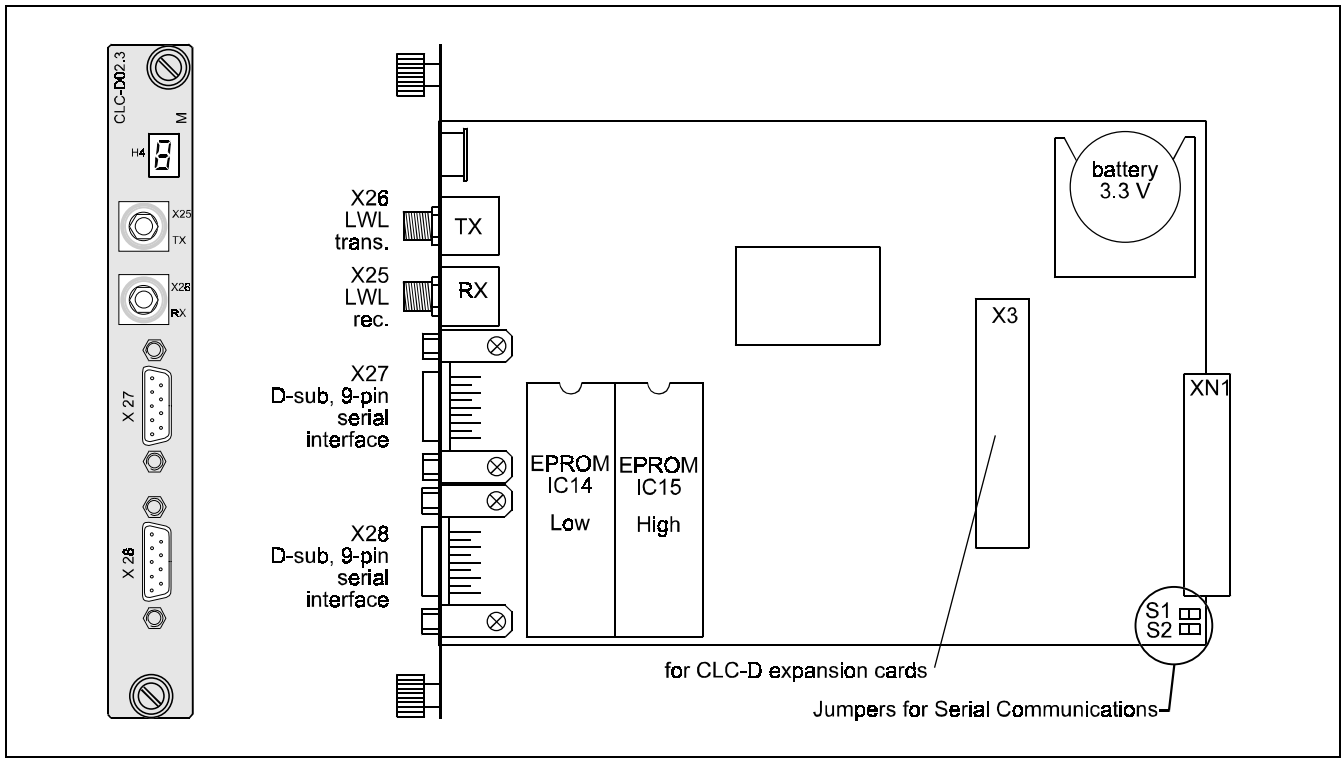


Figure 1-10: CLC-D jumper configuration

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.

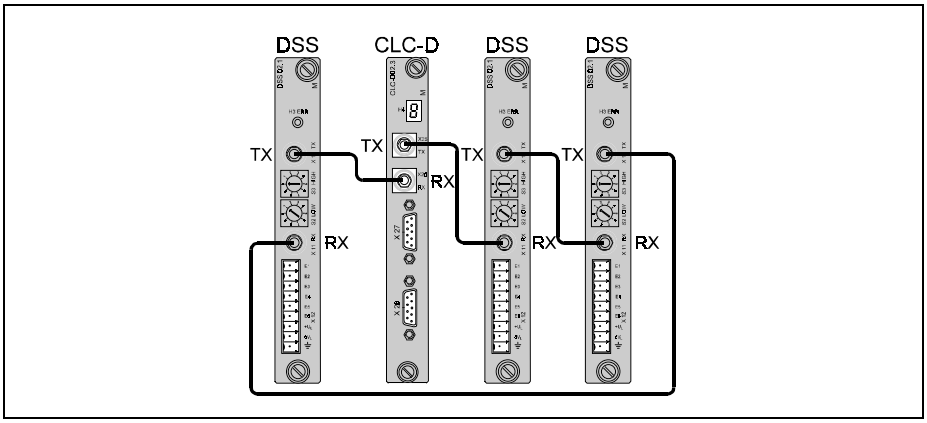


Figure 1-11: Fiber optic ring structure

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.

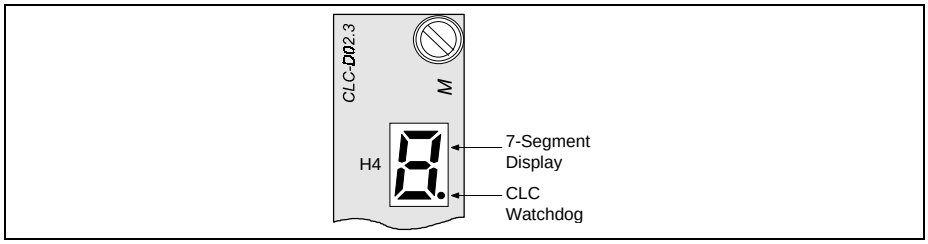


Figure 1-12: 7-segment display on the CLC-D

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.

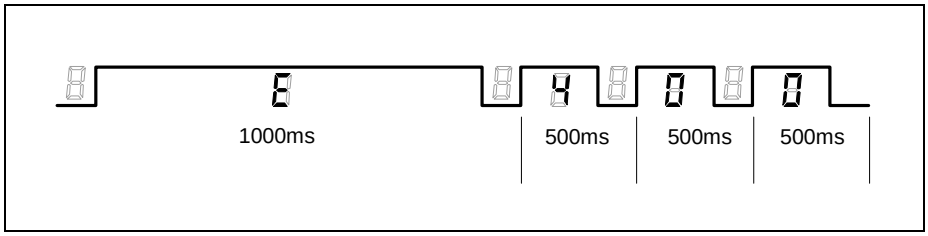


Figure 1-13: Example of an E400, Emergency Stop, error code

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.

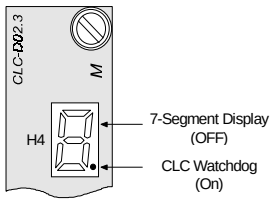


Figure 1-14: Watchdog message on the CLC

1.6 CLC-P01.1 Overview

CLC-P01.1 hardware

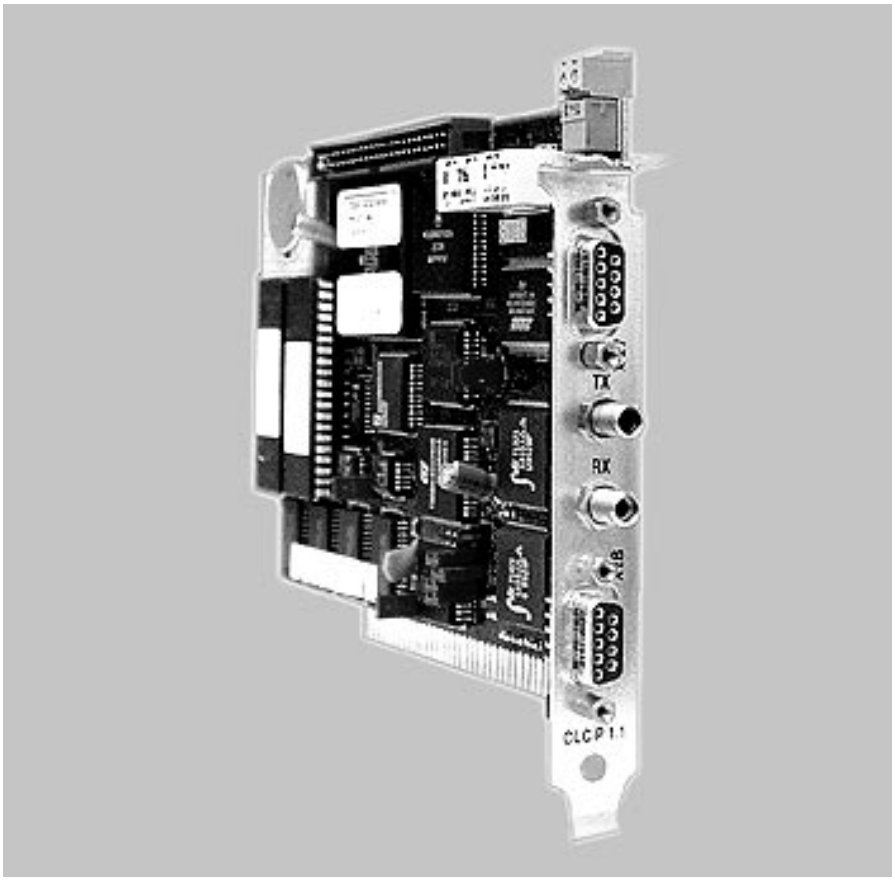


Figure 1-15: CLC-P01.1 Hardware

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.

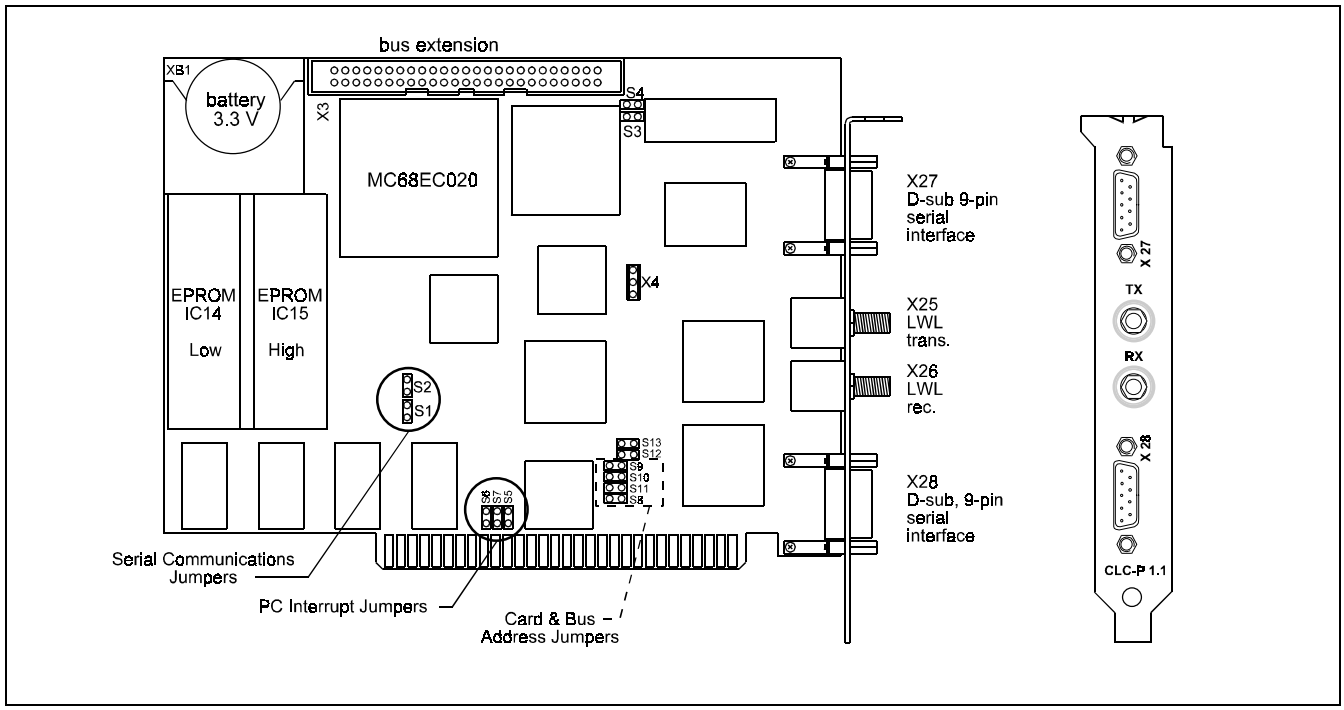


Figure 1-16: CLC-P01.1 jumper location

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***."

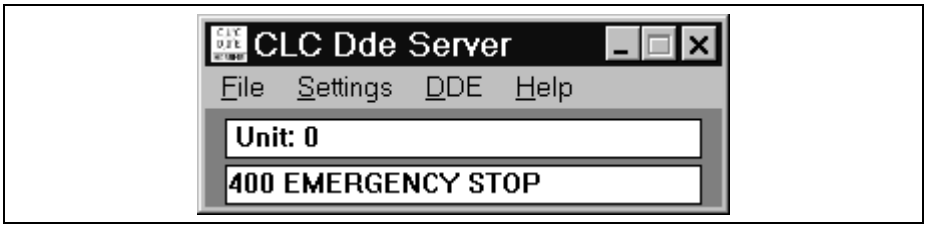


Figure 1-17: CLC DDE Server

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.

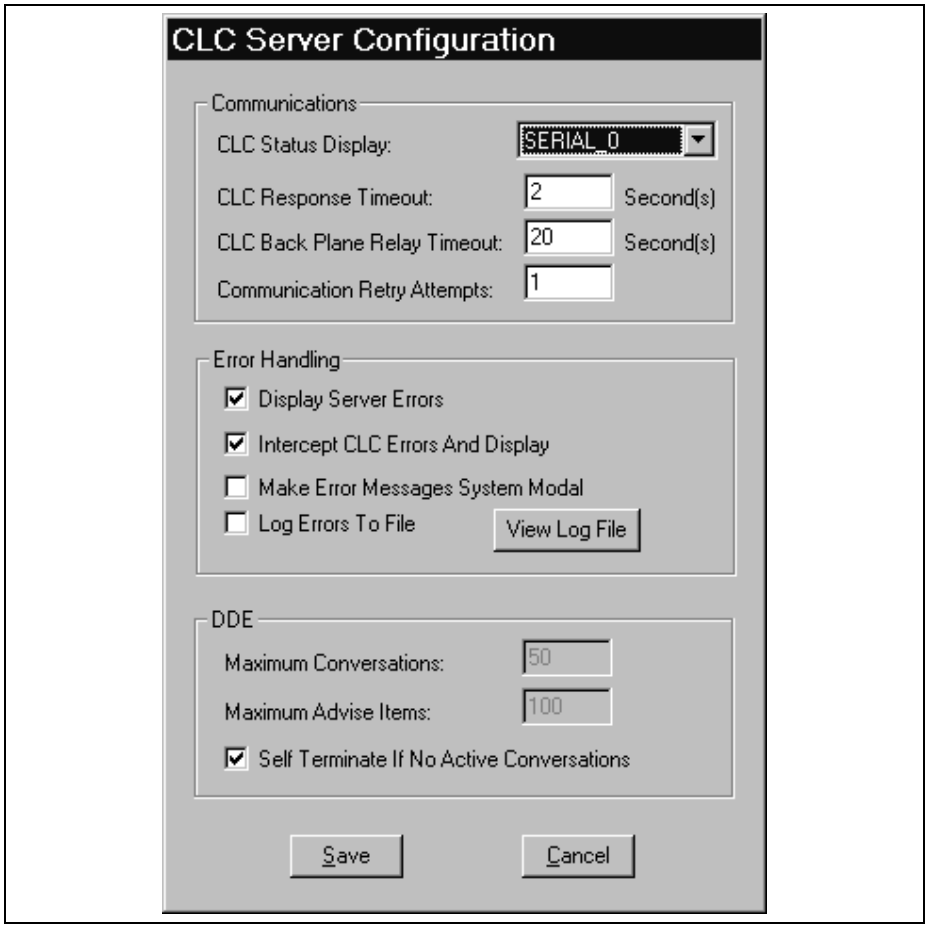


Figure 1-18: Setting SERIAL_0 for CLC Status Display - DDE Server

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.

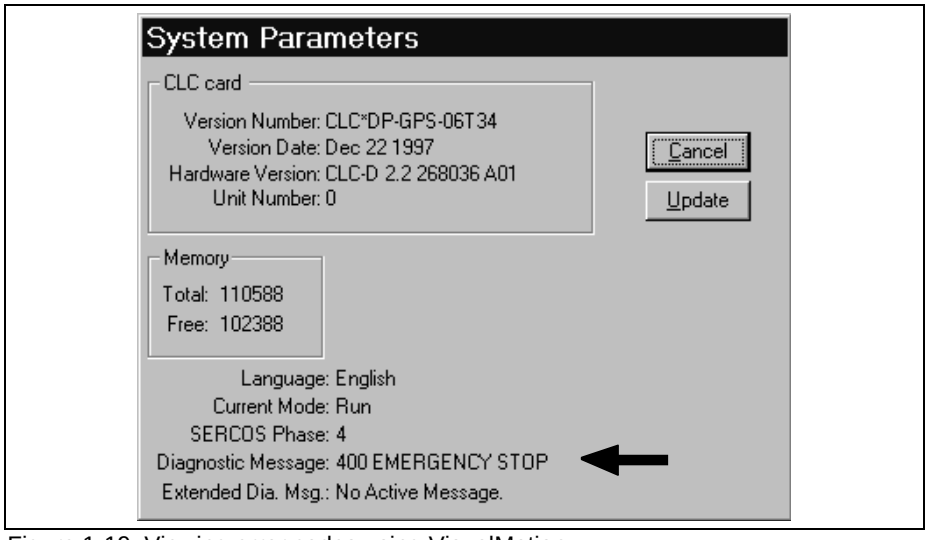


Figure 1-19: Viewing error codes using VisualMotion

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

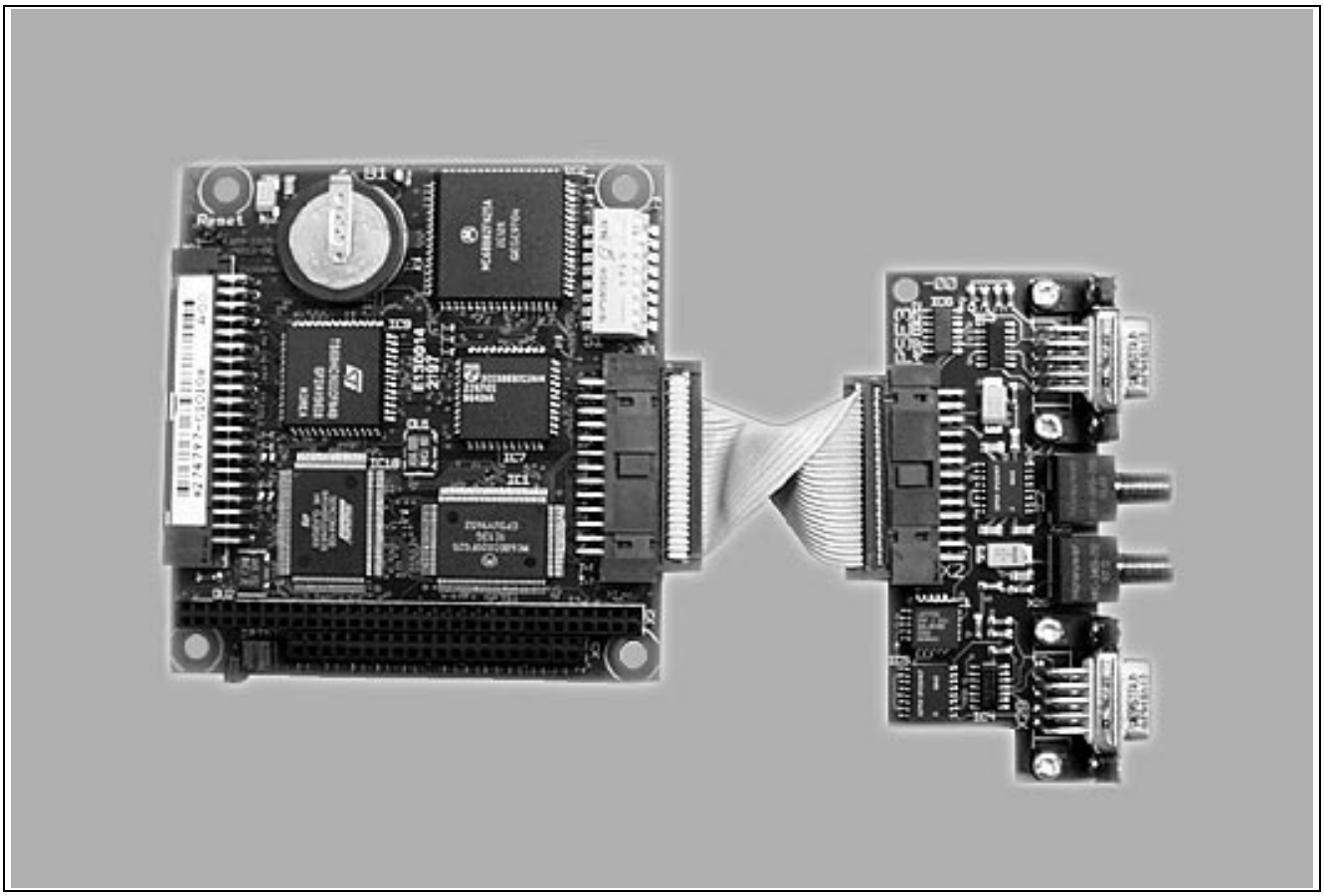


Figure 1-20: CLC-P02.2 Hardware

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.

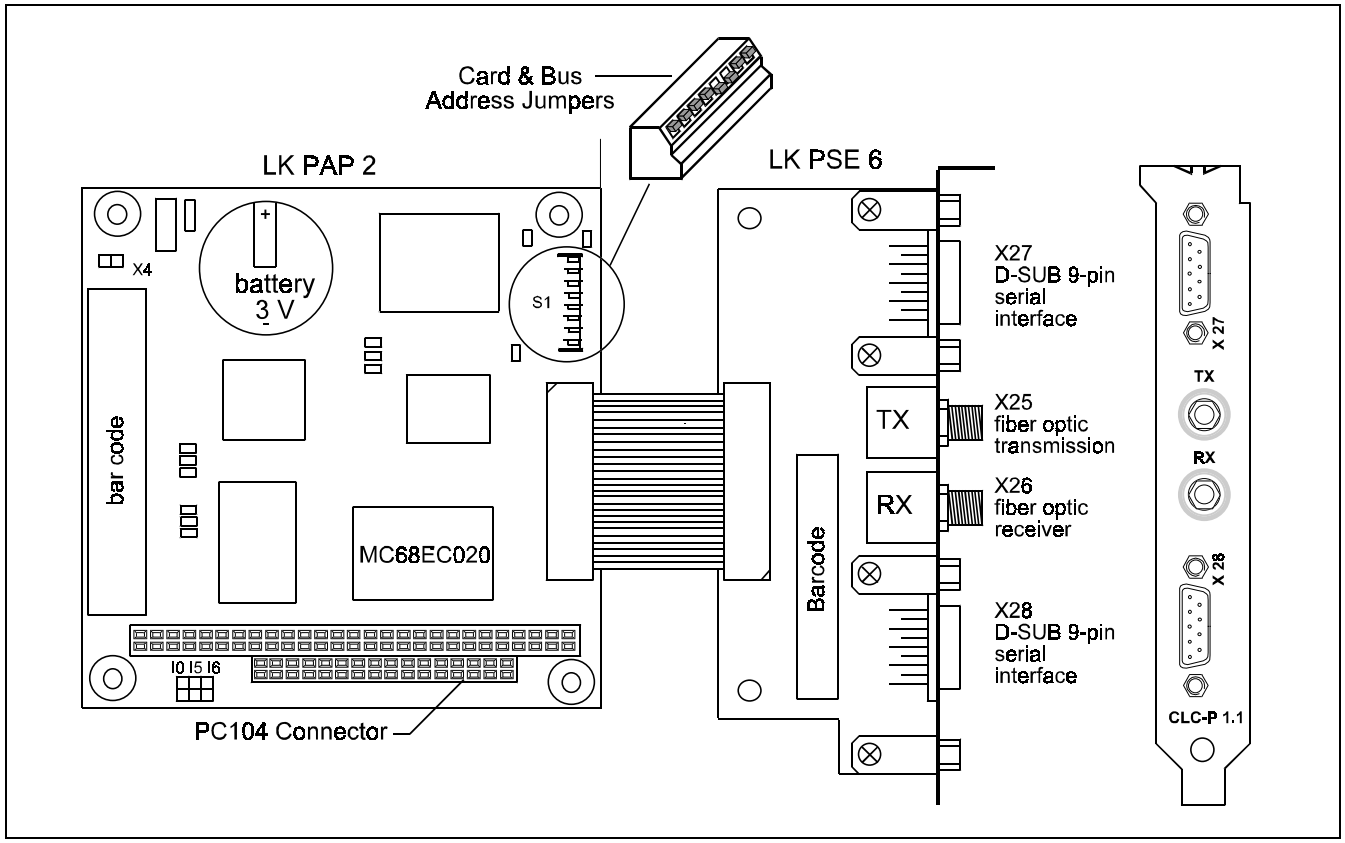


Figure 1-21: CLC-P02 jumper configuration

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

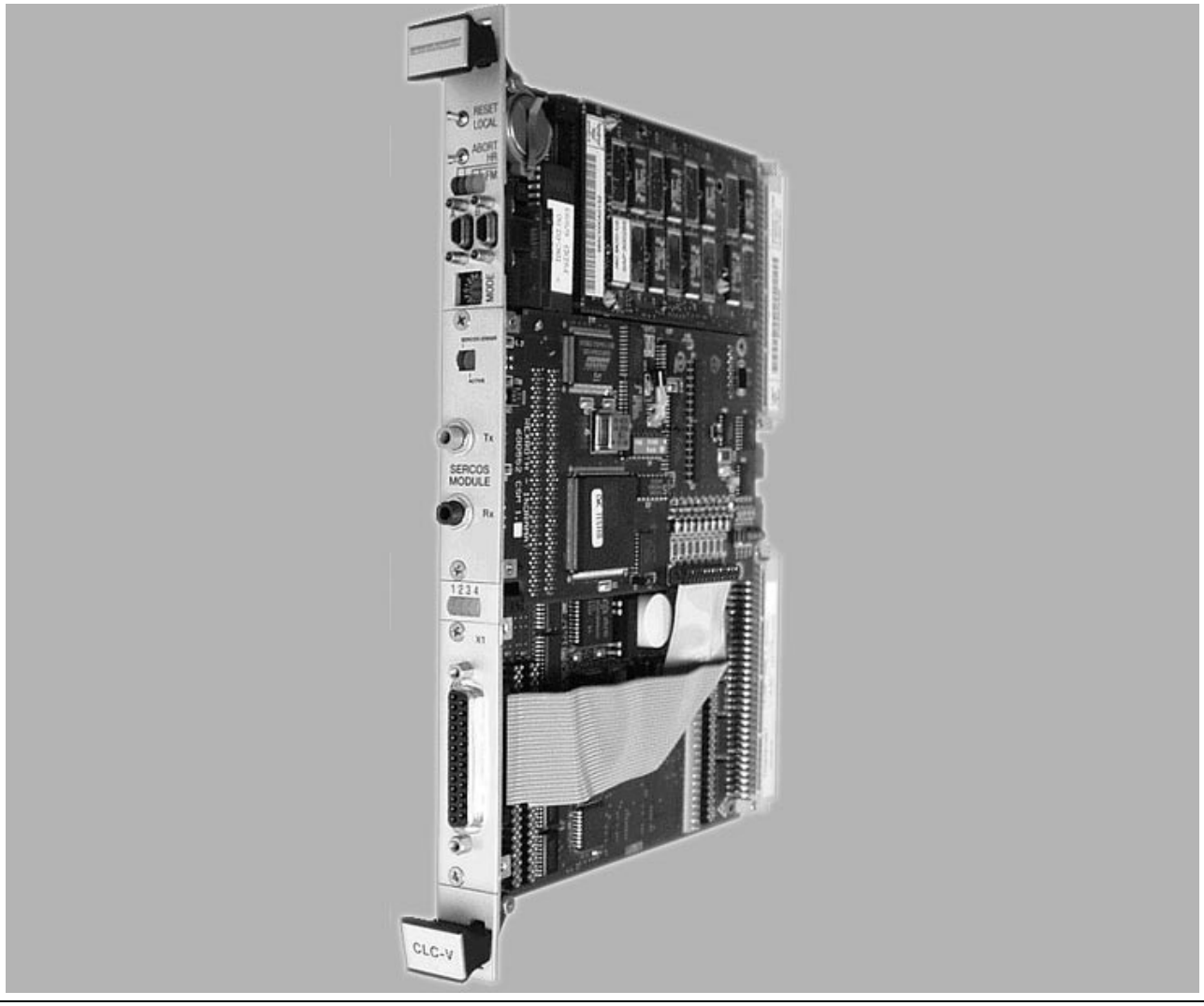


Figure 1-22: CLC-V02.3 Hardware

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

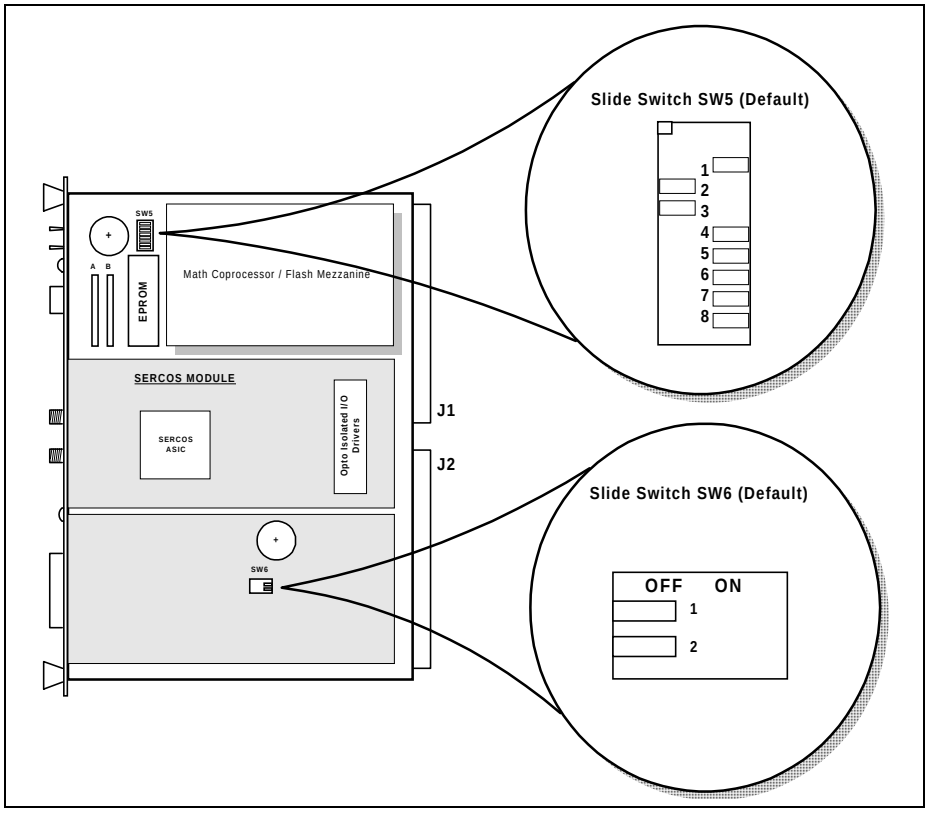


Figure 1-23: CLC-V Configuration Switches

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.

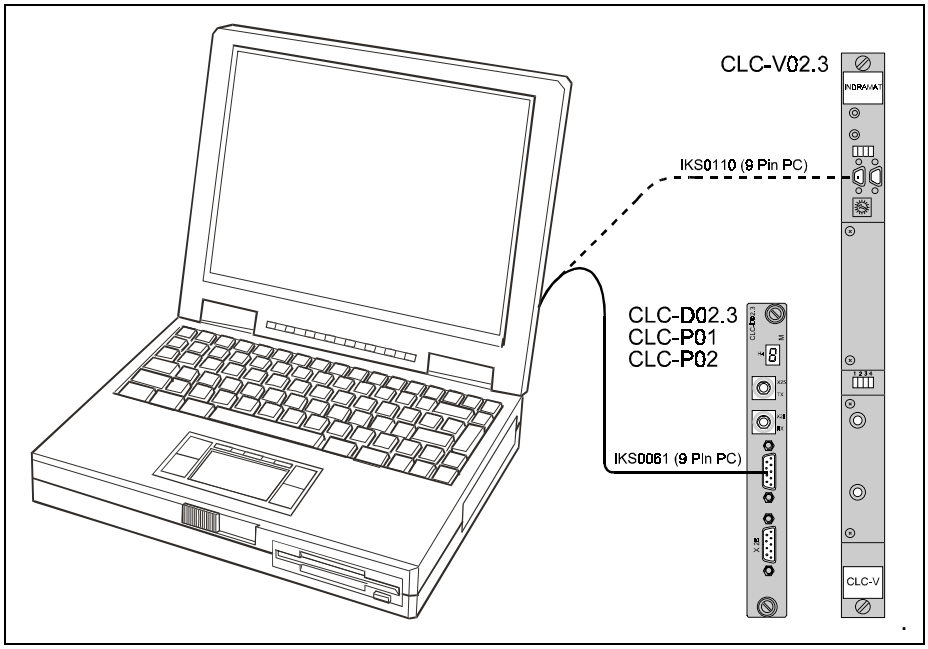


Figure 2-1: VisualMotion to PC connection diagram

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.

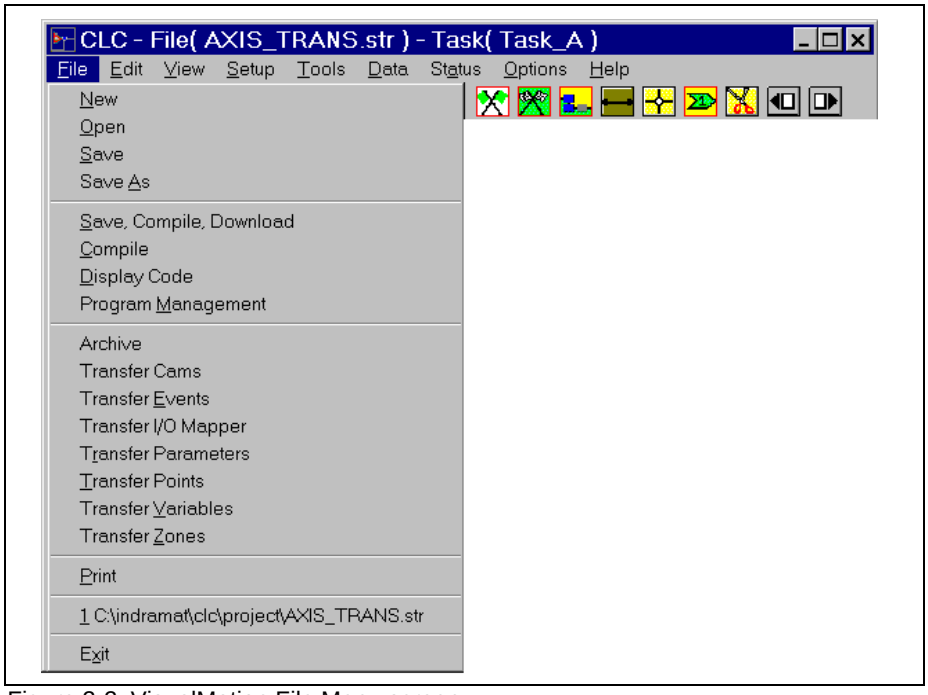


Figure 2-2: VisualMotion File Menu screen

Program Management

All available user programs can be viewed by selecting ***File*** ⇒ ***Program Management***. From this screen, the user can see which program is currently active on the card or active a different program in its place.

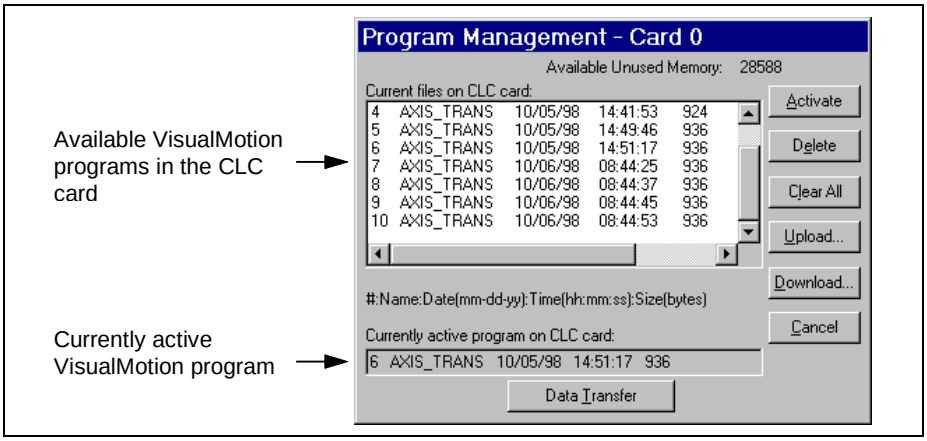


Figure 2-3: Program Management screen

Note: The following is a list of the basic file extension types used for viewing and editing VisualMotion programs:

- ***.str** - Graphical icon program file used by VisualMotion Toolkit
- ***.exb** - Compiled program file uploaded from the CLC containing current values, i.e., variables, points, event, etc.
- ***.exc** - Compiled program file downloaded to the CLC and activated using Program Management.

In order to properly trouble shoot a VisualMotion program, the ****.str*** (icon file) along with the ****.exb*** file are necessary.

VisualMotion Error

The CLC card can contain only 10 user programs at any one given time. If you try to Compile and Download a new VisualMotion program to the CLC card, the following VisualMotion Error appears notifying you that you have exceeded the maximum number of files. To clear this error, do the following:

⇒ Press OK

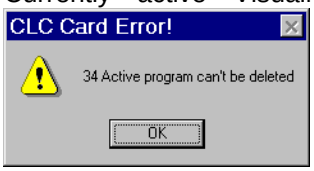
⇒ Delete one of the currently loaded programs in the card from the Program Management screen. This will bring the count to 9 programs.

⇒ Compile and Download the program by selecting ***File*** ⇒ ***Save, Compile, Download*** or press the  icon.

⇒ Once compiled, select and active the program by pressing the ***Activate*** button.

Figure 2-4: !24 Maximum number of files exceeded

Note: Currently active VisualMotion programs can't be deleted.



To delete an active program, you must first stop the program.
Then, select it from the Program Management screen and then press delete.

Program deletion should only be performed by authorized personnel.

For complete details of the Program Management screen, refer to the VisualMotion Reference manual.

Archive

The archive selection provides backup and restore functions for a CLC card. Backups of VisualMotion programs, I/O Mapper strings, and parameters of the CLC card and active drives are saved by default to the \indramat\clc\project\saveset directory. The **Browse** button allows the user to select another directory location. Programs, I/O Mapper equations, CLC card parameters, and drive parameters can also be selectively restored.

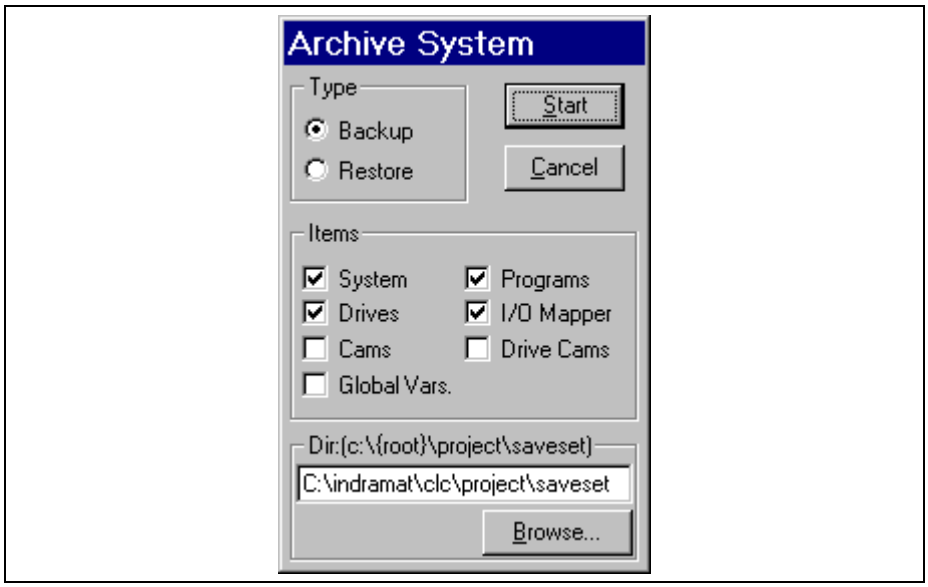


Figure 2-5: Archive System screen

Select Backup or Restore, then press the Start button to transfer. If restoring, the check boxes are enabled to allow selection of kind of data to be restored. During data transfer, a bar graph will advise you of progress.

Only parameter sets of active drives(those defined in the active program) will be backup. VisualMotion does not have knowledge of other drives. Backup files are named as follows:

Drives	"drivexx.prm"	where xx is the drive number
System	"system.prm"	
I/O Mapper	"mapper.iom"	
Programs	"mmmm.exn"	where mmmm is program name, n is program number

Note: Archived program files are saved with the following format:

program name.exn = where ***ex*** represents a compiled VisualMotion program and the number ***n*** represents the program number stored in the CLC card and viewable within the Program Management screen. Every program stored on the CLC and archived will have it own unique ****.exn*** file extension.

Cams	"cam.csv"

2.4 The View Menu

The view menu allows the user to select a task, subroutine or event function for displaying or editing. Choosing task, subroutine or an event function from the view menu loads the selected portion of the program into the VisualMotion toolkit workspace. This process replaces the current workspace contents.

Note: Before a program can be viewed it must first be opened using the ***File ⇒ Open*** menu selection. This menu selection opens the ***.str** file stored on the harddrive.

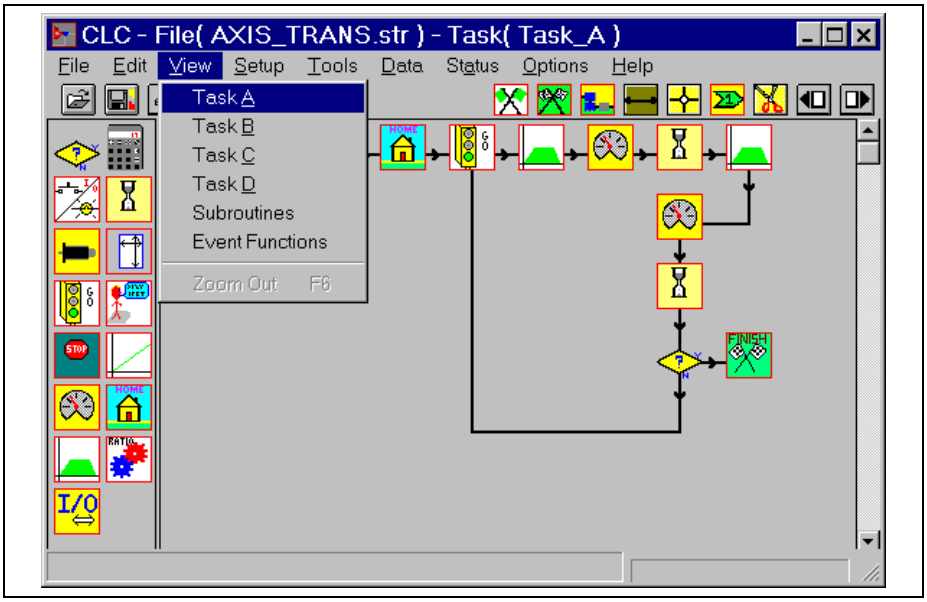


Figure 2-6: Viewing task in VisualMotion

Task VisualMotion can have up to 4 tasks running in each program. Tasks A-D run simultaneously and are given equal priority (task A is executed first.) A task is a process that the user runs in his machine. Using VisualMotion, the user can have 4 separate processes or task running simultaneously and each task can be independent of each other.

Subroutine Subroutines are basically sub-programs that are called by the main program when selected to start. They are used mainly to improve readability as well as simplify the program.

Event functions Events are basically interrupt driven subroutines. They can be triggered by a variety of methods, such as transition of an input, repeating timer, position trigger, etc.

Program flow After either selecting task, subroutine, or event function, the user can view the program flow by pressing <F7> or selecting ***Show program flow*** from the Tools menu. Program flow can be viewed after a program has been started.

Note: You must connected to the CLC card with the currently active program on the screen in order to see program flow. In order to have the show program flow function available, a ***.map** file needs to be generated when the program is compiled and download. Refer to ***Setup ⇒ Configuration*** for details.

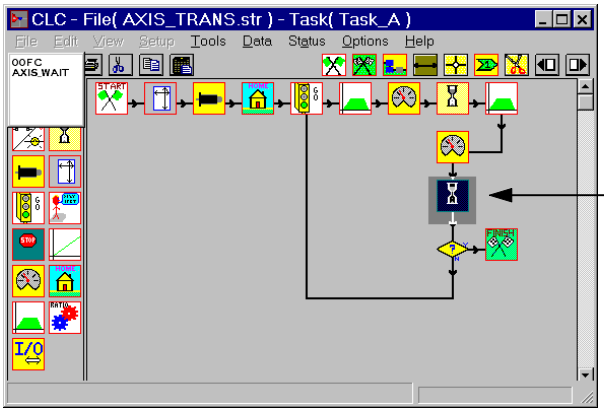


Figure 2-7: VisualMotion program flow

2.5 The Setup Menu

This menu is used to setup and establishes communication as follows:

- Card Selection: communications method between the CLC and the DDE Server
- Configuration: defines directory structure for saving VisualMotion program files and language settings
- Drives: setup drive and motor parameters and view drive diagnostics
- Drives Help Dir. Help files are configured for current version
- Coordinated Motion: setup coordinated motion features
  - *jogging acceleration*
  - *jogging*
  - *task limits*
- I/O Setup: allows viewing and editing of the I/O hardware setup for VisualMotion
- Overview: Allows viewing and editing of parameters for…
  - *Card*
  - *Drives*
  - *Task*
  - *Axis*
- CLC Serial Ports: setting communication Baud rates for port 1: X27 and port 2: X28
- VME Configure: used to configure a CLC-V card within a VME rack

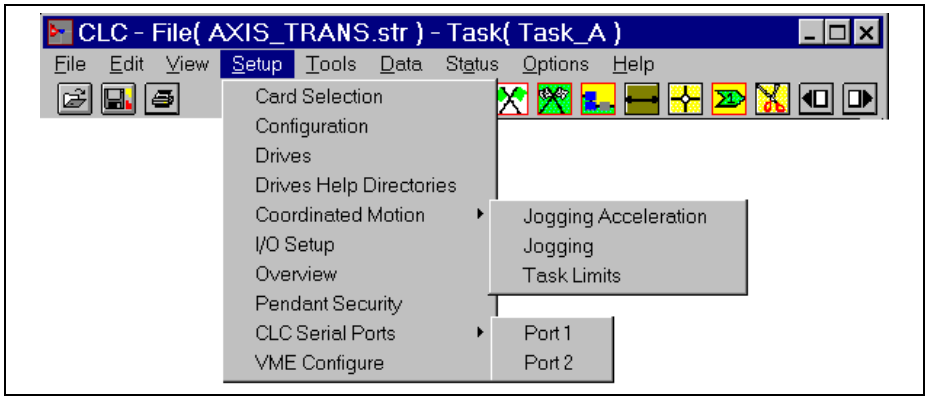


Figure 2-8: Setup Menu screen

Most of the setup configuration above is typically perform by the machine builder. The user can normally use the setup menu to verify setting and view parameter settings when diagnosing an error.

The following selections from the setup menu are typically operations that can be perform by the user.

Card Selection

Card selection determines the communication method that will be used for communicating to the VM Controller card. The user must identify the method for which to communicate information from the Host to the VMC. The user must also enter the card number.

Figure 2-9: Card Selection screen

Connection Method	DDE Link (read only) Service	Topic	Description
Serial	CLC_DDE	serial_0	Serial connection between PC and CLC-D/P/V
Xycom VME	CLC_DDE	xycom_0	Xycom PC in VME rack talking to CLC-V
PC ISA Bus	CLC_DDE	ISA_0	PC talking over the ISA Bus to a CLC-P
AT Modem	CLC_DDE	AT_Modem_0	Modem communication from PC to CLC

Connection Method	DDE Link (read only) Service	Topic	Description
Demo	CLC_DDE	demo_0	used by developers for demonstrations
GE Plug & Play	CLC_DDE	GE_P&P_0	GE PC in VME rack talking to CLC-V
CLC File	CLC_File	*.ex*	Offline configuration
PC-104 Bus	CLC_DDE	PC104_0	PC talking over the PC/104 platform to a CLC-P02

Table 2-1: Card Selection Setup options

For a functioning system, to determine what number the installed CLC card is assigned to, select ***Setup ⇒ Overview***. Under ***Param source*** select the CLC card radio button and click on OK. Parameter C-0-0002, Unit Number, should be set to the same number as in the Card Selection Setup.

Note: Before editing any CLC card parameters, stop any running programs and switch the system to parameter mode. **Parameter values should always be performed by trained authorized personnel.**

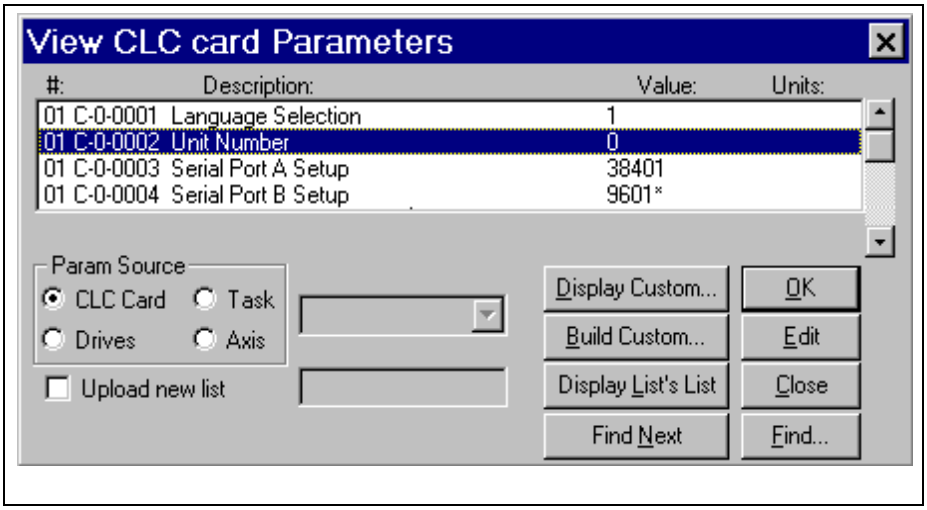


Figure 2-10: Selecting CLC card number under Overview

Configuration

The user can select the type of **Windows editor** that will be used for the following operations.

- Viewing system parameters under ***File ⇒ Transfer Parameters***
- Display code for VisualMotion program under ***File ⇒ Display code***
- Text language programming instead of icon programming

Note: Notepad is the default Windows editor selected when VisualMotion is first installed and is limited for viewing smaller text files. If a Windows error is encountered when a text file is too large for viewing, select a Windows editor with larger file capabilities, such as Wordpad.

Caution

Maintain ASCII formats when editing text files.
Download errors will occur if text format is not true ASCII.
⇒ Always use true ASCII format Windows editors, such as notepad or WordPad when editing and/or downloading system parameters and VisualMotion text language programs.

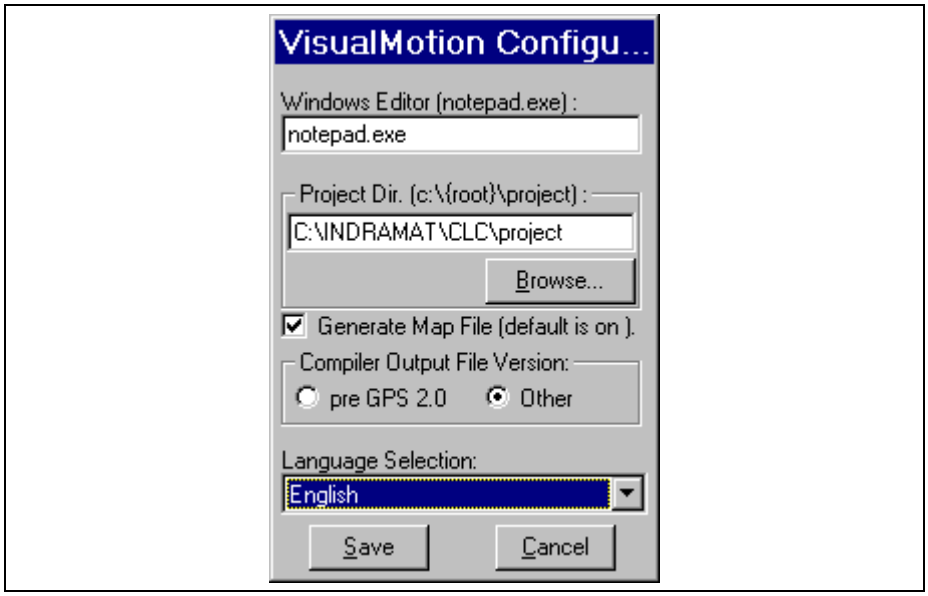


Figure 2-11: Configuration screen under Setup

Project Directory

Select the directory for file storage. The default is c:\indramat\clc\project. The Browse button simplifies the selection of the project directory.

Generate Map File

This option generates a map file (*.map) when VisualMotion icon based programs are compiled. This map file is used for showing program flow when the user selects <F7>. The check box is on as a default.

Language Selection

VisualMotion can be viewed in either English or German. This options also directly writes to the CLC card parameter C-0-0001, Language. Both VisualMotion Toolkit and CLC card language are set with this option.

CLC card parameter

C-0-0001 0 = German
1 = English

Drives

When opened, the CLC Drive Parameter Editor uploads the current status information for drive #1 (the default). The current drive status is also displayed. The Position, Velocity and Acceleration values from the CLC card are displayed along with the feedback status from the selected drive.

The Drive # box allows selection of another drive by entering a drive number or scrolling with the up or down list button.

Since the drive internally generates rate profiles for single axis motion, the programmed acceleration is also displayed. Acceleration is not shown for coordinated motion since the CLC path planner manages acceleration for coordinated motion.

Note: More than one session of VisualMotion's CLC Drive Parameter Editor can be run by selecting ***Drives*** once again from the ***Setup*** menu. This can be useful if you want to view more than one axis. However opening additional sessions of Parameter Editor will slow down the update time to all sessions opened.

Note: If the drive controller connected to the VisualMotion system experiences an error, the user can obtain drive status information from the Status message displayed within VisualMotion's CLC Drive Parameter Editor.

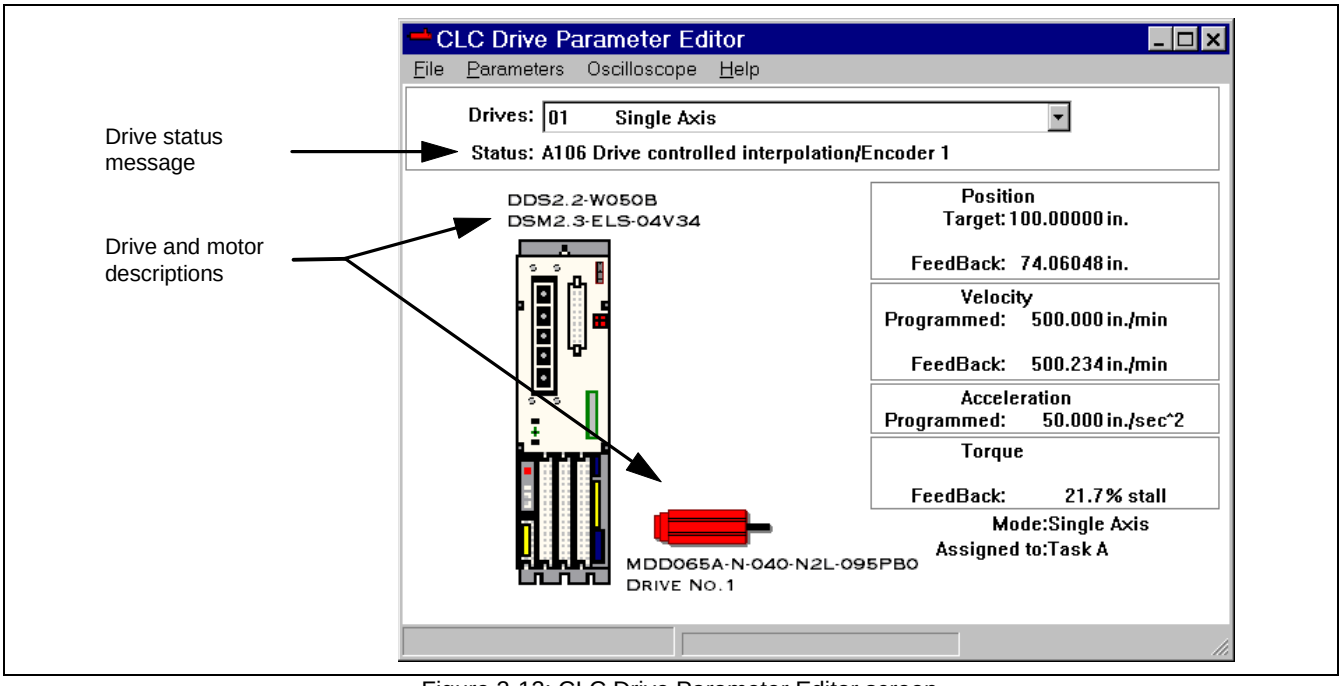


Figure 2-12: CLC Drive Parameter Editor screen

Note: From the above screen, the user can verify drive type, firmware version, and motor type from the descriptions above the drive and below the motor.

File menu

From the file menu, the user can load default drive parameters.

Caution

Load Default Parameters caution.
This process overwrites any changes made to the drive parameters set by the O.E.M.
⇒ **Loading default parameters should only be perform by trained authorized personnel.**

Uploading Drive parameters

The user can upload VisualMotion parameters, by selecting the Transfer Parameters option from the file menu. This is helpful for determining set drive parameters when errors are issued within Status. Refer to Figure 2-12: CLC Drive Parameter Editor screen.

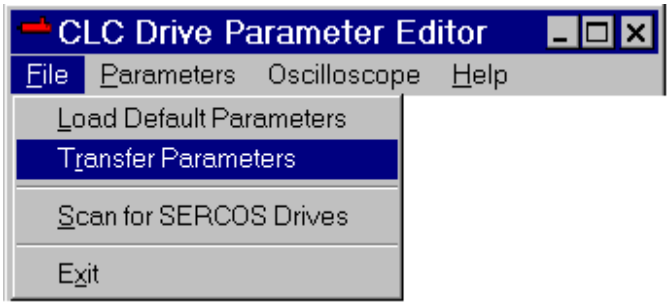


Figure 2-13: CLC Parameter Editor - File Menu

Transfer Parameters

This menu item uploads parameters to a file for archiving or viewing, and downloads archived parameters from a file to the selected drive.

Note: This option only transfers the parameters for the servo drive; it does not transfer any other CLC parameters.

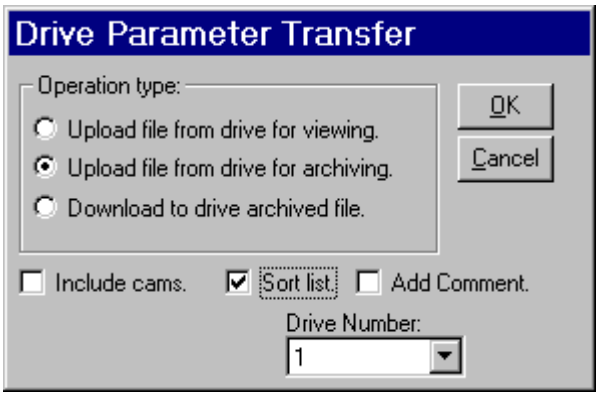


Figure 2-14: Drive Parameter Transfer screen

Each drive has one parameter set that can be transferred. Any operation within this screen requires a drive number before proceeding. The parameter set for the selected drive other than the drive containing the CLC card is transferred through the SERCOS communication ring.

Parameters may be uploaded in one of two formats. Uploading for archiving saves the file with the ".prm" file extension in the :\PROJECT\SAVESET directory, with the data in the proper format for downloading to the drive. Uploading for viewing saves the file to the same sub-directory as a text file

with a ".txt" extension and may be viewed using Notepad or another ASCII text editor or file viewer.

Note: A *.txt parameter set uploaded for viewing cannot be downloaded to the drive.

Caution

Maintain ASCII formats when editing text files.

CLC's download errors will occur if text format is not true ASCII.

⇒ Always use true ASCII format Windows editors, such as notepad or WordPad when editing and/or downloading system parameters and VisualMotion text language programs.

CLC Serial Ports

Serial port setup allows the user to set the desired communication baud rate between the CLC card and the host PC running VisualMotion and the CLC DDE Server.

Refer to chapter 4 for detailed information on the CLC DDE Server.

CLC Serial Communication

Serial Port 1

Changes to serial port 1 are written directly to CLC card parameter C-0-0003. This parameter can be view under ***Setup ⇒ Overview***. Under ***Param source*** select the CLC card radio button and click on OK.

Format:	Baud Rate + Option
Valid Baud Rates:	300, 1200, 2400, 4800, 9600, 19200, 38400
Valid Options:	1 = checksum on
Default:	9601 (9600 baud, checksum on)
Attributes:	Integer, Read/write at any time
Modes:	RS232, RS422, RS485

This parameter sets the baud rate and options for Serial Port 1 (X27 on CLC/D, CLC/P and CLC-V), which communicates with a PC, a terminal, or any device that follows the CLC ASCII Host Protocol. This port always operates with 8 data bits, 1 stop bit, and no parity.

If the checksum option is enabled, the CLC will send a checksum as described in the Host Protocol Description, and will check the checksum in data received from the host. The options are added together with the baud rate. For example, to set 9600 baud, checksum on, the parameter would be set to (9600 + 1)= 9601.

Note: The baud rate of serial port 1 is forced to 9600 if a jumper is set on S1 of the CLC-D and CLC-V cards. An asterisk appears to the right of card parameter C-0-0003 indicating that a jumper is set on S1. Example: 9601* Refer to Figure 2-10
Another method for determining if a jumper is set on S1 is to open the setup port screen under ***Setup ⇒ CLC Serial Ports***, and if a jumper is set the following message appears at the bottom of the screen.

"Port forced to 9600, RS232 by jumper on card"

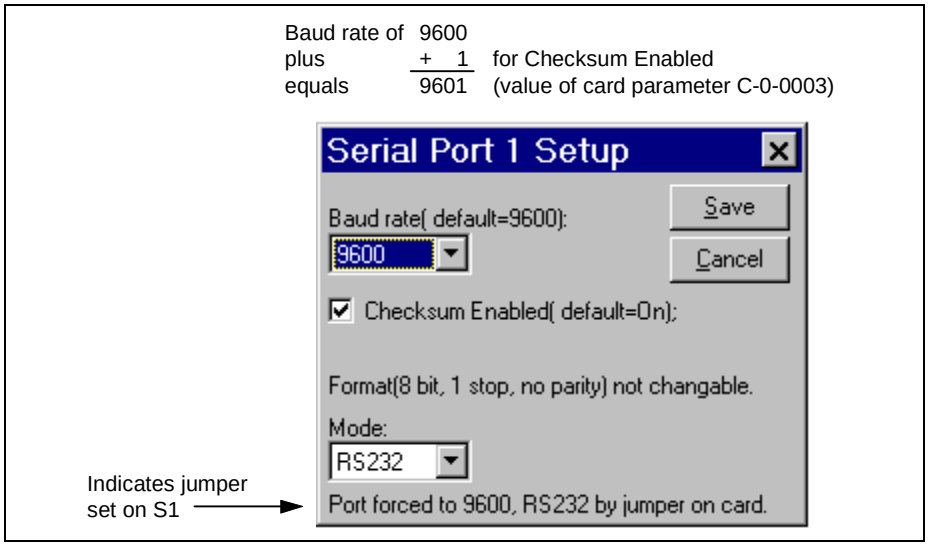


Figure 2-15: Serial port 1 setup

Serial Port 2

Changes to serial port 2 are written directly to CLC card parameter C-0-0004. This parameter can be view under ***Setup ⇒ Overview***. Under ***Param source*** select the CLC card radio button and click on OK.

Format:	Baud Rate + Options
Valid Baud Rates:	1200, 2400, 4800, 9600
Options for Host Protocol:	1 = checksum on
	2 = send CLC status (option not activated)
Default:	9601 (9600 + checksum on)
Attributes:	Integer, Read/write at any time
Modes:	RS232, RS422, RS485

This parameter sets the baud rate and options for Serial Port 2 (X28 on CLC/D and CLC/P). A device selected under ***Type:*** connected to this port is written directly to card parameter C-0-0012. Refer to the VisualMotion Reference manual. This port always operates with 8 data bits, 1 stop bit, and no parity.

Note: If a device being selected under **Type** requires a RS422 or RS485 serial communication, such as a BTC06 Teach Pendant (RS422), make certain that the S2 jumper is not set.

Note: *The baud rate of this port is limited to 9600 although higher baud rates appear within the Baud rate selection pull down list. For high-speed host communications above 9600, port 1 (X27) should be used without a jumper on S1.*

Note: The baud rate of serial port 2 is forced to 9600 if a jumper is set on S2 of the CLC-D and CLC-P cards. An asterisk appears to the right of card parameter C-0-0004 indicating that a jumper is set on S2. Another method for determining if a jumper is set on S2 is to open the setup port screen under ***Setup ⇒ CLC Serial Ports***, and if a jumper is set the following message appears at the bottom of the screen.

"Port forced to 9600, RS232 by jumper on card"

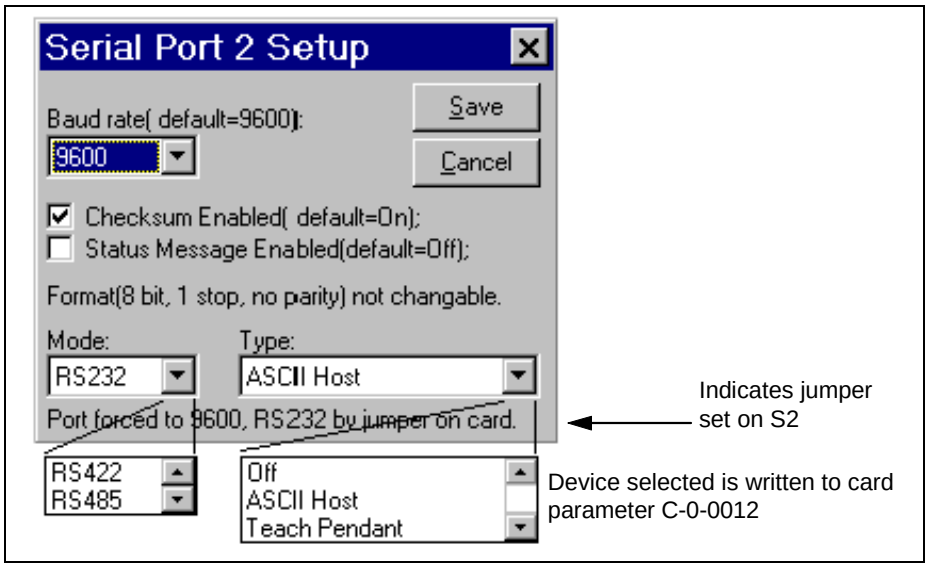


Figure 2-16: Serial port 2 setup

2.6 The Tool Menu

The Tool menu is used for configuring and monitoring using the following options.

- Break Point
- Cam Builder: used to build a table of positions that relates a master axis to a slave
- Jogging: used to jog any axis on the system that is velocity or single axis mode
- Oscilloscope This utility is used to capture and display run-time data
- VisualMotion 32 Release6 opens a new session of VisualMotion in order to access other programs and utilities from within VisualMotion
- Show Program Flow F7 used to highlight to currently executing program icon.

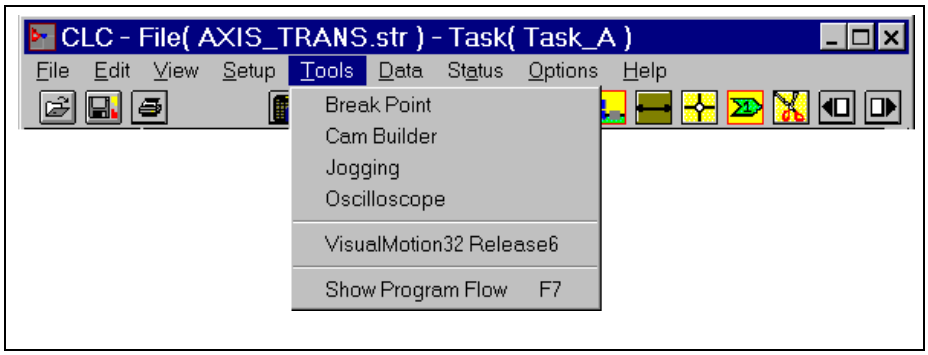


Figure 2-17: Tools menu screen

Jogging

The jogging option within VisualMotion Toolkit gives the user the ability to jog an axis programmed for Velocity or Single axis with a great deal of accuracy and ease. For Coordinated motion programs, all jogging functions are controlled by the *Axis(n)_Control* and *Task(A-D)_Jog* Registers.

Axis Control Registers 11-18, 209-240

Task Jog Control Registers 7-10

Refer to chapter 2, CLC Input/Output Systems, of the VisualMotion Reference manual for a complete description of the above mentioned functions and registers.

Caution

Jogging an axis in a mode other than manual

Damage to personnel or machine can result from improper jogging

⇒ Jogging can also be performed while in Auto mode or while a Task is running. This jogging function should only be performed by personnel who are completely familiar with the machine's motion capabilities.

To jog a given axis, the system must in manual mode.

Select ***Tools*** ⇒ ***Jogging*** from the menu and specify an axis. To specify a distance and rate (velocity), select ***Axis*** from the ***Options*** menu.

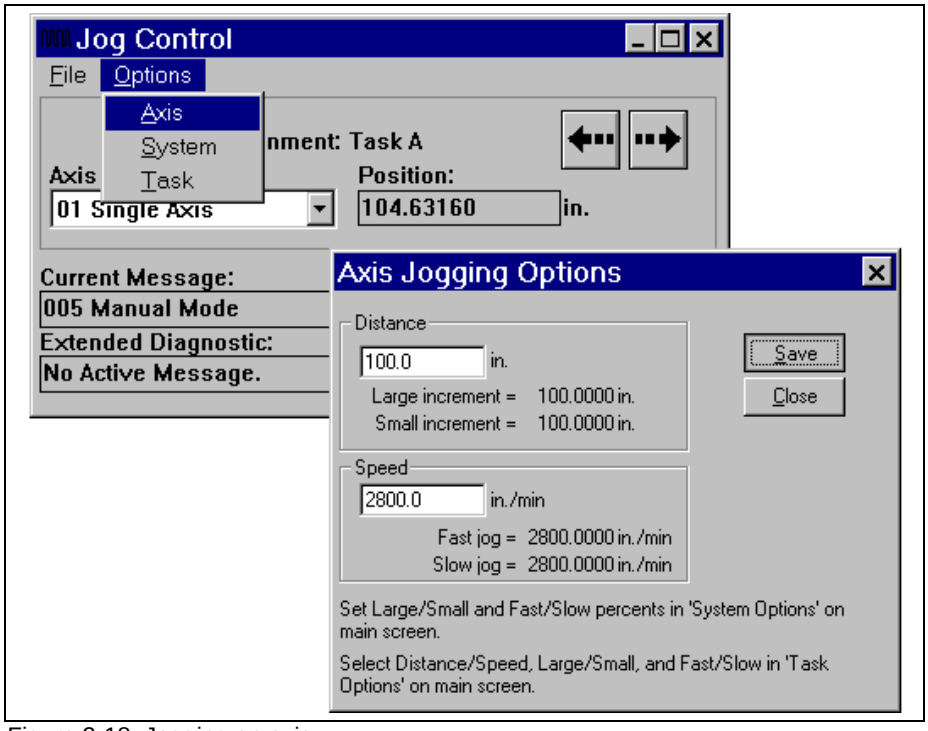
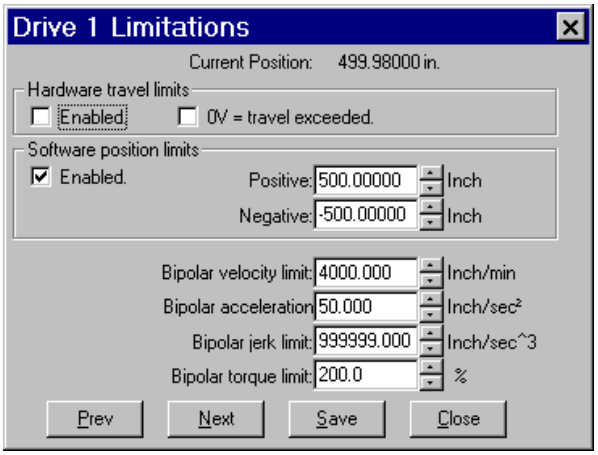


Figure 2-18: Jogging an axis

Note: The position field within the Jog Control window is limited by the following drive parameters if software travel limits are enabled.

S-0-0049 Positive position limit value
S-0-0050 Negative position limit value

Otherwise, the axis will travel until a physical travel limit switch is reached.
These parameters can be enabled and modified by editing the Drive limit parameters within VisualMotion Toolkit's CLC Drive Parameter Editor.



Refer to Drives on page 2-10 for more information.

Axis Jogging Options

Distance: The distance the axis will jog, either positive (right arrow) or negative (left arrow), when one of the directional arrows is clicked and held.

Speed: The speed the axis will travel when commanded by directional arrows. For precision, reduce the speed of the axis.

For a complete description of all the available options within Jogging, refer to the VisualMotion Reference Manual.

Show Program Flow <F7>

VisualMotion Toolkit gives the user the ability to follow along with the program flow by selecting Show Program Flow under Tools or press F7. Program flow can also be used to help locate incorrectly programmed icon instruction when diagnostic error messages appear.

Show Program Flow utilizes a map file (*.map) generated at compile time to tag the screen location of an instruction. If this *.map file is not found, or if the icons have been moved, added or deleted since the time the program was compiled and downloaded, erroneous program flow may appear.

During Show Program Flow other menu items are disabled, selecting Show Program Flow a second time enables the other menu items and removes the highlighting. Refer to Figure 2-7: VisualMotion program flow.

2.7 The Data Menu

The Data menu is used for configuring and programming key interfaces with external I/O and devices.

- CAM Indexer — Index cams are CLC cams that use equations to compute a position, as opposed to a normal cam, which uses a point table.
- Events — displays a list of events for viewing and editing that have downloaded to the CLC card.
- Field Bus Mapper — used to create data interchanging bridges between the CLC card and an optional Field bus slave card.
- I/O Mapper — used to map physical I/O bits to the control and status registers. Defines set of logical conditions for changing the states of CLC register bits.
- PID (Proportional, Integral, Derivative) — used to configure set points, feedback, and output variables of optional PID loop control routines. Control factors (Kp proportional gain; Ki integral gain; Kd derivative gain)
- PLS (Programmable Limit Switch) — programmable limit switches can be defined as a set of 16 output bit positions that come on and off when the master position is on range.
- Points — Points are used in coordinated motion programs to describe a location in Cartesian coordinates, tool orientation, and associated events. Also used to store points for Cam builder icon.
- Registration — Not functional for GPS 06VRS

- Registers — registers are a block of memory on the CLC card used to handled I/O and/or bit settings.
- Sequencer — The CLC Sequencer provides the user with a facility for making machine operational changes without having to edit, recompile and download a program to the CLC Card. Sequencer must be configured in original program to support this function.
- Variables — The CLC Variables dialog box permits viewing the integer and floating point variables of a CLC resident program.
- Zones — This Windows utility allows viewing and editing of the zone table on the CLC card. Zones can be used in coordinated motion programs to describe a volume of space where motion of any kind is prevented.

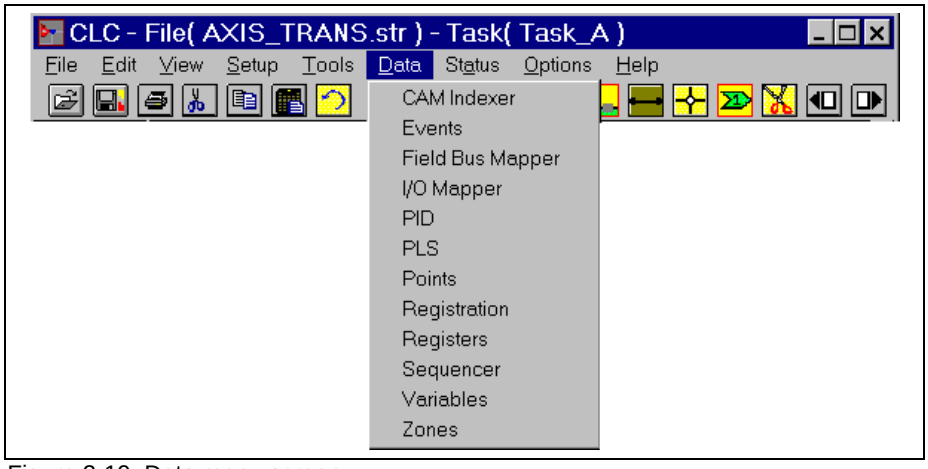


Figure 2-19: Data menu screen

Many of the selections under the data menu are normally performed by the machine builder or experienced VisualMotion programmer. The user typically acquires information from Events, I/O Mapper, Registers, and Variables.

Events

Events are basically interrupt driven subroutines. A list of active events can be viewed by selecting ***Data ⇒ Events***. Events by nature are normally short and to the point; otherwise, the processor will be loaded with executing a lengthy event program. Double-clicking on an event number allows the user to assign an event type.

Note: Before Events can be viewed in the Active Program, Event screen, they must first be assigned program memory in the sizing icon and then compiled and downloaded on to the CLC card.

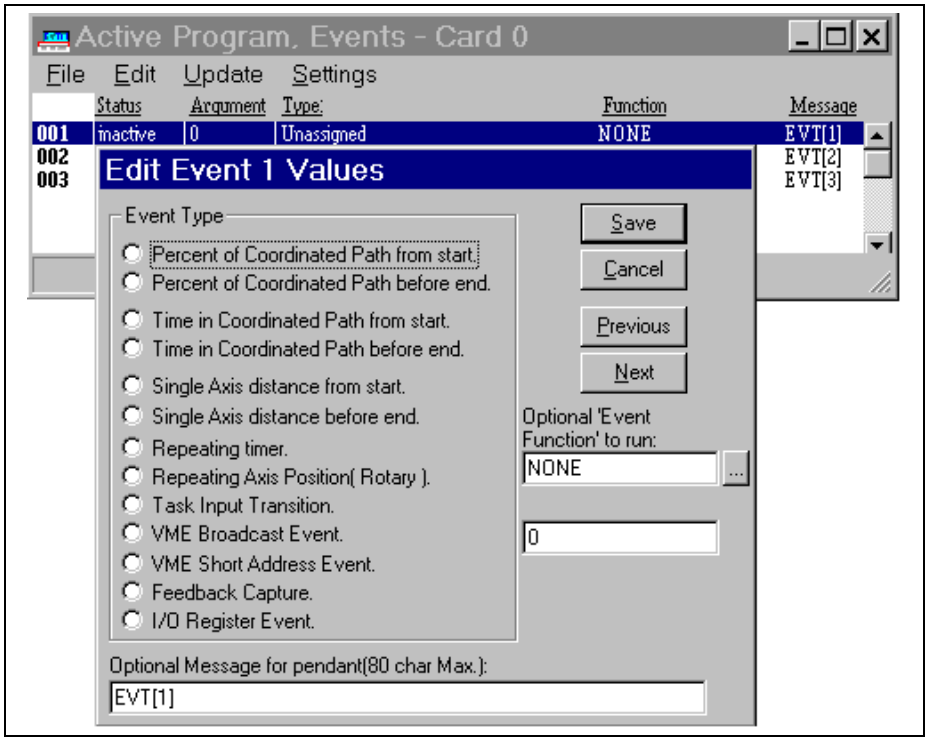


Figure 2-20: Events screen

The number of available events is directly controlled by the numbers of events selected initially in the sizing icon. The information in the sizing icon resides in the compiled program in the CLC as well as in the ***.str** file.

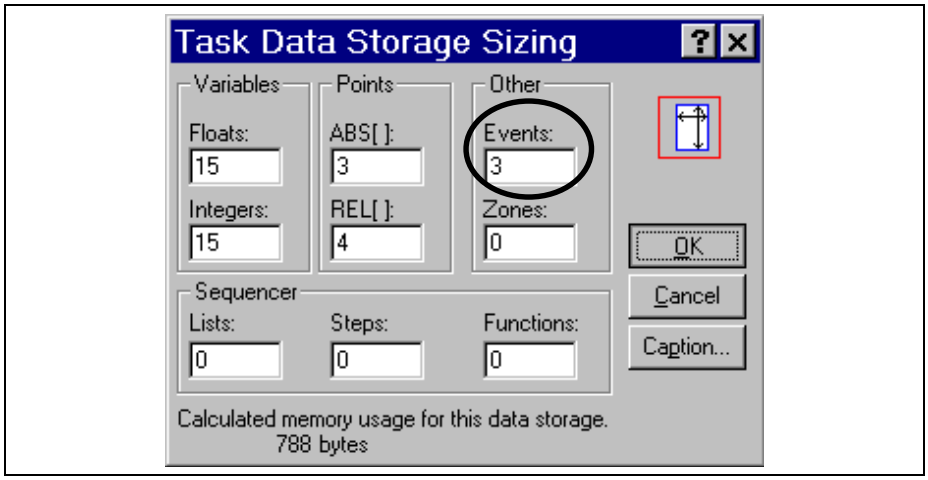


Figure 2-21: Events selected in sizing icon

Only those event routines that were created by the ***Edit ⇒ Add Event Function*** can be configured and activated. Use ***Settings*** to verify CLC card setup.

I/O Mapper

The I/O Mapper is displayed by selecting ***Data ⇒ I/O Mapper***. VisualMotion's I/O mapper allows manipulation of I/O registers using Boolean strings or an optional ladder logic interface. The I/O Mapper can be used to map physical I/O bits to the control and status registers of the CLC card.

The I/O Mapper runs continuously in the background and is updated every CLC program cycle (2ms or 4ms.)

Uploading I/O Mapper

To view the I/O Mapper on the CLC card, the user must ***Upload Strings*** from the file menu. Figure 2-22 shows the I/O Mapper open displaying the I/O configuration in ladder logic.

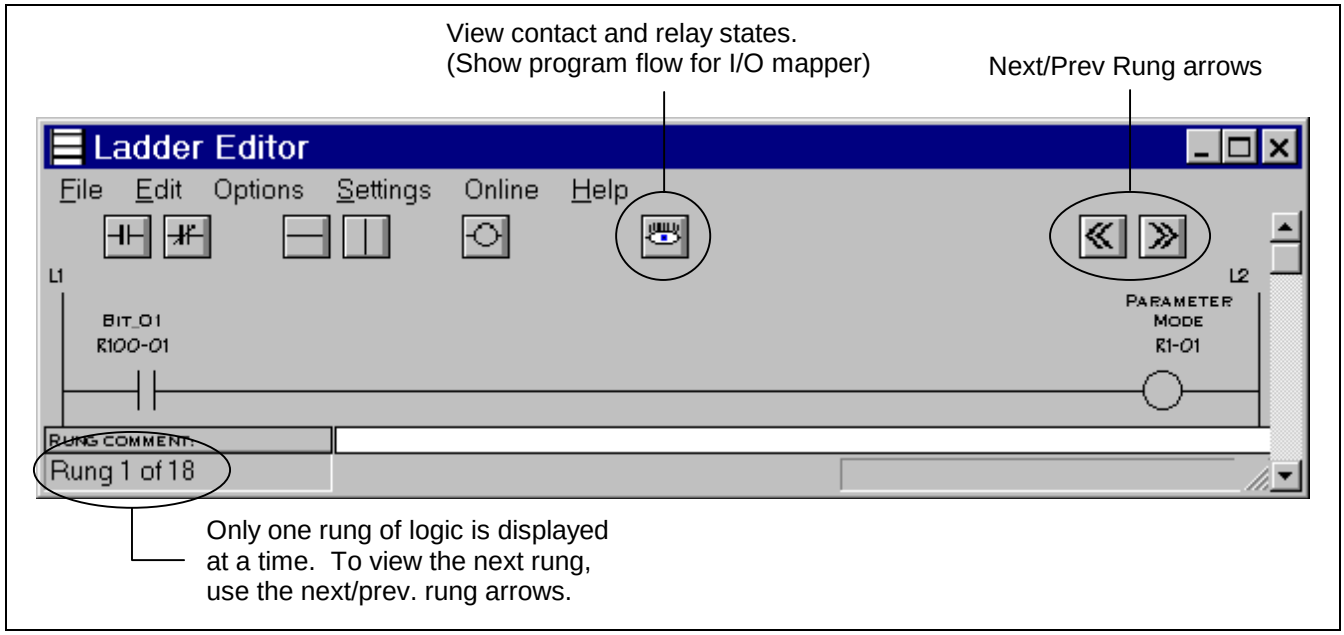


Figure 2-22: Uploading an I/O Mapper string

To view the I/O Mapper in Boolean equation form, select ***Display Strings*** from the Options menu.

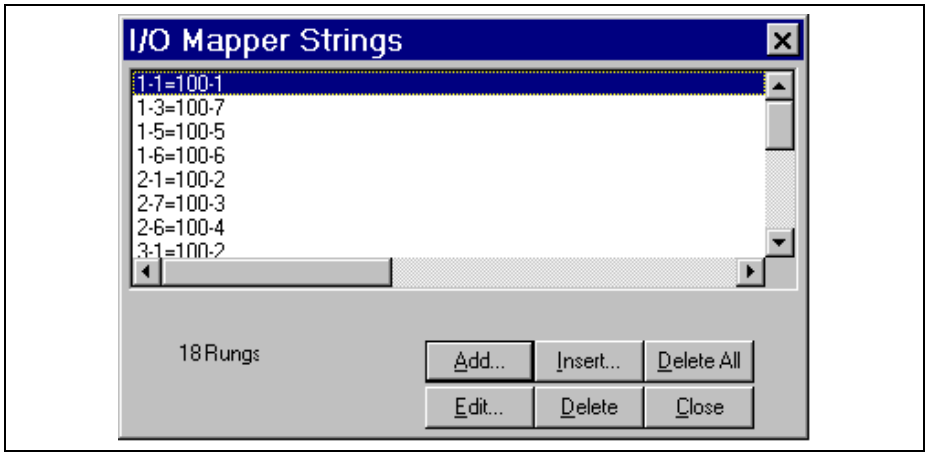


Figure 2-23: Displaying I/O Mapper in Boolean Equation

Examples of Boolean equation expressions…..

I/O Map	**Comments**
1-1=100-1	; Set Register 1, Bit 1 equal to Reg. 100, Bit 1
1-5=40-5|130-5	; Reg. 1, Bit 5 = (Reg. 40, Bit 5) or (Reg. 130, Bit 5)
41-5=41-1&21-1	; Reg. 41, Bit 1 = (Reg. 40, Bit 1) and (Reg. 21, Bit 1)

Registers

Registers are a block of memory on the CLC card used to handled I/O and/or bit settings. The CLC card has a total of 512 registers available for system and user functions. Select ***Data ⇒ Registers*** to view the Active Program, Register screen. The following table outlines a basic structure for the CLC registers. For a complete description of the CLC registers, refer to chapter 2 of the VisualMotion Reference Manual.

Note: CLC predefined register labels are maintained even if battery backup to the card is lost. However, any customer defined register labels or bit settings made to any register will be lost.

Register Number	**Register Label**
1	System Control
2-5	Task A-D Control
6	System Diagnostic Code
7-10	Task Jog Control
11-18, 209-240	Axis Control 1-8, 9-40
21	System Status
22-25	Task A-D Status
26	Fieldbus Status
27 and 28	Eagle Module Input and Output (CLC-V only)
29	ELS Control
30	ELS Master Status
31-38, 309-340	Axis Status 1-8, 9-40
40-87	DEA (4/5/6) I/O
400-405	DEA (28/29/30) Inputs
410-415	DEA (28/29/30) Outputs
88 and 89	Task A Extend Event Control
90 and 91	Latch and Unlatch
92-94	Mask BTC06 Key Functionality
95-97	BTC06 Teach Pendant Status
98 and 99	BTC06 Teach Pendant Control; Task A-B, C-D
100 and 101	User defined Inputs
120 and 121	User defined Outputs

Table 2-2: CLC register structure

Register 6, System Diagnostic Code, can be viewed as a decimal number if the data Format is set to decimal. The following figure illustrates an Emergency Error - 400 in register 6. Double-clicking on a register allows the user to edit the bits.

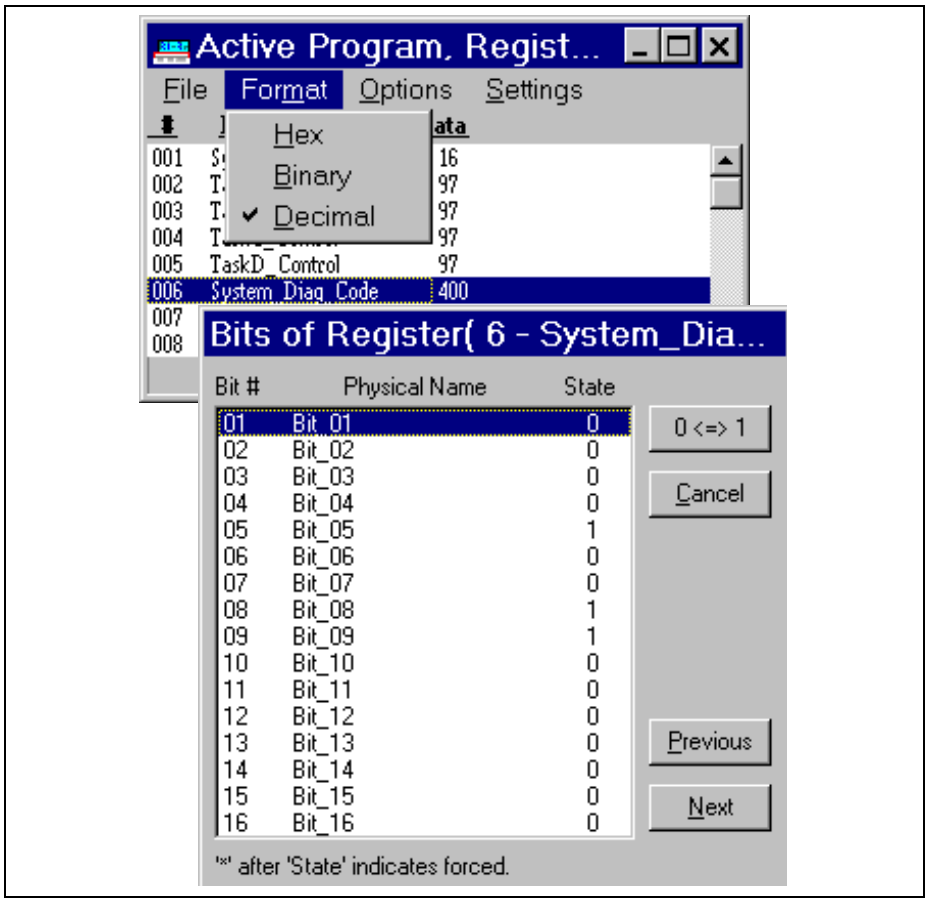


Figure 2-24: System diagnostic code register

Variables

VisualMotion variables are defined by the programmer and are used in programs to enable the user to modify a value in the active VisualMotion program without having to re-compile and download the information. Modified variables are only updated the next time the program cycles and encounters an icon instruction using that variable. Select ***Data ⇒ Variables*** to view the Active Program, Variable screen.

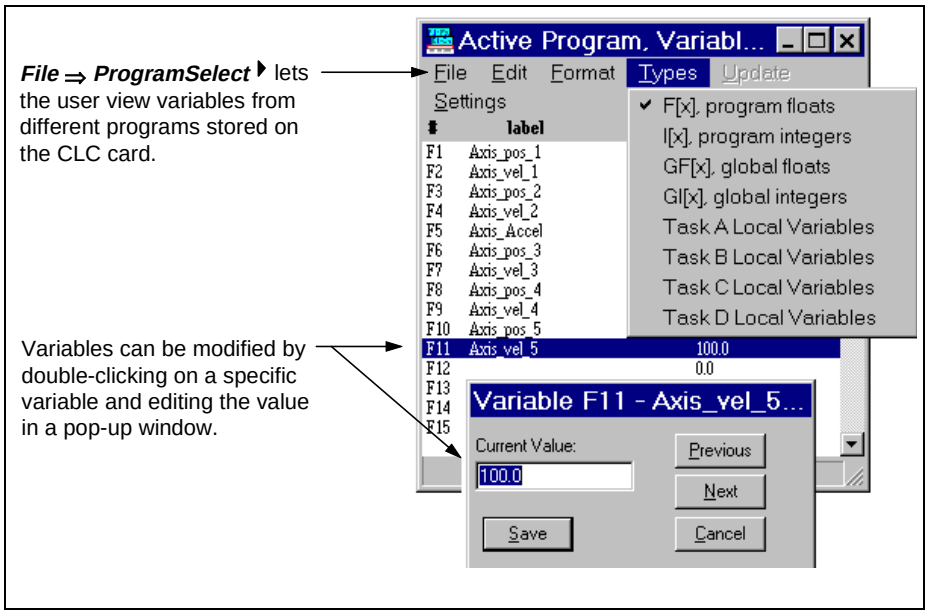


Figure 2-25: Viewing and editing variables

The following variable types are available:

Floating Point Variables (F1-Fx)

A floating point variable is simply a number containing a decimal point. The number of 32 bit floating point variables is defined in the sizing icon at the beginning of the program and are stored as part of the program.

Integer Variables (I1-Ix)

Integers are signed or unsigned whole numbers, such as 5 or -3. The number of 32 bit Integer variables is defined in the sizing icon at the beginning of the program and are stored as part of the program.

Global Floating Point and Integer Variables (GF1-Gfx;GI1-GIx)

Global variables are available to all programs stored on the CLC card. Global variables are program independent. Multiple programs can write to the same set of Global variables.

Task A-D Local Variables

Local variables are created when a subroutine or task begins and eliminated when the subroutine or task execution has ended. Arguments can be passed to local variables to allow multiple applications of a common subroutine.

Note: Except for local variables, all CLC variables are not lost if the battery loses power.

2.8 The Status Menu

The status menu provides status information for logging and monitoring system errors and diagnostics.

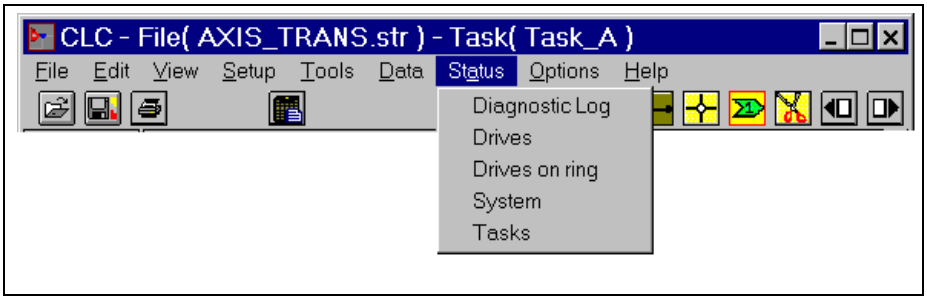


Figure 2-26: Status menu screen

Diagnostic Log

The diagnostic log screen displays the last 100 errors that the CLC card has encountered. Along with the error messages, the date, time and extended error codes are displayed and only the CLC-P normally stores the date.

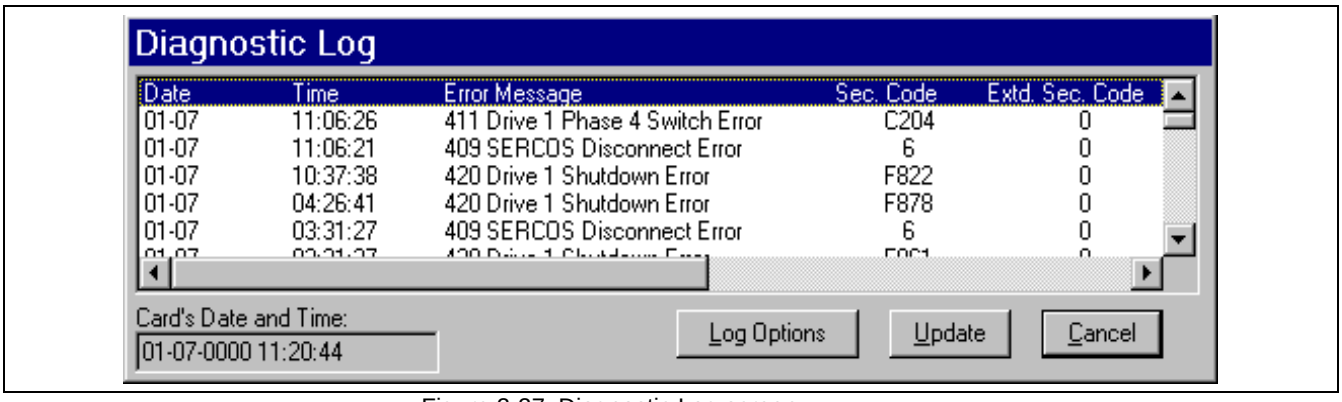


Figure 2-27: Diagnostic Log screen

Date and time are relative to the power on of the CLC D/P cards, they have no battery backed clock. During power up , the CLC-P tries to get the date and time from the PC. The time can be set in card parameter C-0-0126.

The Log Options button opens an options window. It allows some common errors to be ignored and saving the diagnostic log to a file. Also see card parameter C-0-2020

Figure 2-28: Diagnostic Log Options screen

Drives

The Drives screen is the same as it appears under ***Setup ⇒ Drives***. Refer to Drives on page 2-10 for more information.

Drives on Ring

When selected, ***Drives on Ring*** scans the SERCOS fiber optic ring for all drives connected to the VisualMotion system. This screen is read only and displays standard description information on each drive. The user can use this screen to record or report axis information for themselves or when communicating with Indramat's Service department.

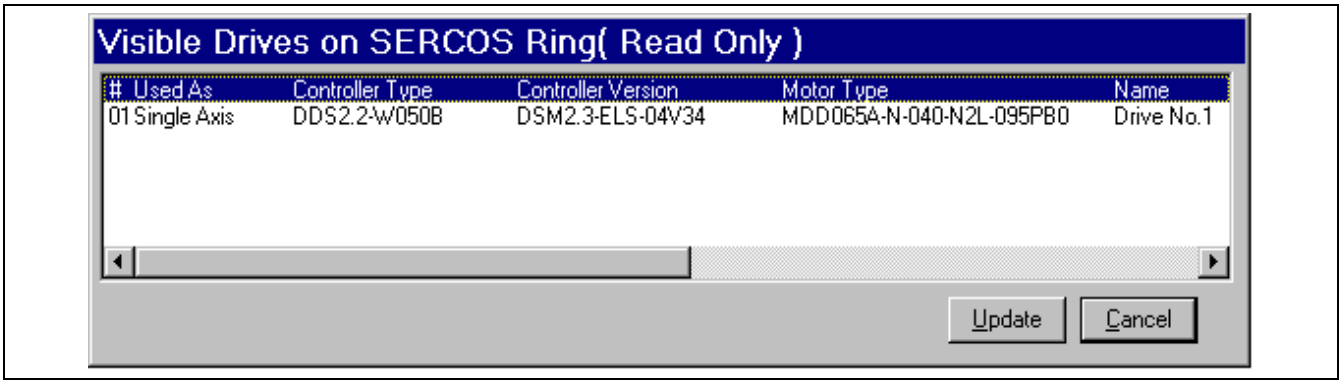


Figure 2-29: Drive on Ring screen

System

Choosing System from the Status menu opens the System Parameters dialog box. System Parameters displays information about the current CLC card hardware and software for the indicated unit number; and the total memory and free memory on the CLC card.

In addition, the user can use this screen for retrieving Diagnostic Message and Extended Diagnostic Message information that can assist in determining the cause of an error.

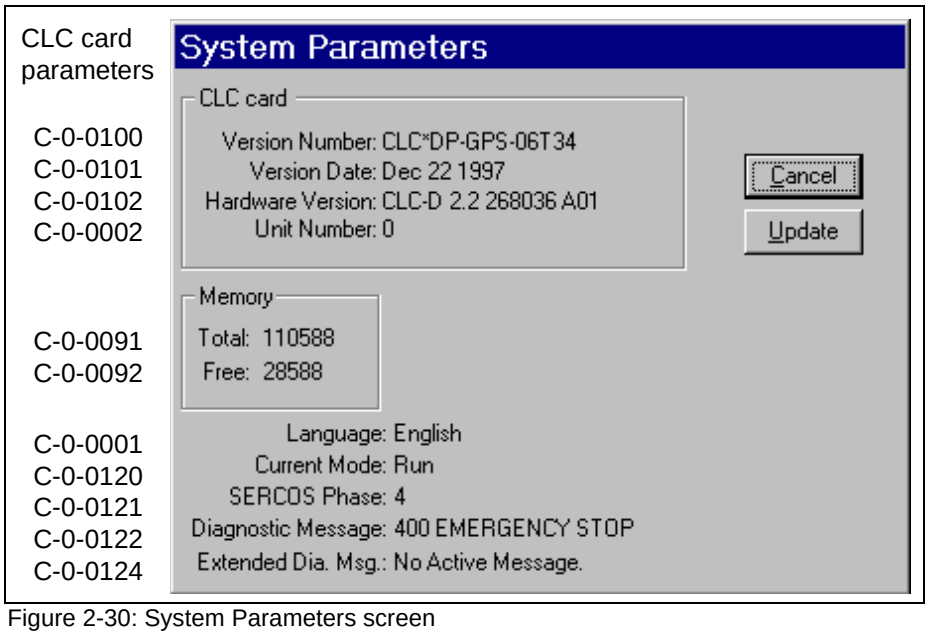


Figure 2-30: System Parameters screen

Tasks

Selecting Task from the Status menu opens the Task_A Parameters dialog box and uploads data regarding the current CLC task. The other tasks may be viewed by clicking on the Previous or Next buttons.

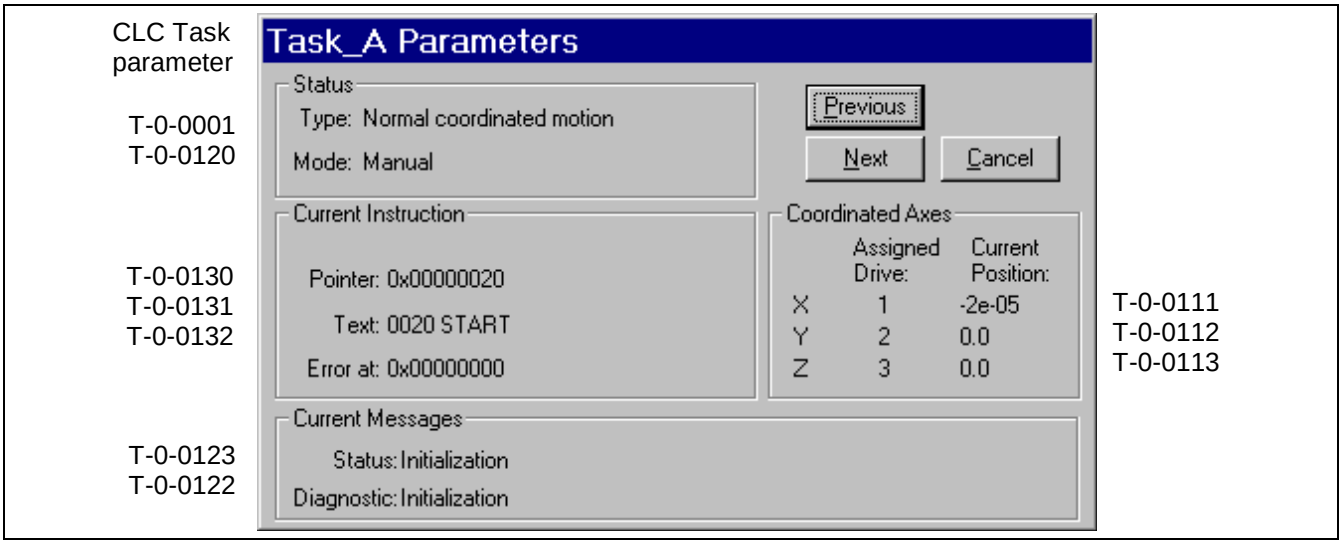


Figure 2-31: Task_(A-D) Parameters screen

Status Status indicates the type of motion programmed in the selected task for the active program and the current CLC mode (Parameter, Initialization, Manual or Automatic).

Current Instruction Current Instruction displays the instruction executing and its pointer, and a pointer to a run-time error if one has occurred. This display is useful when debugging in single-step mode. If a program is running in automatic mode, the displayed instruction is the instruction that was executing at the time that the SERCOS cycle sampled instruction execution, which may appear to be random.

Current Messages Current Messages displays the last messages encountered in the program.

Coordinated Axes Coordinated Axes displays the axes in the active task that are assigned to coordinated motion and their current position.

2.9 The Options Menu

The Options menu provides pre-configured palettes of programming icons for single axis, coordinated, and Electronic Line Shaft (ELS). Choosing one of these menu items loads the selection onto the palette area on the left of the VisualMotion workspace.

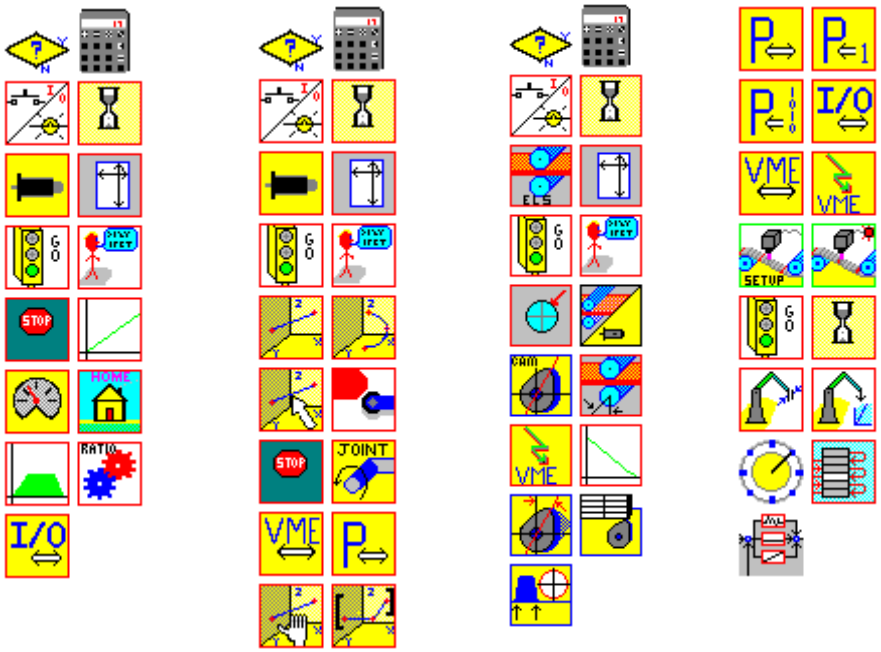
ICON Palettes used for writing VisualMotion programs

Icon Palette 'Single' from the Options menu selects a set of icons used frequently in single axis control.

Icon Palette 'Coord' selects a set of icons used frequently in coordinated control.

Icon Palette 'ELS' selects a set of icons used frequently in electronic line shaft(ELS) control.

Icon Palette 'Utility' selects a set of general purpose icons used in program initialization and runtime data management.



Single **Coord** **ELS** **Utility**

Choosing **Icon Comments** enables/disables identifying comments that appear when the mouse cursor is moved over the top of the icon. The icon comments in a program flow can be modified in the corresponding icon setup box. The setup box appears when the icon is first placed or by double clicking the left mouse button while the pointer is over the icon. Each box has a "Label" button to edit its comment text, by default there is no comment. The comment also appears on the printout of the setup information, if enabled or not. The comment text also appears on the lower left status bar window.

Choosing **Icon Labels** from the Options menu alternately turns the icon labels in the VisualMotion workspace on or off. If there are no user entered labels, VisualMotion uses the default icon labels. Up to 8 characters of text can be entered and view if this feature is selected.

2.10 The Help Menu

VisualMotion's Help menu accesses the on-line help system.

Selecting **Help/Getting Started** or pressing **<F1>** opens the main help screen, from which you can browse through the system by pointing the cursor at the green keywords (help topics) and clicking.

Selecting **Help/Search** opens a dialog box into which you can type a keyword to go directly to a specific help topic.

Help/Change Log displays a list of the new features that appear in your version of VisualMotion.

3 Monitoring and Diagnostic

3.1 System Diagnostics - Codes and Message

VisualMotion provides three types of diagnostic messages:

- Status messages
- Warning messages
- Shutdown messages

Diagnostic messages are preceded by an identifying 3-digit code number.

Example: **400 Emergency Stop**

These identifying code numbers are assigned by Indramat and are broken up into the following groups:

- (001-199) Status messages
- (201-399) Warning messages
- (400-599) Shutdown messages

Each group above does not contain the range of code numbers indicated as diagnostic messages. The range of numbers was designed to allow for future development.

The Host can request the currently active VisualMotion diagnostic message for the CLC card and for each user task from the following parameters.

CLC Card parameters

- Parameter C-0-0122: Displays current diagnostic message
- Parameter C-0-0123: Displays current diagnostic 3-digit code
- Parameter C-0-0124: Displays extended diagnostic message

VisualMotion Task parameters

- Parameter "0**x** T-0-0122": Displays Task (A-D) diagnostic message
- Parameter "0**x** T-0-0123": Displays Task (A-D) status message
  (where **x** = 1-4 for Task A-D)

Drive Parameter

- Parameter "0**x** S-0-0095": Displays Drive diagnostic message
  (where **x** = 1-8 for Drive 1-8)

The above diagnostic message parameters can be view by using VisualMotion Toolkit and selecting ***Setup ⇒ Overview*** from the menu.

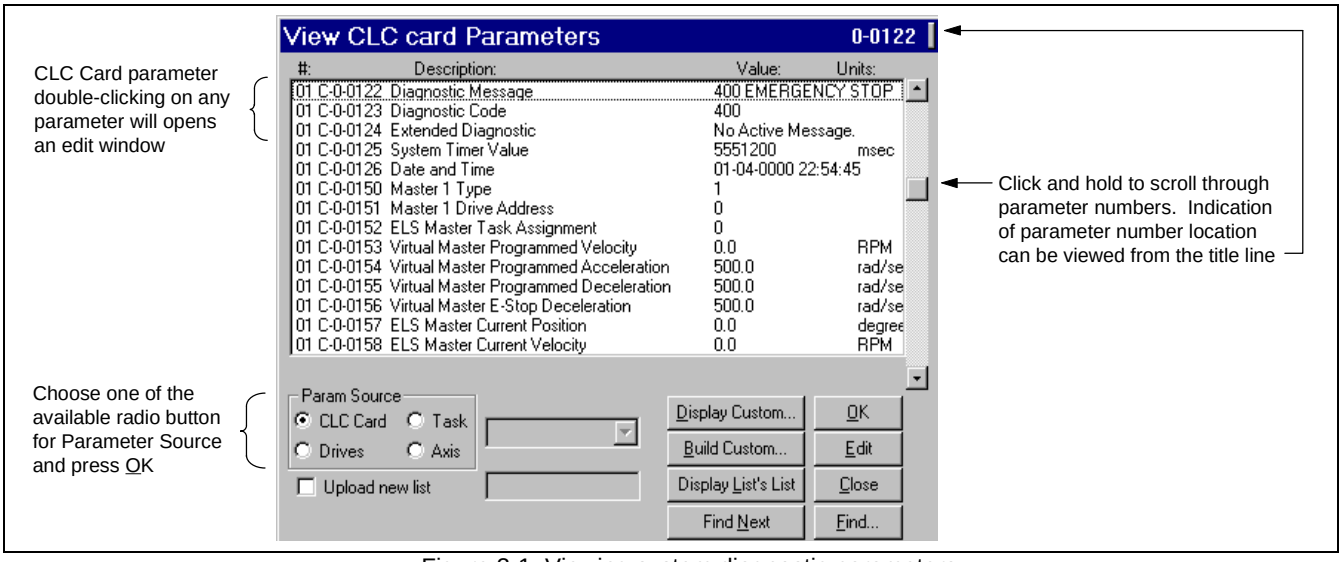


Figure 3-1: Viewing system diagnostic parameters

Parameters pertaining to Drive Diagnostics can be viewed by selecting **Status ⇒ Drives**. This menu selection opens the CLC Drive Parameter Editor.

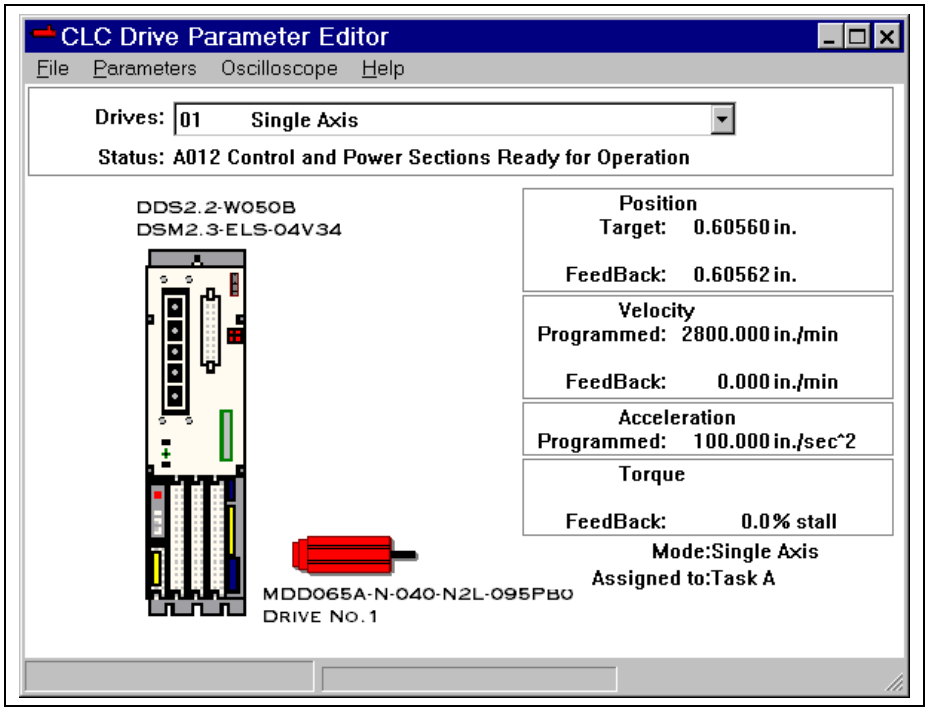


Figure 3-2: CLC Drive Parameter Editor

Select the drive number containing the diagnostic error code and the **Status** line will display the drive diagnostic message from parameter S-x-0095. Refer to the Drive manual for descriptions of drive diagnostics.

3.2 Status Messages (001-199)

A Status Message indicates the normal operating status of an axis, task, or the system when there are no errors. A change in status that generates a new status message overwrites the previous message. No user acknowledgment is required for a change in a status message.

Status messages can be viewed within VisualMotion Toolkit (VMT) under menu selection ***Status ⇒ System*** or from the CLC DDE Server if the CLC Status Display is set to *SERIAL_0* under ***Settings ⇒ Server Communications***.

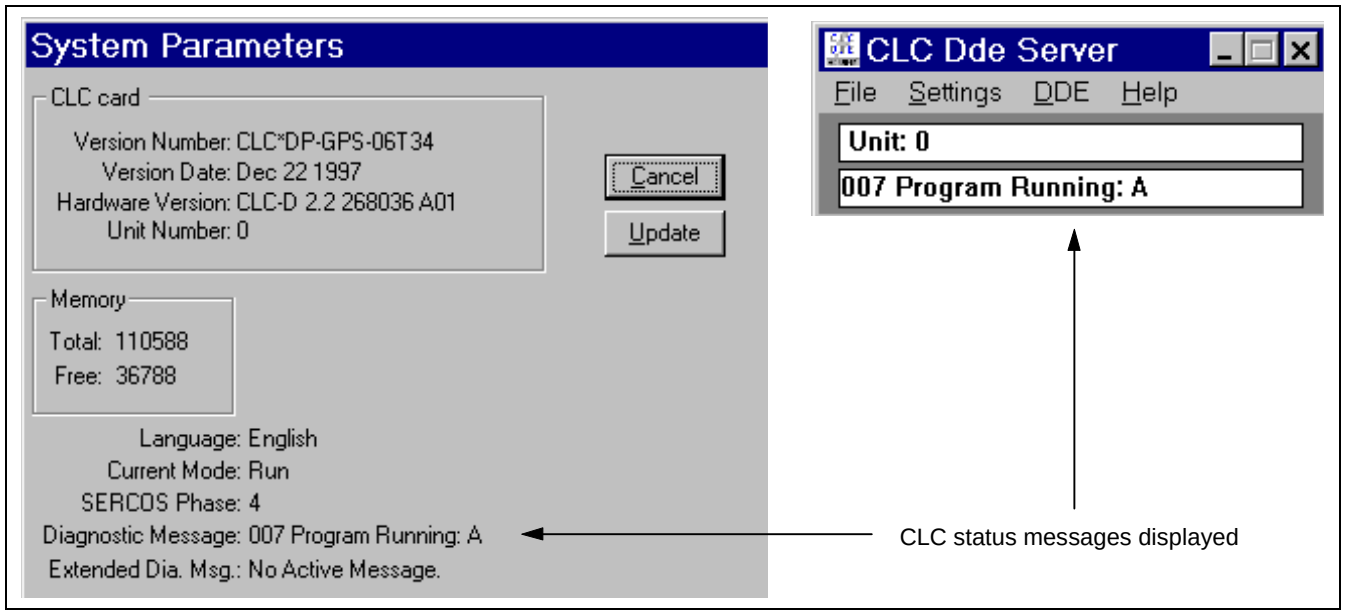


Figure 3-3: Viewing diagnostic status messages

001 Initializing System

The CLC is initializing the executive firmware, the SERCOS ring, and other devices at power-up or exit from parameter mode.

002 Parameter Mode

The CLC is in parameter mode, and the drives are in Phase 2.

003 Initializing Drives

SERCOS has been reconfigured and the ring is being initialized.

004 System is Ready

The system has been initialized and is ready for operation.

005 Manual Mode

All four user program tasks are in manual mode.

006 Automatic Mode: ABCD

The user program tasks indicated at the end of the message are in automatic mode, and the rest are in manual mode. For example, "Automatic Mode: B" indicates that only Task B is in automatic mode.

007 Program Running: ABCD

The user program tasks indicated at the end of the message are running, and the rest are not running or are single-stepping.

008 Single-Stepping: ABCD

The user program tasks indicated at the end of the message are in single-step mode. The other tasks are not running.

009 Select Parameter Mode to Continue

An error during system initialization occurred and was cleared, but the error condition was not corrected. Switch into Parameter Mode to continue.

010 Breakpoint Reached: ABCD

The user tasks indicated at the end of the message have reached a user program breakpoint, and the rest of the tasks are not running.

011 Waiting for PLC

The CLC-P02 card has initialized and is waiting for communications from the PLC.

Note: This status message is only available with the CLC-P02 card.

3.3 Simulation Status messages (012-017)

Simulation messages are reserved for Indramat development and are used for testing program validity and program logic. These status messages perform the same functions as their standard counterparts but do not rely on external communications.

Operating State:

0= normal drive operation

1= simulation mode, does not scan for drives

When card parameter C-0-0010, bit 1 is set to 1, the axes will be simulated. The SERCOS ring will not be scanned for drives, and the drive enable bits will be ignored. This mode is useful for simulating coordinated motion when the CLC is not connected to the actual system, or when a program does not contain any axes. All axis and task status parameters are simulated. Drive parameters and I-O, requiring a SERCOS drive, are not simulated. Any drive-controlled related motion, (homing, single-axis, etc), will not be simulated. Actual homing and motion will not occur while in simulation mode.

012 Simulation: Parameter Mode

The CLC is in parameter mode, and the drives are in Phase 2.

This status message performs the same function as it's standard counterpart but does not rely on external communications.

013 Simulation: Manual Mode

This status message performs the same function as it's standard counterpart but does not rely on external communications.

All four user program tasks are in manual mode.

014 Simulation: Automatic Mode: ABCD

This status message performs the same function as it's standard counterpart but does not rely on external communications.

The user program tasks indicated at the end of the message are in automatic mode, and the rest are in manual mode. For example, "Automatic Mode: B" indicates that only Task B is in automatic mode.

015 Simulation: Program Running: ABCD

This status message performs the same function as it's standard counterpart but does not rely on external communications.

The user program tasks indicated at the end of the message are running, and the rest are not running or are single-stepping.

016 Simulation: Single-Stepping: ABCD

This status message performs the same function as it's standard counterpart but does not rely on external communications.

The user program tasks indicated at the end of the message are in single-step mode. The other tasks are not running.

017 Simulation: Breakpoint Reached: ABCD

This status message performs the same function as it's standard counterpart but does not rely on external communications.

The user tasks indicated at the end of the message have reached a user program breakpoint, and the rest of the tasks are not running.

3.4 Warning Messages (201-399)

Warning messages are issued when an improper system condition exists. The condition is important enough to be brought to an operator's immediate attention, but not critical enough to shut down the system. However, a warning may be a notification of an impending shutdown condition. Warnings typically allow normal system operation to continue.

A warning sets the error bit associated with the affected task or the system and displays the warning message. Once issued, the error condition must be corrected and acknowledged to the system. The user acknowledges and clears a warning with a low-to-high transition of the Clear All Errors bit of the CLC's System Control Register.

CLC System Control Register 1 can be viewed within VMT under menu selection ***Data ⇒ Registers***. Double-clicking on register #1 will open a window containing all bits in reg. #1 along with their names. Bit 5 is labeled as Clear_All_Errors and it's transition from low-to-high (0 to 1) is typically controlled by an external PLC or switch. To view Data in binary, select binary under menu selection ***Format***.

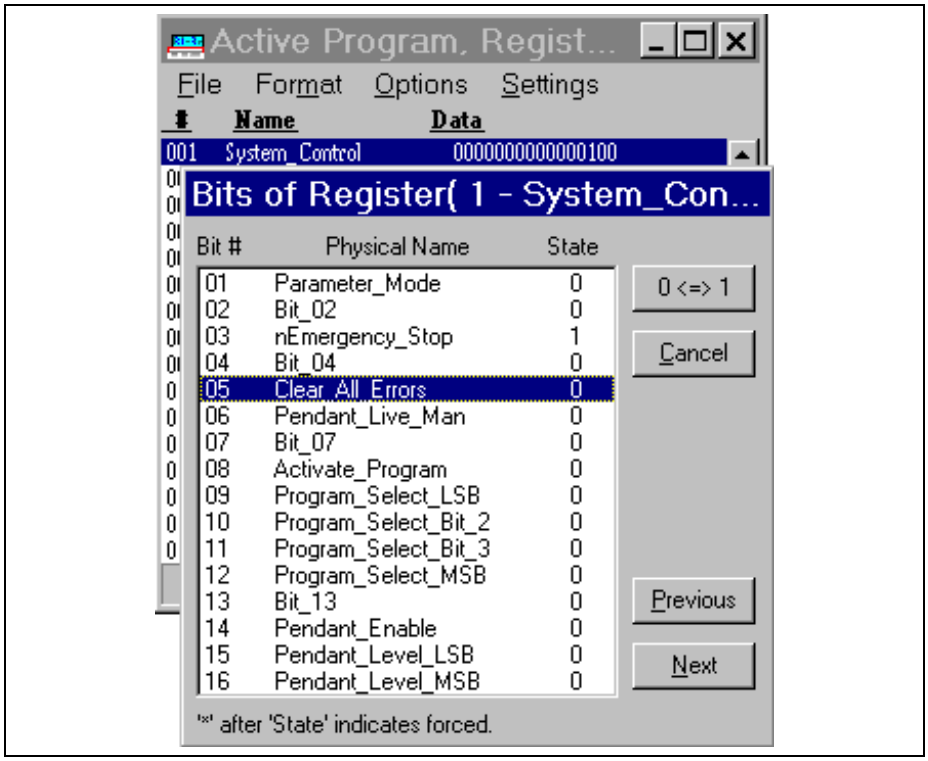


Figure 3-4: Viewing Registers

After a warning condition has been corrected and acknowledged, the user program can be resumed at the point where the error occurred. In SERCOS, warnings are Class 2 Diagnostics.

Warning messages can be cleared by correcting the warning condition, or by setting the CLC's clear error input. Similar to status messages, Warning messages can also be viewed from ***System Parameters*** and/or ***CLC DDE Server***. Refer to Figure 3-3: Viewing diagnostic status messages

201 Invalid jog type or axis selected

This message is issued before a coordinated I/O jog when an invalid type or axis is selected.

Cause:

1. The axis selected for jogging is not defined as a coordinated motion axis.
2. An axis defined for coordinated motion is commanded to jog as a single axis and visa versa.

Remedy:

1. Ensure that the selected axis  is programmed for either coordinated motion or single-axis motion and that the jogging command selected match the axis selected.

202 Drive D is not ready

Cause:

An attempt to jog axis D in manual mode was commanded before the drive was enabled (AF)

Remedy:

1. Clear error and wait for drive to be enabled before jogging.
2. Check the axis disable bit in AxisD_Control register under ***Data*** ⇒ ***Registers***. If the bit is high (1), the drive is disabled. Change the state to low and restart program.
3. Check the fiber optic connections and power to drive.

204 SERCOS Ring was disconnected

Cause:

The SERCOS ring was disconnected before a shutdown error was cleared. The ring is now initialized. This message allows detection of an intermittent break in the fiber optic ring.

Remedy:

1. To continue, activate the clear input.
2. If error continues, replace fiber optic cable.
3. Ensure that the DSS card number is properly selected and has not changed.

205 Parameter transfer warning in Task A

There is an error in the parameter transfer instruction. This indicates a warning condition that does not shutdown the task. A communication error message is displayed in the diagnostic message for the task (A-D) in which the error occurred (T-0-0122). Information on the actual parameter number that caused the error is provided in extended diagnostics (C-0-0124).

Using VisualMotion Toolkit,

Parameter T-0-0122: Task diagnostic message can be viewed under ***Status ⇒ Tasks***

Parameter C-0-0124: Extended diagnostic can be viewed under ***Status ⇒ System***

Cause:

The parameter format, parameter number, or stored value may be invalid.

Remedy:

1. Verify that the parameter transfer instruction  is valid for the program in task A.

206 Battery is low: replace it soon

Cause:

A low voltage on the SRAM backup battery (accumulator for CLC-P02) has been detected at power-up or initialization from parameter mode.

Remedy:

1. Replace the battery to prevent any loss of data. Refer to the appropriate card in Chapter 1 for details.

207 Axis D position limit reached

Cause:

The negative or positive travel limit of axis D was reached, preventing a jog from occurring.

Remedy:

1. Clear error and move axis to a position within drive parameters
   S-x-0049: Positive position limit value
   S-x-0050: Negative position limit value
   Current position can be view under ***Status ⇒ Drives***

3.5 Shutdown Messages (400 - 599)

A Shutdown is issued in an emergency situation or when the system or drives cannot operate correctly. During a shutdown, the CLC switches the user program tasks into manual mode, decelerates all motion to zero velocity, and sets the error bit in the status register.

If the shutdown condition results from an E-stop or DDS-2 drive shutdown condition, the CLC also disables the drives, disabling motor torque and engaging the brake.

A low to high transition on the Clear All Errors bit in the System Control Register will clear a shutdown. The CLC automatically sends a 'Reset Class 1 Diagnostics' command to each drive that has an error.

400 Emergency Stop

Cause:

The Emergency Stop input is active (low). The E-Stop circuit has been opened due to activation of the E-Stop push button or external logic. All drives on the ring are disabled.

Remedy:

1. Release the E-Stop button or correct the error condition. Clear error on CLC card. Set Emergency Stop input active (high) and restart program.

401 SERCOS Controller Error: DD

Cause:

The SERCOS communications controller has indicated an error on the SERCOS ring.

Remedy:

1. Check the fiber optic connections, the addresses set on the drives, and the drive configuration.

402 SERCOS Config. Error: see ext. diag. or

402 SERCOS Interface Error: XXXX (versions before 01.20)

Cause:

An error in the SERCOS service channel has occurred when the CLC was initializing the timing and scaling parameters. The extended diagnostic (C-0-0124) gives a description of the error.

This can be viewed under ***Status ⇒ System***.

Remedy:

1. If the extended diagnostic indicates a timing error or data limit error, check the amount of data or drives on the ring and the minimum cycle time parameter C-0-0099. Otherwise, check the fiber optic connections, the addresses set on the drives, and drive firmware versions.

404 Invalid Switch into Phase D

Cause:

The SERCOS communications controller did not allow a phase switch.

Remedy:

1. Check if power is applied to the drives and if the fiber optic connections and the drive addresses are correct. If drive parameters were just downloaded, switch back into parameter mode to reinitialize the interface. If the above conditions are O.K., the SERCOS interface board (DSS) may be faulty.

Note: *This error is only issued in versions that do not use the SERCOS ASIC (firmware versions less than GPS 1.20).*

405 Phase D: Drive did not respond

Cause:

A time-out in the SERCOS ring has occurred when the CLC card did not receive a response from the drive during Phase D initialization. The CLC card sent out a signal to the drive, however the drive is not responding. This distinguishes a communication error from an actual phase switch error.

Remedy:

1. Check the fiber optic connections, the addresses set on the drives, and the drive firmware versions.

407 Drive D Phase 3 Switch Error

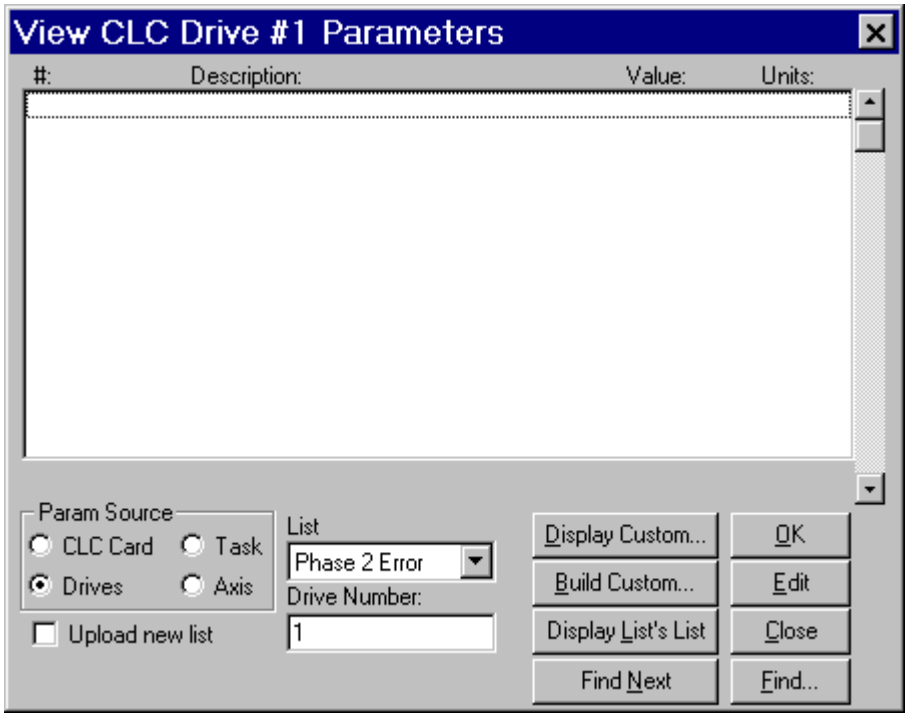
Cause:

The SERCOS phase 3 switch command failed for the drive indicated. This usually indicates that configuration parameters for the drive are invalid or have not been saved. This message is displayed when an error occurs while the drive is switching from phase 2 to phase 3.

Note: Do not clear the error or switch to parameter mode before viewing a list of invalid parameters. Doing so will clear any chance of viewing invalid parameters.

Remedy:

1. View drive diagnostic under ***Status ⇒ Drive.*** If the drive status indicates parameters are invalid or lost, display the Phase 2 error parameter list for Drive 'D' (Step 2.)
2. View a list of invalid drive parameters by selecting ***Setup ⇒ Overview*** within VisualMotion Toolkit. Set the Param Source to Drives, indicate a Phase 2 Error and select a Drive Number.



Once the list is displayed, switch to parameter mode and change the invalid parameters or download a valid parameter file to the drive.

3. If the drive is not communicating, check the connections and the addresses. If drive parameters were just downloaded, switch back into parameter mode to reinitialize the interface.

408 SERCOS Controller is in test mode

Cause:

The Indramat DAS2 SERCOS Controller is in test mode.

Remedy:

1. Set the mode switch on the front of the board to a position where this error does not occur.

Note: This error is not issued in versions that use the SERCOS ASIC.

409 SERCOS Disconnect Error

The SERCOS fiber optic ring was disconnected or a drive connected to the ring was powered down while in Phase 3 or 4. A more descriptive message will be displayed in the extended diagnostics (C1.124 - *Indicates the first drive in which the drive data failed*).

Cause:

1. A fiber optic cable has been disconnected or damaged somewhere in the SERCOS ring.
2. A drive in the system may contain old firmware.

Remedy:

1. Check the fiber optic connections, the addresses set on the drives, and the drive firmware versions.
2. If a new drive was added to the SERCOS ring, make sure it contains current drive firmware.

411 Drive D Phase 4 Switch Error

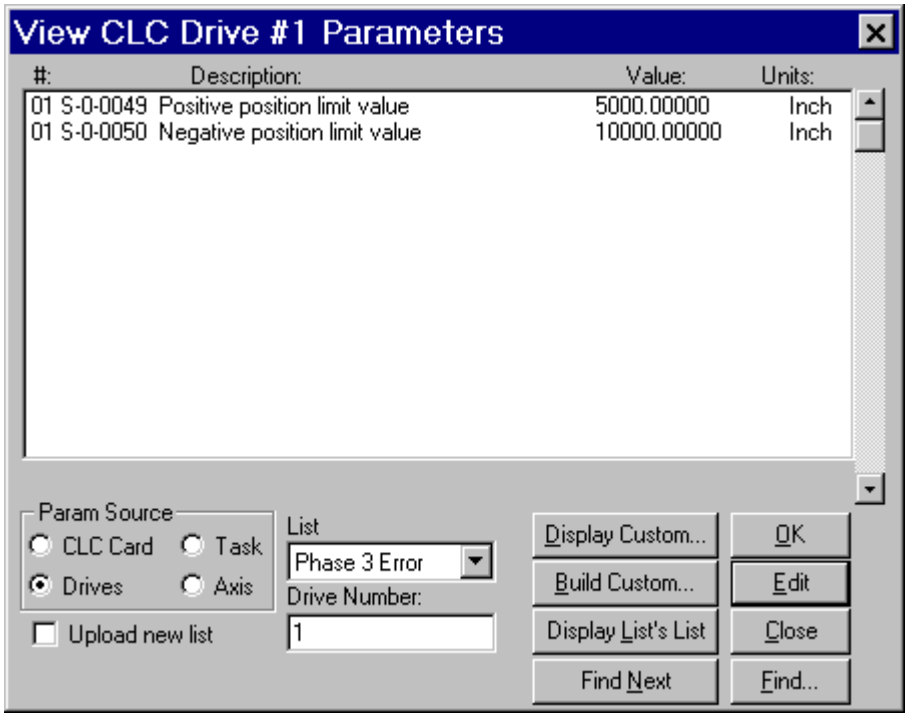
Cause:

The SERCOS phase 4 switch command failed for the drive indicated. This usually indicates that configuration parameters for the drive are invalid or have not been saved. This message is displayed when an error occurs while the drive is switching from phase 3 to phase 4.

Note: Do not clear the error or switch to parameter mode before viewing a list of invalid parameters. Doing so will clear any chance of viewing invalid parameters.

Remedy:

1. View drive diagnostic under ***Status ⇒ Drive.*** If the drive status indicates parameters are invalid or lost, display the Phase 3 error parameter list for Drive ‘D’ (Remedy 2.)
2. View a list of invalid drive parameters by selecting ***Setup ⇒ Overview*** within VisualMotion Toolkit. Set the Param Source to Drives, indicate a Phase 3 Error and select a Drive Number.



Once the list is displayed, switch to parameter mode and change the invalid parameters or download a valid parameter file to the drive.

3. If the Drive Status indicates that there is a feedback error, voltage error, or other hardware error; correct the problem and switch into and out of parameter mode to reinitialize the interface.

412 No drives were found on ring

Cause:

No drives were found when the CLC initialized the SERCOS ring to Phase one.

Remedy:

1. Check the addresses set on the drives, in the CLC program, and in the CLC parameters. Also, check that power is applied to all the drives and that the fiber optic connections are correct.

413 I-O board was not found

Cause:

The selected I/O board was not found on the VME bus. The correct I/O device must be enabled and the address selected on the device must match the CLC parameter C-0-0005.

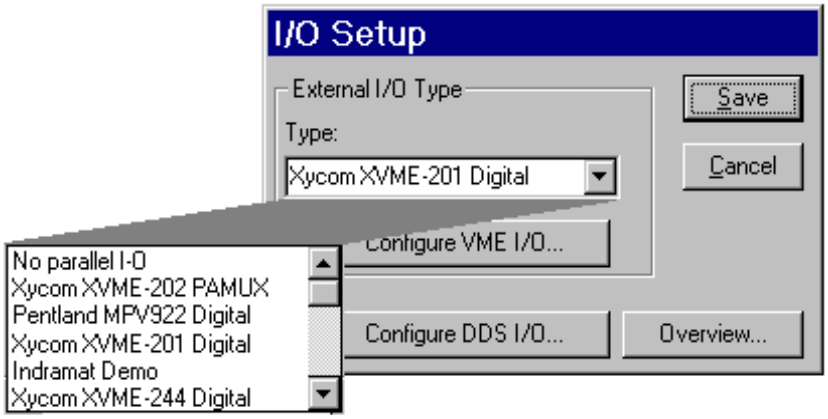
Selections: 0= no parallel I/O
1= Xycom XVME-202 PAMUX
2= Pentland MPV922 VME
3= Xycom XVME-201 Digital
4 = Indramat Demo
5 = Xycom XVME-244 Digital

Default: 0

A VME arbiter must be present in the rack (on CLC/V, switch SW5-8 must be on).

Remedy:

1. Verify that the correct I/O board is configured in the following I/O Setup screen. ***Setup ⇒ I/O Setup***



Complete list of available I/O options

414 Parameters were lost

CLC System, Task, and Axis parameters were lost, and defaults have been loaded.

Cause:

The RAM backup battery has failed or was not connected, or an internal system error or new software version has corrupted the memory.

Remedy:

1. Replace the battery. Refer to Chapter 1, CLC-D Overview under the sub-heading "On-Board Battery." Restore archived system files using archive function under ***File*** ⇒ ***Archive*** and select items to restore and click on Start.

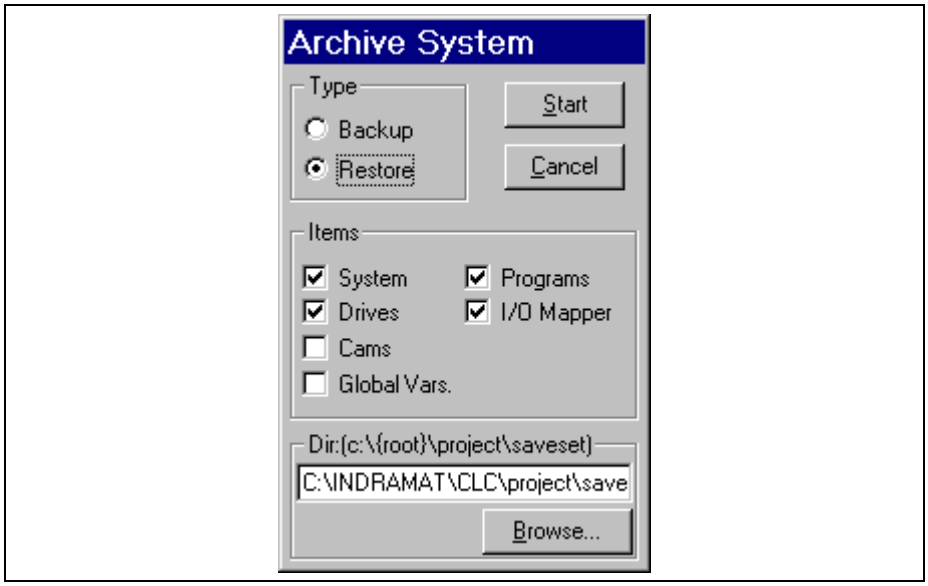


Figure 3-5: Restoring archive system files

415 Drive D was not found

Drive (D) that is used in a program or selected in the system parameters was not found on the SERCOS ring.

Cause:

1. The axis icon in the VisualMotion program is specifying an axis number or name that is recognized by the system.
2. The SERCOS card addresses of two or more drives are set to the same number.

Remedy:

1. Verify that the Axis icon  in the VisualMotion program is programmed with the correct axis number or variable label.
2. Verify that all drives have unique SERCOS card addresses anywhere from 0 to 40.

416 Invalid Instruction at XXXX

Cause:

An invalid user program instruction was found by the CLC during compilation.

Remedy:

1. Recompile the program from the PC and download it again. If the error still occurs, check the source program for an instruction that may not be supported in this firmware version.

417 SYSTEM ERROR: pSOS #XXXX

Cause:

An internal CLC operating system error has occurred.

Remedy:

1. Call Indramat Service for assistance.

418 No program is active

Cause:

No active user program was found on the CLC during initialization.

Remedy:

1. Active a user program using VisualMotion Toolkit (VMT).
   ⇒ Open a file in VMT using the **File ⇒ Open** menu command.
   ⇒ Save, Download and Compile the VisualMotion program
   ⇒ Using **File ⇒ Program Management**, active the program.
   ⇒ Once the program is active, clear the error.

419 Invalid Program File

Cause:

A checksum or file format error was found in the active program file. The file may be corrupt or missing information.

Remedy:

1. Recompile the program using VisualMotion Toolkit and download it again. If the error still occurs, call Indramat Service for assistance.

420 Drive D Shutdown Error

Cause:

The drive has issued a shutdown error, which disables motion.

Remedy:

1. Check the SERCOS Drive Status message (Drive parameter S-0-0095) for a description of the error.
2. Using VisualMotion Toolkit, open the CLC Drive Parameter Editor under menu selection ***Status ⇒ Drives*** and view the status line for a description of the drive error. Refer to the drive manual for more information.

421 User Program Stack Overflow

Cause:

The subroutine call stack for a user program task has overflowed. The stack is an area of dedicated memory. The most likely scenario is that there are too many nested subroutines in a task. A nested subroutine is a subroutine within another subroutine.

Remedy:

1. Check the program for the following conditions:

   -there is not a return for every subroutine call

   -a subroutine is calling itself

   -program flow has caused multiple returns

   -more than 10 subroutines are nested.

422 Parameter transfer error in Task A

There is an error in the parameter transfer instruction. A communication error message is displayed in the diagnostic message for the task (A-D) in which the error occurred (T-0-0122). Information on the actual parameter number that caused the error is provided in extended diagnostics (C-0-0124).

Using VisualMotion Toolkit,

Parameter T-0-0122: Task diagnostic message can be viewed under ***Status ⇒ Tasks***

Parameter C-0-0124: Extended diagnostic can be viewed under ***Status ⇒ System***

Cause:

The parameter format, parameter number, or stored value may be invalid.

Remedy:

1. Use Program Flow <F7> to locate parameter transfer instruction.
2. Verify that the parameter transfer instruction  is valid for the program in task A.

423 Unimplemented Instruction

Cause:

The command instruction or icon is not recognized by the current version of CLC firmware or VisualMotion Toolkit software. Example: A new icon function is used with older card firmware. The icon can be identified by using the show program flow <F7> function.

Remedy:

1. Recompile the program without the instruction indicated by the current instruction pointer or update the CLC firmware or VisualMotion software. Contact Indramat for updated firmware and software information.

425 Instruction Error: see Task A diag.

Cause:

An error has occurred in a user program instruction. A more specific message is displayed in the diagnostic message for the task (A-D) in which the error occurred (T-0-0122). This error usually applies to coordinated motion instructions.

Remedy:

1. Verify that the following icons are setup properly and do not contain variables with negative values or incorrect axis numbers.

Wait  ELS mode  ELS Stop  Text message 

426 Drive D is not ready

Cause:

Programmed motion was commanded to axis D before the drive was enabled (AF).

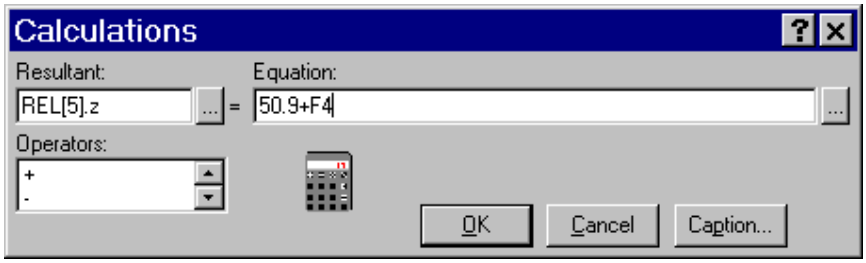
Remedy:

1. Clear error and wait for drive to be enabled before commanding motion.
2. Check the axis disable bit in AxisD_Control register under ***Data*** ⇒ ***Registers***. If the bit is high (1), the drive is disabled. Change the state to low and restart program.
3. Check the fiber optic connections and power to drive.

427 Calc: invalid table index D

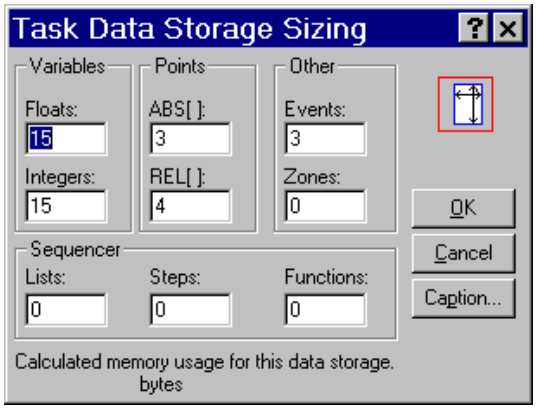
Cause:

1. In a user program calculation expression, the index to a point or event table is invalid.
2. A value used in the calculation expression is not accounted for in the sizing icon. The value is either greater than or less than the allowable range. The allowable range is 0 to maximum number entered.



Remedy:

1. Locate the Calc icon with the error, if more than one is used, by using program flow <F7>.
2. If the value in the Calc icon is incorrect, change it to an allowable value and clear the error.
3. Verify that the Sizing icon is accounting for all variables, points, events and zones programmed in the user program.



428 Calc: division by zero

Cause:

In a user program calculation instruction, an attempt was made to divide a number by zero.

Remedy:

1. Locate the Calc icon with the error, if more than one is used, by using program flow <F7>.
2. Modify the Calc icon and remove any zero expression to the denominator. The denominator can be expressed as an integer or a variable.

429 Calc: too many operands

Cause:

In a user program calculation instruction, too many operands (+, -, *, /, etc.) and operators were used in the string. Use the show program flow <F7> function to locate the Calc icon containing the error.

Remedy:

1. Split the calculation operation using more than one Calc icon in consecutive order.

430 Calc instruction: invalid operator

Cause:

An invalid arithmetic operator was found in a user program calculation instruction. The operator used is not supported by the current version of VisualMotion Toolkit..

Remedy:

1. Check the compiler and firmware version numbers, and call Indramat service for assistance in upgrading software. Version information can be found for menu selection ***Status ⇒ System***

431 Calc error: see Task A diag.

Cause:

An error has occurred in a user program calculation instruction.

Remedy:

1. See the task diagnostic message for a communication error message.

432 Calc: too many nested expressions

Cause:

In a user program calculation instruction, more than 16 operations were pending. See the diagnostic message for each task to find the task and the instruction.

Remedy:

1. Check the number of operands in the expression, looking for unbalanced parentheses or incomplete expressions.

433 Setup instruction outside of a task

Cause:

The following commands must be placed in a task's main program: TASK/A XES, KINEMATIC, and DATA/SIZE. This error is issued if any of these commands is found in a subroutine.

Remedy:

1. Move the instructions to Task A, B, C, or D, following the TASK/START instruction or Axis Setup icon.

434 Axis D configured more than once

Cause:

Axis D was selected more than once in a TASK/A XES command  icon.

Remedy:

1. Modify the program so that the axis is selected once.

435 Axis D not assigned to a task

Cause:

Axis D was not assigned to the task using the Axis icon  but was specified in a command.

Remedy:

1. Modify the program so that the axis is selected and configured for the correct axis number or variable label used in the program.

436 General Compiler Error: XXXX

Cause:

An error was found in a compile-time instruction (TASK/A XES, KINEMATIC) after program activation.

Remedy:

1. See the task diagnostic message for a description under menu selection ***Status ⇒ Tasks***. If there is no task diagnostic message, call Indramat for assistance.

438 Invalid Axis Selected: D

Cause:

Axis D was not found on the SERCOS ring or is an invalid axis number. This error is issued during single-axis or ELS motion commands.

Remedy:

1. Check the constant or variable that contains the axis number.

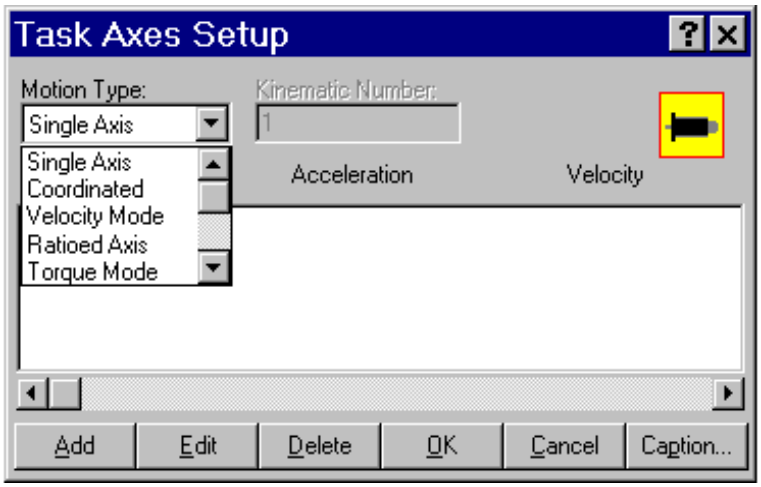
439 Invalid Motion Type: D

Cause:

The axis type does not match the type of motion used by the instruction. This error is issued when a single-axis command is given to a coordinated motion axis.

Remedy:

1. Locate the icon containing the error and verify that the axis type matches the motion type. For example: a coordinated VisualMotion program contains an axis setup icon that was originally setup for single-axis.



440 I-O Transfer Error: see task diag.

Cause:

An error occurred in a command instruction selecting a register to write to or to read from. Some examples would be….

Setting an I/O register

I/O Transfer or any other instruction that directly writes to a register.

Remedy:

1. Locate the instruction icon using show program flow <F7> and verify the register read and write command.

441 DMA error while reading from local RAM

Cause:

A Direct Memory Access (DMA) error interrupt was encountered during reading of the local RAM memory. An address was specified that does not exist or could not be read. This error is typically hardware related and can not be easily remedied.

Remedy:

1. Archive all CLC programs and tables and replace hardware. Call Indramat Service for assistance.

442 DMA error while reading from VME address

Cause:

A Direct Memory Access (DMA) error interrupt was encountered during reading of a specified VME address. An address was specified that does not exist or could not be read. This error is typically hardware related and can not be easily remedied.

Remedy:

1. Archive all CLC programs and tables and replace hardware. Call Indramat Service for assistance.

443 DMA error while writing to local RAM

Cause:

A Direct Memory Access (DMA) error interrupt was encountered during writing to local RAM memory. An address was specified that does not exist or could not be written. This error is typically hardware related and can not be easily remedied.

Remedy:

1. Archive all CLC programs and tables and replace hardware. Call Indramat Service for assistance.

444 DMA error while writing to VME address

Cause:

A Direct Memory Access (DMA) error interrupt was encountered during writing to a specified VME address. An address was specified that does not exist or could not be written. This error is typically hardware related and can not be easily remedied.

Remedy:

1. Archive all CLC programs and tables and replace hardware. Call Indramat Service for assistance.

446 DMA Time-out Error

Cause:

A Direct Memory Access (DMA) transfer was cancelled while data was being transferred. This error is typically hardware related and can not be easily remedied.

Remedy:

1. Archive all CLC programs and tables and replace hardware. Call Indramat Service for assistance.

447 VME SYSFAIL Detected

Cause:

VME bus signal SYSFAIL was activated somewhere in the VME rack and the CLC-V has detected this error. SYSFAIL is a VME bus error for signaling the bus that an error has occurred.

Remedy:

1. All devices in the VME rack must be diagnosed and cleared of any faults before the error can be cleared.

448 VME Communication Handshake Error (D)

Cause:

The VME bus uses mailboxes for sending messages across the VME backplane. An error has occurred while a message was either being send or requested. This error is typically hardware related and can not be easily remedied.

Remedy:

1. Archive all CLC programs and tables and replace hardware. Call Indramat Service for assistance.

449 VME Bus Error

Cause:

A VME bus error occurred while communicating to another card in pass-through mode through the serial port or during a VME data transfer instruction.

Remedy:

1. Check the extended diagnostics for the type of error and the address at which it occurred. If VME transfers were not being performed or if the address does not match that in the program, an internal CLC system error has occurred. Notify Indramat Service of this system error.

450 Event D: invalid event type

Cause:

The event type selected in the event table is not valid or does not match the type of motion or event. This error is also issued if an event/trigger (event arm) is executed for a motion-based event.

Remedy:

1. Make sure that the event type selected under ***Data ⇒ Events*** is consistent with the type of motion specified for the axis. Modify the numbered event and correct the event type. Save, compile and download the program.

451 Invalid event number D

Cause:

The event number is not within the bounds selected with the data/size command for this task.

Remedy:

1. Verify that the sizing icon contains the correct amount of events for the program.
2. Verify that the correct event number is selected and configured from within ***Data ⇒ Events***

452 More than D event timers armed

Cause:

Only 'D' repeating timer events can be armed at one time.

Remedy:

1. Check the program flow to make sure that triggered events are being disabled.

453 Homing param. transfer error: D

Cause:

A SERCOS communication error occurred during a drive-controlled homing command. 'D' indicates the communication error code returned by the drive.

Remedy:

1. Try to home the axis again. If this error still occurs, call Indramat Service for assistance.

454 Axis D homing not complete

Cause:

The drive did not successfully complete the homing sequence.

Remedy:

1. See the drive diagnostics for a status or error message. This can be viewed under ***Status ⇒ Drives***.

455 Invalid VME Data Transfer Class

Cause:

During a VME/READ or VME/WRITE instruction 

, the transfer class (e.g. I16, F32, etc.) is invalid.

Remedy:

1. This error is normally an indication that the compiled program is either incomplete or corrupt. Reopen the VisualMotion program and repeat the process of Saving, Compiling and Downloading.

456 Invalid VME Address

Cause:

During a VME/READ or VME/WRITE instruction 

, the VME address does not lie within the valid VME address range.

Remedy:

1. Since a VME address is selected from a valid listing of available addresses, this error is normally an indication that the compiled program is either incomplete or corrupt. Reopen the VisualMotion program and repeat the process of Saving, Compiling and Downloading.

457 Table Bounds Error During VME Read

Cause:

The variable or point table index exceeds the size of the table configured in the DATA/SIZE instructions.

Remedy:

1. Verify that the correct number of variables or points are being used in the program. If correct numbers are being used, then increase the amount specify in the DATA/SIZE instruction, or the Sizing icon if using icon programming.

458 Table Bounds Error During VME Write

Cause:

The variable or point table index exceeds the size of the table configured in the DATA/SIZE instructions.

Remedy:

1. Verify that the correct number of variables or points are being used in the program. If correct numbers are being used, then increase the number amount specify in the DATA/SIZE instruction, or the Sizing icon if using icon programming.

459 Axis D target position out of bounds

Cause:

The programmed position in an axis/move command or the Move  icon exceeds the drive's travel limits.

Remedy:

1. Adjust the travel limits or check the variable or constant containing the position. Drive travel limits are programmed in SERCOS parameters S-0-0049, Positive position limit value and S-0-0050, Negative position limit value. Check variable values under ***Data ⇒ Variables***.
2. Check travel limits set in CLC Drive Parameter Editor.
   ⇒ Select ***Status ⇒ Drives*** from VisualMotion Toolkit's main menu.
   ⇒ Select ***Parameter ⇒ Drive*** Limits from the CLC Drive Parameter Editor screen.

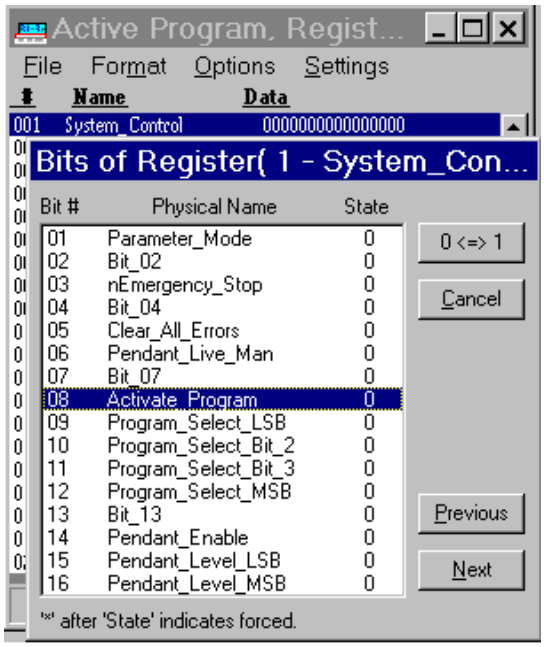
460 Invalid program D from binary inputs

Cause:

The program selected from the Binary Program Select bits 9-12 in System register 1 does not exist on the card or is greater than the maximum number of programs.

Remedy:

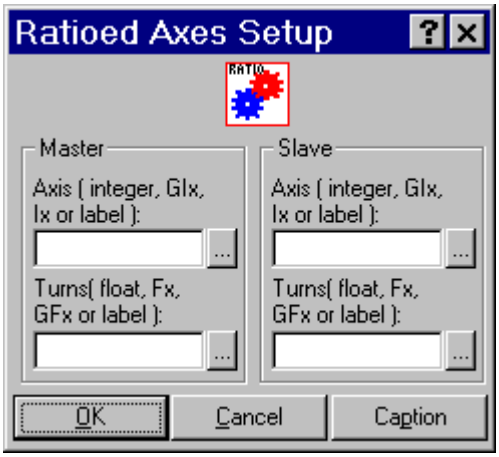
1. Make certain that the program number being selected is available on the CLC card. Program number can be viewed using VisualMotion and selecting ***File ⇒ Program Management***.



463 Ratio command: invalid ratio

Cause:

In the RATIO command, one of the factors is too large or the master factor is zero. The values entered in the Turns field are not correct.



Remedy:

1. Update the ratios so that the master is not a zero and the values are not too large.

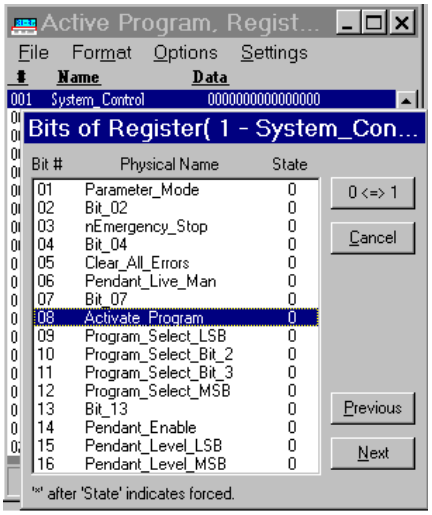
464 Can't activate while program running

Cause:

A new program cannot be activated through the Binary Program Select inputs, bit 8 of register 1, unless the program is stopped.

Remedy:

1. Stop the currently running program by setting register 1 bit 8 to 0. Set the desired program number in binary format through bits 9-12 and activate the new program by setting bit 8 to 1.



465 Drive D config. error, see ext. diag, or

465 Drive D: telegram type not supported (versions before 01.20)

Cause:

Drive D does not support a product-specific option or a drive configuration calculation has failed. Product-specific options include ELS, single-axis motion, or I-O cards.

Remedy:

1. The extended diagnostic message (C1.124, or in Status-System menu) describes the error in more detail. It often shows the parameter that failed along with a short message describing the error. If it indicates that a parameter is invalid or a configuration is not supported, check the axis configuration with the drive hardware or software.
2. If the extended diagnostic indicates an error such as 'Handshake time-out' or 'Drive is not responding', the SERCOS ring may have been disconnected during initialization. Check the fiber optic connections and the addresses of the drives on the ring.

467 Invalid ELS Master Option

Cause:

An option in the ELS/INIT command is invalid, not supported, or inconsistent with the other options. VisualMotion is initialing all of the ELS axes in the program and has come across an axis parameter A-0-0004 option that is invalid

Remedy:

1. Search the program for the axis in fault and verify that the axis options in parameter A-0-0004 are correct and within range. Refer to the VisualMotion 6 Reference manual for an explanation of axis parameter A-0-0004.

468 ELS adjustment out of bounds

Cause:

The phase offset or fine ratio adjustment exceeded the bounds allowed by the drive. The fine adjust must be between -100 and 300%.

Remedy:

1. Use the show program flow <F7> function to find the ELS phase adjust or Cam phase adjust icon in fault. Correct the value entered in degrees or percentage or the variable if programmed using variables.

ELS Phase Adjust

Cam Phase Adjust

469 Axis D accel <= 0 or > maximum

Cause:

The acceleration  or deceleration  programmed for axis D is negative, zero, or exceeds the maximum acceleration or deceleration parameter (A-0-0021 or A-0-0022).

Remedy:

1. Change the value of the acceleration or deceleration icon or variable to a value greater than 0 but less than the values in parameter A-0-0021 and A-0-0022. View axis parameters under ***Setup ⇒ Overview***.

470 Axis D velocity > maximum

Cause:

The velocity programmed for axis D exceeds the maximum velocity parameter A-0-0020.

Remedy:

1. Change the velocity value programmed in the velocity icon or the variable label being used in the velocity icon to a value less than parameter A-0-0020.

471 Invalid VME Base Address Page: 0xXXXX

Cause:

The base address page selected in the VME parameter is invalid. See the VME descriptions. Possibly power was loss to the system and address page has become corrupt.

Remedy:

1. This error is normally an indication that the compiled program is either incomplete or corrupt. Reopen the VisualMotion program and repeat the process of Saving, Compiling and Downloading.

472 VME Event Trigger Rejected

Cause:

A CLC did not respond to the VME broadcast event message. See the VME event description.

Remedy:

1. Verify that the correct event is selected under the event type programmed under ***Data ⇒ Events***.

473 VME Event Trigger For Unit D Failed

Cause:

Unit D did not respond to the VME mailbox event message. See the VME event description. This error is typically hardware related and can not be easily remedied.

Remedy:

1. Archive all CLC programs and tables and replace hardware. Call Indramat Service for assistance.

474 Drive D cyclic data size too large

Cause:

Too much data is configured in the SERCOS cyclic telegram. The drives currently support up to 16 bytes of configurable data.

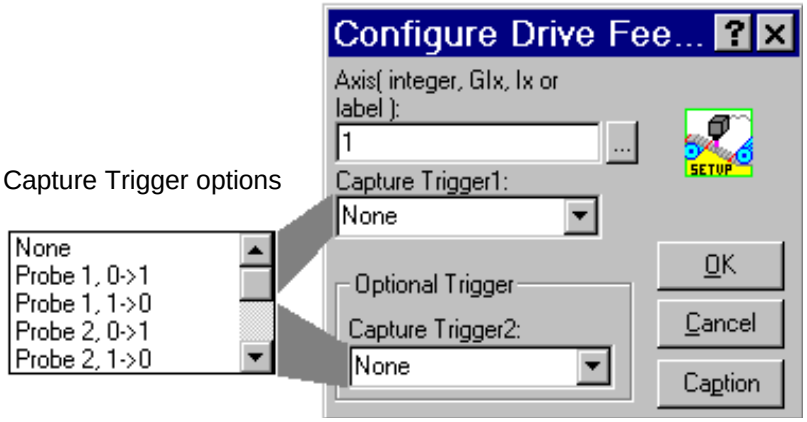
Remedy:

1. Remove I/O or registration options from the parameter or program configuration.

475 Axis D capture already configured

Cause:

An axis has been configured for the feedback capture function in a previous user program command. The capture/setup command allows up to 4 different trigger options setups for each axis. The same capture/setup configuration can not exists in the same program. Only one capture/setup command is allowed for each axis.



Remedy:

1. Verify that the capture/setup instructions are not setup to perform the same capture trigger option for the drive specified in this diagnostic message. If found, modify the capture/setup command and save, compile, and download the program.

476 Axis D: Real Time Bit Setup Error

Cause:

A SERCOS error occurred while the CLC was configuring the drive's real time bits for the feedback capture function.

Remedy:

1. Clear the error, enter parameter mode to reinitialize SERCOS, and then exit parameter mode.

477 Axis D: probe edge not configured

Cause:

This error, issued in the capture/enable instruction  , indicates that the selected probe edge for the event has not been configured with the capture/setup instruction 

.

Remedy:

1. Check the program to ensure that the Probe setup icon is included and defines the correct event trigger in the Probe enable icon.

478 Calc: operand out of range

Cause:

The operand of a calculation function is out of the range of valid arguments.

The following examples apply:

- Square root of a negative number
- Logarithmic of a negative number
- Arcsine and Arccosine value must be -1, 0, 1
- Raising to a power a non integer number (fraction)

Remedy:

1. Use show program flow <F7> feature to locate Calc icon with error and correct. If variables are being use to represent a value, correct the variable value from within ***Data ⇒ Variables***.

481 Event D is already armed

Cause:

An event that is currently armed has been armed again using event/trigger (event arm) or the VME event instructions.

Remedy:

1. Check the program for all insists of the specified event number and only allow the event to be armed only once.

482 Checksum Error in Program

Cause:

The currently active program's checksum doesn't match the checksum that is stored in memory. This indicates that a system error has caused the CLC to overwrite memory. Call Indramat service for assistance.

Remedy:

1. Reinitialize VisualMotion Toolkit and reopen the file containing the active program. If no changes were made to the currently active program; Save, Download and recompile the program.

483 Parameter Init. Error: see Task A diag

There is an error in the parameter initialization or bit initialization instruction; which is executed when exiting parameter mode. The parameter format, parameter number, or stored value may be invalid.

A communication error message is displayed in the diagnostic message for the task (A-D) in which the error occurred (***T-0-0122***). Information on the actual parameter number that caused the error is provided in extended diagnostics (***C-0-0124***).

Cause:

In many cases, this error is issued when a drive is not on the ring or the drive parameter is not found for a type of drive.

Remedy:

1. Make sure that all drives on the ring are powered up and enabled.
2. Check fiber optic connections.

484 CLC SYSTEM ERROR

Cause:

This error indicates a problem in the CLC executive firmware.

Remedy:

1. See the extended diagnostics parameter (***C-0-0124***) for more information or select ***Status*** ⇒ ***System*** within VisualMotion Toolkit, and call the Indramat service department for assistance.

485 SERCOS I/O: too many registers configured

Cause:

More than 50 SERCOS I/O registers were configured in the CLC, which exceeds the system limit. This includes both drive-resident I/O and SERCOS I/O slaves.

Remedy:

1. Reduce the amount of I/O in the SERCOS ring until the error is no longer encountered. If your system requirements are such that the I/O configuration must be maintained, contact Indramat Applications for additional assistance.

486 SERCOS Device D is not a drive

Cause:

The SERCOS device with address D was enabled in the user program or parameterized as an axis, but an I-O slave or other type of slave was detected.

Remedy:

1. Check the VisualMotion program for any instances where the device (not a drive, but maybe an I/O station) number is being configured as a drive and modify the program accordingly. Once corrected, Save, Compile and Download the modified program.

487 Cam D is invalid or not stored

Cause:

In the cam/activate command, the selected cam ('D') is not stored on the card or does not contain valid data.

Remedy:

1. Check the variable or constant that selects the cam. Check that there is a valid cam with index 'D' stored on the CLC.

488 Cam Error: See Task A diag.

Cause:

An error was issued during a cam command in task (A-D).

Remedy:

1. See the task diagnostic message (***T-0-0122***) for a description. See the extended message under ***Status ⇒ Tasks*** for more information.

489 More than D cam axes selected

Cause:

The CLC limits the number of axes configured as CLC Cam Axes to 'D'. The maximum number of CLC cams allowed on the card is 8. The maximum number of CLC cams running in the program is 4.

Remedy:

1. Check the program and modify it so that the number of CLC cams running is less than the number specified in this diagnostic message.

490 System Memory Allocation Error

Cause:

The dynamic memory space on the CLC has been exhausted. This diagnostic message is related to the amount of memory consumed by the compiled program as well as operations being performed dynamically, such as index can builds. The amounts of configured memory in the sizing icon directly effect the amount of system memory available.

Remedy:

1. The amount of memory available in the system can be viewed under menu selection ***Status ⇒ System***. One way to decrease memory usage would be to verify that all the items being selected within the sizing icon are necessary. For example: if only 3 event functions are used in the current VisualMotion program but 10 events are reserved in memory within the sizing icon, then the addition 7 events use up unnecessary memory resources. Decrease each field within the sizing icon to free up memory space.
2. If the problem persists, contact Indramat Service for assistance.

491 PC Communication Handshake Error

Cause:

The CLC/P did not respond to an ASCII message.

Remedy:

1. Check the address configuration on both the PC (config.sys and system.ini) and the CLC/P (address jumper switches) as well as ***Setup ⇒ Ports***.

492 Programs were lost

Cause:

User programs and data were lost. The RAM backup battery has failed or was not connected, or an internal system error has corrupted the memory. For the CLC/V, the card may have been removed from the VME rack.

Remedy:

1. Replace the battery and upload the archive file under ***File ⇒ Archive***.

493 Data was restored from Flash

Cause:

User programs and parameters have been restored from Flash EPROM.

Remedy:

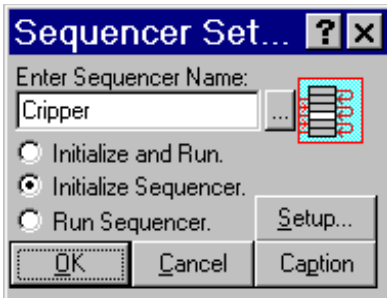
1. If the card has just been installed in the VME rack and a valid program is active, clear this error and proceed.
2. If the card has not just been installed, this indicates that the VME standby battery has failed and the previous program and data has been replaced with that stored in Flash.

494 Sequencer init. error: see task T diag

Cause:

An error has occurred in a sequencer/initialize instruction in task 'T'. The task diagnostic (***T-0-0122***) and the extended diagnostic (***C-0-0124***) gives a more detailed description of the error. This error occurs when the sequencer is commanded to initialize. Refer to Sequencer in the VisualMotion Reference manual for more information.

This error can occur in both initializing options.



Remedy:

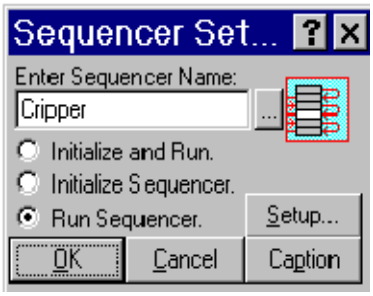
1. One possibility is that an Event is programmed as a function in the sequencer icon. Modify the program and replace the event with a subroutine.
2. Task diagnostic can be view under ***Status ⇒ Tasks***
3. Extended diagnostic can be view under ***Status ⇒ System***

495 Sequencer error: see task T diag.

Cause:

An error has occurred in a sequencer/execute instruction in task 'T'. The task diagnostic (***T-0-0122***) and the extended diagnostic (***C-0-0124***) gives a more detailed description of the error. This error occurs when the sequencer is commanded to execute. Refer to Sequencer in the VisualMotion Reference manual for more information.

This error can occur when a sequencer is being executed.



Remedy:

1. One possibility is that an Event is programmed as a function in the sequencer icon. Modify the program and replace the event with a subroutine.
2. Task diagnostic can be view under ***Status ⇒ Tasks***
3. Extended diagnostic can be view under ***Status ⇒ System***

496 Can't Execute this Instruction from an Event

Cause:

This user program instruction cannot be executed from within an event. See the task error descriptions and the current program instruction. Some operations, such as sequencer initialization, cannot take place during an event.

Remedy:

1. Move the instruction into a main user task or subroutine

497 Limit switch config. error, see ext. diag

Cause:

This error is issued at activation of a program when one of the PLS parameters defined in the program is invalid. It is also issued when the ELS setup is incorrect for PLS operation.

Remedy:

1. Parameter ***C-0-0124*** provides a detailed description of the error as an extended diagnostic message.
2. Extended diagnostic can be view under ***Status ⇒ System***

498 Drive D Shutdown Warning

Cause:

This error is issued when any drive has a Class 2 shutdown warning. The tasks that stop for errors switch into manual mode and perform a controlled stop of all axes. A drive warning indicates a condition that will later cause a shutdown, but is serious enough to require immediate attention.

Note: Class 2 warnings may not be detected by the CLC if drive parameter S-0-0012 is being continuously read by the user interface or user program, since the diagnostic change bit is reset whenever this parameter is read.

Remedy:

1. Since the warning may have already been cleared on the drive, the extended diagnostic (***C-0-0124***) latches the class 2 diagnostic bits (drive parameter S-0-0012) from the drive so that this condition can be corrected.
2. Extended diagnostic can be view under ***Status ⇒ System***
3. Using VisualMotion Toolkit, open the CLC Drive Parameter Editor under menu selection ***Status ⇒ Drives*** and view the status line for a description of the drive error. Refer to the drive manual for more information.

499 Axis number D not supported in this version

Cause:

This version of CLC software is limited to less than D axes. The axis number is limited to the number of axes allowed. Currently, VisualMotion allows 40 axes.

Remedy:

1. Check the program for an axis value greater than 40 or a variable label given to an axis with a value greater than 40.

500 Axis D is not referenced

Cause:

Axis D has not been homed, the reference position has not been set, or the reference position has been lost. The reference position bit in drive parameter S-0-0403 is zero. To enable or disable this error, use parameter A-0-0006. If parameter A-0-0006, bit 1 is set to (1), then VisualMotion will display this error.

Remedy:

1. Stop the VisualMotion program. Recycle the program by switching to manual mode and then back to auto mode. This process will reinitialize the program back to the ***Start*** icon. If the homing command instruction is at the beginning of the program, re-start the program to home the axis again.

2. Verify homing options within the CLC Drive Parameter Editor.
   Setup ⇒ Drives
   Parameters ⇒ Drive Reference
3. If the drive controlled homing procedure still does not occur, contact Indramat Service for assistance.

501 Drive D communications error

Cause:

An error in drive communications has occurred while the CLC was reading or writing a service channel parameter for an internal operation.

Remedy:

1. Parameter C-0-0124, extended diagnostics, has a detailed description of the error. This extended diagnostic can also be using VisualMotion Toolkit under menu selection ***Status ⇒ System***.

502 ELS and cams not supported in this version

Cause:

The ELS and cam features in the currently active VisualMotion program are not supported in this version of VisualMotion CLC card firmware.

Remedy:

1. The CLC card contains a firmware version that is not capable of perform ELS and Cam functions. Verify the version of CLC firmware in card parameter C-0-0100 or using VisualMotion Toolkit under menu selection ***Status ⇒ System***. Contact Indramat Service for assistance.

504 Communication Timeout

Cause:

During a timed serial port transmission, the serial port has not responded within the time set in parameter C-0-0016. Timed transmissions used for jogging through Visual Motion.

Remedy:

1. If this error occurs, increase the timeout value in C-0-0016.
   Using VisualMotion Toolkit…
   Select ⇒ Overview from the main menu
   Refer to Figure 3-1: Viewing system diagnostic parameters, for instructions.

505 Axis D is not configured

Cause:

A user program command was issued to Axis D, but axis D is not configured in the program.

Remedy:

1. Modify the user program so that the correct axis is addressed, or exclude the axis from the system using Axis parameter A-0-0007.

506 I-O Mapper initialization error

Cause:

The I-O mapper was invalid at initialization, due to loss of memory or an incompatibility in the mapper version. During the initial system setup an I/O mapper file should have been created and saved with the extension ***.iom**.

Remedy:

1. Reinstall the I/O mapper file (***.iom**) using the following VisualMotion Toolkit procedure.

Note: This procedure should only be performed by qualified trained personnel who can verify that the I/O Mapper file being selected is the correct file for the system.

- ⇒ Select ***Data ⇒ I/O Mapper***
- ⇒ From the Ladder Editor screen, select ***File ⇒ Upload Strings***
- ⇒ Once the I/O Mapper file is loaded, the I/O Mapper strings can be viewed and verified by selecting ***Options ⇒ Display Strings***.
- ⇒ Once verified, select ***File ⇒ Download Strings*** and answer Yes to the popup window warning.
- ⇒ Reinitialize the VisualMotion program and test I/O mapper

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Note: If the ***.iom** file does not upload from the CLC card, use ***File ⇒ Open*** from the Ladder Editor screen and open a valid ***.iom** file.

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2. If the error is still encountered, contact Indramat Service for assistance.

507 Option Card Power Supply Error

Cause:

There is an external power supply or output driver error on a DEA-08.1C, DEA-09.1C, DEA-10.1C, DEA28.1M, DEA29.1M or DEA30.1M expansion cards connected to the CLC-D. This error is issued only in Run Mode (phase 4). All inputs are read as 0, and all outputs are turned off.

Remedy:

When a 507 error occurs, check parameter C-0-0031 to find the cards that have the error condition. Check the ERR LED on the DEA. If it is on, check the current draw of the devices connected to the outputs. If the ERR LED is off, check the +24V external power supply signal to see if it is connected and if it falls in the range above.

Power Supply Error on DEA:

The +24V signal voltage on each DEA must fall in the following range:

	Min.	Typical	Max.
External Supply Voltage	+18V	+24V	+32V

Output Driver Error on DEA/C:

An output driver error turns the 'ERR' LED on the DEA/C card on. This indicates that the current drawn by the outputs has caused the output drivers to shut down. There is a protection circuit that prevents damage to the card in this condition. This error is issued if the current is greater than 300mA for more than 1 microsecond.

508 User Watchdog Timeout

Cause:

The user watchdog timer enforces a time constraint on a user task or a user interface.

Every time a nonzero timeout value is written to C-0-0021, a timer is triggered on the CLC. If the timeout expires, the error "**508 User Watchdog Timeout**" is issued. The timer is checked by the CLC every 50ms.

If C-0-0021 is set to zero, the watchdog timer is disabled. If it is nonzero, it is active when the CLC is in run mode, there are no errors, and the task specified in C-0-0022 is running.

In a user program task, parameter C-0-0021 can be written to via a parameter transfer at the beginning of the main processing loop. If the CLC system tasks or the user program events are consuming too much processor time, the time set in C-0-0021 will elapse, and error 508 will be issued. The programmer can then adjust the timing of the events, or increase the SERCOS or I-O cycle times to allow more time for the user task.

Remedy:

1. If this feature is intentionally set and the user's desired elapse time, programmed in parameter C-0-0021, can be increased, the user can modify the value in parameter C-0-0021.
2. If this feature is **not** desired but a value other than zero appears in parameter C-0-0021, change this value to zero to disable this feature.

509 CLC System Timing Error D

Cause:

When the CLC is powered up a timer monitors high level control task and generates this error if the system timing overlaps. This means that a high level task or calculation is not completed in the allow system time, and once the timer repeats, the operation being performed did not complete. The cause for timeout can result for electromagnetic interface of serial communications.

Remedy:

1. Increase SERCOS parameter S-0-0002, SERCOS Cycle Time, from 4000µsec to 8000µsec. Switch the system or drive to parameter mode and then back to automatic mode to update the SERCOS ring.
2. If the increase in SERCOS Cycle Time does not help, contact Indramat Service for assistance.
3. Replace the Serial Communication cable.

510 ELS Master Synchronization Error

Cause:

In an ELS application, a switch from virtual master to real master is performed. This error occurs when the Master 1 velocity window in card parameter C-0-0159 or Master 2 velocity window parameter C-0-1556 are exceeded.

Remedy:

1. Increase the velocity window in parameters C-0-0159 or C-0-1556 to allow for wide velocity window.

514 CLC SYSTEM ERROR D

Cause:

This diagnostic has resulted from a processing error in the main 68020 CLC card processor. It can be triggered by numerous types of programs instructions.

Remedy:

1. Cycle power to the entire VisualMotion system and reestablish communications between VisualMotion Toolkit and the CLC card.
2. Verify that all system communications under the Setup menu are correct.
3. Verify that the DDE Server is functioning and communicating.

515 PLC Communication Error D

Cause:

This diagnostic message is only display when using the CLC-P02 with PC104 dual port RAM. Communications between the CLC-P02 and the MTS PLC (MTC200 PLC) across the dual port RAM has terminated due to a failure in transmission from the MTS PLC.

Remedy:

1. Check to see that the CLC-P02 is firmly set at the PC104 dual port RAM to the MS PLC.
2. Cycle power to the entire system to re-establish communications.
3. If communications are still not established, contact Indramat Service for assistance.

3.6 Fatal System Errors

When a microprocessor exception or an unrecoverable system error occurs, the CLC may stop communicating with VisualMotion Toolkit and the BTC06 Teach Pendant interfaces. If possible, control is passed to a CLC-resident monitor routine that can provide debugging information to an ASCII terminal connected to the Host serial port. If a fatal error repeatedly occurs and cannot be recovered, call Indramat Service for assistance in debugging.

3.7 Communication Error Codes and Messages

!01 SERCOS Error Code # xxxx (xxxx = Error code)

This is the code set in the data status word of the DDS-2 drive if SERCOS communication is invalid. Call Indramat Service if this error occurs.

!02 Invalid Parameter Number

The requested or sent parameter does not exist on the CLC or the drive, or the format of the parameter is incorrect.

!03 Data is Read Only

The data in this parameter may not be modified.

!04 Write Protected in this mode/phase

The data in this parameter can not be written in this mode or communication phase. Switch into parameter mode (phase 2) to enter the parameter.

!05 Greater than maximum value

The parameter exceeds the maximum allowed value.

!06 Less than minimum value

The parameter is less than the minimum allowed value.

!07 Data is Invalid

Parameter data is invalid, or the format of the parameter is invalid. See the DDS or CLC Parameter Descriptions.

!08 Drive was not found

The requested drive was not found on the SERCOS ring.

!09 Drive not ready for communication

The requested drive or the SERCOS ring has not been initialized.

!10 Drive is not responding

The drive did not respond to a service channel request. Check system diagnostics for the state of the SERCOS ring.

!11 Service channel is not open

When switching between initialization phases, data from the drive is momentarily invalid, and this message is sent instead of the requested data.

!12 Invalid Command Class

A serial port command is invalid or not supported at this time.

!13 Checksum Error: xx (xx= checksum that CLC calculated)

The CLC detected an invalid or missing checksum in data that was sent to it. As a debugging aid, the checksum that the CLC calculated on the incoming data is also sent with this message.

!14 Invalid Command Subclass

A serial port command option is invalid or not supported.

!15 Invalid Parameter Set

The parameter set number (task or axis) is invalid.

!16 List already in progress

An attempt has been made to start a parameter or program list that is already in progress.

!17 Invalid Sequence Number

The sequence number of a parameter or program list is invalid or has been sent out of order.

!18 List has not started

A parameter or program list has not been initiated (i.e., sequence number was sent before list was started).

!19 List is finished

This is an acknowledgment that a parameter or program list is complete. It does not indicate an error.

!20 Parameter is a List

This parameter is a variable-length list, and its data cannot be displayed as a normal parameter.

!21 Parameter is not a List

Only Variable-Length List parameters can use the Parameter List sequence.

!22 Invalid Variable Number

The variable mnemonic was not 'I' or 'F', or the variable number is greater than the maximum number of variables allocated.

!23 Insufficient program space

This message is sent after the CLC receives a "P W" program header if not enough contiguous memory is left on the CLC to store the program. Other programs may need to be deleted or their order rearranged. Check system parameters C1.91, C1.92 and C1.93 for CLC memory status.

!24 Maximum number of files exceeded

The CLC allows up to 10 programs resident in the CLC. This error message is sent when the CLC receives a "PW" program header and there are already 10 programs stored on the CLC. One of the CLC resident program files must be deleted to make room to download the program.

!25 Invalid program header

The format of the program header sent to the CLC is invalid, or this command is not available for reading or writing.

!26 Checksum Error in Program

This message is sent at the end of a download if the checksum of the data does not match the checksums sent in the program or program header.

!27 Invalid Program Handle

The format of the handle is incorrect, or this command is not available for reading or writing.

!28 Function not Implemented

The function is not implemented in this version of the CLC.

!29 Program not found on CLC

A program corresponding to the requested program handle was not found (e.g., the program is not resident in the CLC).

!30 Invalid I/O Register or Bit Number

The I/O register mnemonic is invalid or a register number greater than the maximum number of registers was sent.

!31 Invalid Table Index

The ABS, REL, or EVT table name was incorrect, or the index number was greater than the maximum number of points or events.

!32 Communication Port Error

The serial port receive buffer has overflowed. Make sure communication is set to half-duplex.

!33 Invalid Data Format

The format of the data received by the CLC is invalid (e.g., non-digits are sent in a decimal number).

!34 Active program can't be deleted

The active program cannot be deleted at any time.

!35 Parameter mode is required

The action requested can only be performed in Parameter Mode.

!36 Invalid Event Number

The event number selected in the ABS or REL point table is out of the range of the total number of events.

!37 Invalid Event Function

The function name selected in the event table does not exist on the CLC card or is not defined as an event function.

!38 Program file version mismatch

The version of the file system on the card does not match that of the downloaded file. Upgrade to the latest versions of the Visual Motion compiler and CLC executive.

!39 Can't activate while program running

A new program cannot be activated unless all user tasks are stopped.

!40 No programs are active

No programs are active on the CLC card. Download a program to the card.

!41 System Error: pSOS #XXXX

This is an internal CLC system error. Call Indramat Service for assistance.

!42 Mapper: invalid operator

An invalid Boolean operator was found in I/O Mapper when it was sent to the CLC.

!43 Mapper: too many operations

The maximum number of Boolean operations allowed by the CLC I/O mapper has been exceeded.

!44 Mapper: invalid register

A register exceeds the maximum number of registers or is 0.

!45 Mapper: invalid bit or mask

The bit number or mask sent exceeds 16 bits.

!46 Mapper: register is read-only

An assignment to a read-only register or bit was made (e.g., attempting to write to a CLC status register).

!47 Invalid Unit Number

The unit number (second character in string) is not a number between '1' and 'F' or an ASCII space character.

!48 VME Bus Error

A VME bus error occurred while communicating to another card in pass-through mode through the serial port.

!49 VME Communication Handshake Error (D)

The card addressed by the unit number in pass-through mode does not exist or its parameters are not configured properly. Change the unit number to correspond to a card in the rack or set it to a space. (No longer issued on CLC.)

!50 Invalid Download Block

The block sent during a program download is incorrect in length or is not in hexadecimal format.

!51 Unit D: Invalid VME Base Address Page

The VME base address page parameter is set to an invalid address for the indicated VME unit number.

!52 Invalid Axis

The parameter set for the requested axis does not exist. Either this axis is disabled or the CLC does not support this number of axes.

!53 Waiting for service channel

When switching between drive initialization phases, data from the drive is momentarily invalid. This message is sent instead of the requested data. This message will also be issued whenever a service channel transaction cannot be completed. Continue to retry the message until a valid response is returned.

!54 List or String is too short

The text string or parameter list is smaller than the minimum length allowed by the CLC or the drive, or the size of a value does not match the attributes sent from the drive.

!55 List or String is too long

The text string or parameter list exceeds the maximum length allowed by the CLC or the drive, or the size of a value does not match the attributes sent from the drive.

!56 PC Communication Handshake Error

The CLC is not responding to an ASCII message. Check the address configuration on both the PC (config.sys and system.ini) and the CLC (address jumper switches).

!57 I/O Mapper: Max file size on CLC Exceeded

The CLC memory that was allocated for I-O mapper strings (8KBytes) has been exhausted. Optimize the mapping program so that it fits into memory.

!58 Cannot store cam: already active for axis D

Cam data cannot be changed unless no axes are currently using it. Deactivate the cam for axis 'D', then send the cam again.

!59 SERCOS handshake/busy timeout

This is an internal error generated by the SERCOS ASIC. Change modes or reset the card. If it happens again, call Indramat Service.

!60 Executable program is too large (ddK)

The executable portion of the user program downloaded to the CLC exceeds the maximum limit, which is indicated in the message ('dd') in kilobytes. Optimize the program and download it again, or update the firmware to a version that has a larger program limit.

!61 System Memory Allocation Error

The dynamic memory space on the CLC has been exhausted. Call Indramat Service for assistance.

!62 Cam X data is < 0 or greater than 360

All values in the x-column (right hand column) of the cam file sent to the CLC must be between zero and the modulo value of the master.

!63 X-Column does not start at 0 or end at 360

In the cam file sent to the CLC, the first point must be zero and the last point must be the modulo value of the master. Check the beginning and end of the cam file.

!64 Not supported in user prog file version 1.1

The requested feature is not present in the file version of the user program from which the data was requested or sent. To use this feature, a compiler upgrade is necessary.

!65 Sequencer: invalid sequence (D)

The sequence number (D) is zero or is greater than the allocated maximum number of sequencers for this program.

!66 Sequencer: invalid step (D)

The sequencer step number (D) is zero or is greater than the allocated maximum number of steps for this program.

!67 Invalid function number (D)

The function number (D) selected for a sequencer step is invalid or refers to a function that does not exist on the card.

!68 Function D not accessible in a step

The function referred to with the number (D) cannot be entered in a sequencer step. It needs to be declared accessible by the sequencer in the user program.

!69 Too many functions are used (D)

The total number of functions used by all steps exceeds the number (D) allocated for the program in the data sizing instruction, or the number of functions used in a step exceeds the number of functions remaining. Reduce the number of functions used or allocate more function slots in the data sizing instruction.

!70 Maximum steps per sequence exceeded (D)

The number of steps in a sequence exceeds the number (D) allocated for the program in the data sizing instruction.

!71 Maximum functions per step exceeded (D)

Up to (D) functions can be used in one sequencer step. This is a CLC system limit, which in version GPS-02.00 is 100.

!72 Program does not include a PLS

PLS data was requested from a program that does not support the Programmable Limit Switch function or does not have any PLS's configured.

!73 Invalid ABS or REL point index (D)

Point D is zero or is greater than the allocated maximum number of points for the selected point table.

!74 Error in command execution

A procedure command set in the CLC or drive parameter has not been successfully completed.

!75 Comm. port buffer overflow

The serial port received buffer has overflowed. In current versions of the CLC, this buffer is 512 bytes. To avoid this error, the host must communicate in half duplex or use XON-XOFF handshaking correctly.

!77 Can't save sequencer while it is running

Sequencer data can only be save while the program is not running, or while no user tasks are running a sequencer.

!78 Service channel in use

The SERCOS service channel is being used by a user program task or by a CLC internal process, and has suspended the transmission of a list or text string. See the description of parameter C-0-0010, bit 12.

!79 PID block number does not exist

This error is issued when the selected PID block is not initialized in the user program.

!80 IBS: Invalid Object Number

The Fieldbus object number being transmitted to the CLC card by the way of serial communications has become corrupted and is in an invalid format. Fieldbus object numbers must always begin with a 5, e.g., 5F02.

!81 IBS: Invalid Mapping(s)

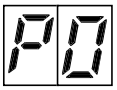
The Data Type selected in the Fieldbus Mapper is invalid. Fieldbus object number can be mapped to a Variable, Register, Card parameter, Axis parameter, or Task Parameter. The Data Types mentioned above become an invalid mapping if the type being selected can not be mapped or is read only. This will normally occur when mapping object numbers to parameters.

!82 Write protected by password

The SERCOS parameter being modified is password protected. This password protection is reserved for Indramat Service personnel.

3.8 Drive Errors

Always look at CLC diagnostics before troubleshooting drive errors. The CLC-D/V cards have an LED display. You can also refer to VisualMotion Toolkit for diagnostic messages. Refer to the *VisualMotion 6.0 Reference Manual* for more information.



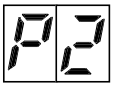
If **P0** is displayed on **all** the drives on the ring, then a drive number has been setup that is not present on the ring. Go to System under the Status menu and check the diagnostic message. "***415 Drive x was not found***" should be displayed, where *x* is the drive number defined but does not exist. If *x* should be a valid drive number, make sure that the drive is included in the SERCOS ring.

*Other possible errors: 412 No Drives were found on ring
402 SERCOS configuration error

Make sure that the drive numbers in the "Task Axis Setup" dialog box within the **Axis**  icon agree with the rotary switches S2 and S3 on the DSS modules.

If the drive numbers do not agree, there are two options. The first is to power down the drives and change S2/S3 so that they agree with the software settings. The other option is to change the drive numbers in the "Task Axis Setup" dialog box, save the file, compile and download the revised program. After completing either of the options, the drives should display **AH**.

If **P0** is displayed on only some of the drives, then those drives are not part of the SERCOS ring. Power down the system, add the drives to the ring, and then bring the system back on line.



Cause:

There are 2 cases where **P2** would be displayed on the drives:

1. Drives are in Parameter Mode (all drives would display **P2**)
2. SERCOS ring cannot switch into Phase 3 due to error (all drives would display **P2**)

Remedy:

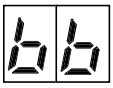
1. Take the system out of Parameter mode (Register 1, bit 1 =0) or,
2. Determine which drive has the Phase 3 error and refer to drive error 32.

Cause:

Ab means that control voltage and main 3 Φ power is present and the drive is ready to be enabled (E-Stop is active).

Remedy:

To enable the drive, set Register #001 Bit #03 (!Emergency_Stop) = 1 and clear the E-stop error by setting register 1 bit 5 (Clear_All_Errors) = 1 (bit is leading edge triggered). Drive should then display **AH**.



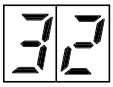
Cause:

If **bb** is displayed, then 3 Φ power is not present on the bus.

Remedy:

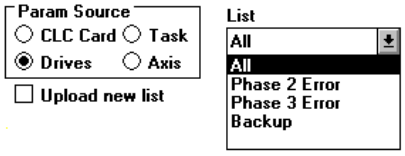
1. Make sure 3 Φ power is available to the drives
2. Check the power supply to be sure that the path from X2.1 to X2.6 is complete.
3. Make sure the terminating resistor is installed on the last drive on the power supply.

Note: *DIAX03 drive equivalent is C2 Communication Phase 4 Transition Check. See parameter S-0-0128.*

 - See also CLC Error 407: Phase 3 switch error and 411: Phase 4 switch error.

This error only applies to DIAX02 drives. Flashing 32 indicates that an error has occurred in the SERCOS initialization process. The error occurs when SERCOS finds a non valid drive parameter on the DSM module.

Action:

Step 1. Error Status	Check Drive Parameter S-0-0095 This parameter gives details of the error message. A common message is "201 Parameter Set Incomplete."
Step 2.	Look at the Diagnostic Message in the "System" dialog box under the Status menu. The error message will probably be "407 Drive *x* Phase 3 Switch Error" or "411 Drive *x* Phase 4 Switch Error."
Step 3.	Put the drive in Parameter mode.
Step 4. Parameter Error List	Select Overview from the Setup menu in Visual Motion. Select Drives as Parameter Source and choose error type from the list drop down box. Choose Phase 2 Error if Error 407 or Phase 3 Error if Error 411 (*DIAX02 only*). For DIAX03 drives see note above. 
Step 5.	Highlight the first parameter in the list and double click. An edit box for that parameter will open.
Step 6.	Save the **default** value in the parameter by clicking on the Save button. Click on the Next button to edit the next parameter in the list.
Step 7.	Repeat step six for all the parameters in the list.

The default value for each parameter is only a suggested value. The correct value for each application should be determined during the application set-up.

For an explanation of each parameter see the appropriate drive manual.

4 CLC DDE Server

4.1 Dynamic Data Exchange

The Microsoft Windows operating system specifies a method for transferring data between applications which is called dynamic data exchange (DDE). DDE is a message protocol that developers can use for exchanging data between Windows-based applications. The CLC communication server uses the dynamic data exchange management library (DDEML) which is built on top of the DDE protocol. The DDEML provides services that the message-based DDE protocol does not support. Under the DDEML a client application requests information from a server application, or it sends unsolicited data to the server. The client does this by passing predefined ASCII strings to the server through the DDEML.

Before a client and server can exchange data, they must first agree upon what they are going talk about. This is done by establishing a conversation. Conversations are defined by a service name and a topic name. The CLC server application uses this information to specify how and who to communicate with. After having established a conversation, the client application can now pass data. This is done by specifying an item name. The item name identifies the specific data to be passed.

There are three basic types of data transactions which can be initiated by the client application. A ***request*** transaction is used to obtain data from the server. The server application knows how to obtain the requested information. The second type of transaction is an ***advise link***. After a client application establishes an advise link with a server, it is up to the server to poll the data for changes. If the server finds that the data has changed it will notify the client application. The third type of transaction is a ***poke***. A poke transaction is used to send data for a specific item to the server.

The Dynamic Data Exchange Server

CLC_DDE is a Windows based Dynamic Data Exchange (DDE) Server application which is used to communicate with Indramat's CLC motion control cards. It has been implemented using windows dynamic data exchange management library (DDEML).

Key Features

- Serial connection to a CLC card with support for an RS485 auto switching adapter.
- Support for a modem connection to a CLC card (AT protocol).
- VME back plane communications from a XYCOM PC (Requires *XVME984.DLL*).
- VME back plane communications from a GE FANUC Plug & Play PC (Requires *VPCMTK.DLL*).
- Direct PC AT bus communication to a CLC-P card (Requires *CLC_P.DLL*)
- Direct PC104 bus communication to a CLC-P02 card (Requires CLC_P2.DLL)
- Connection for editing a CLC compiled program file off line (Requires *CLC_FILE.DLL*).
- Demonstration connection for testing client applications off line (Requires *DEMO.INI*).
- Access to server parameters and status through DDE.

- Supports *Request, Advise* and *Poke* transactions.

Dynamic Data Exchange Interface

A windows application, known as a *client,* can pass information between other applications known as *servers* using Dynamic Data Exchange (*DDE*). A client establishes a conversation with a server specifying a *Service* and a *Topic*. Once a conversation has been started, a client may request or send information by specifying an *item*.

Service Name

The CLC communication server supports two DDE service names. The standard service name is ***CLC_DDE***. This should be used for all connections except when connecting to a CLC compiled program file. For this case use ***CLC_FILE***.

Topic Name

When the standard service name is used to exchange CLC data, the topic name identifies the method of connection to the CLC card and the card unit number. Valid strings consist of a communication device name and a unit number. Valid device names are ***SERIAL_***, ***AT_MODEM_***, ***XYCOM_***, ***GE_P&P_***, ***DEMO_, ISA_ or PC104_*** and valid card unit numbers are '0' to 'F'. Connections which use the CLC_FILE service should specify the CLC program file as the topic name. If the file is not located in the same directory as clc_dde.exe then the complete path should be included. To exchange server data the service name should be CLC_DDE and the topic name should be **SERVER**. This is the only topic which will not support an advise link. *See section SERVER Topic Name**.***

Example:	**"SERIAL_0"**	Serial connection to a CLC-D card designated as unit '0'.
	"XYCOM_B"	Xycom PC in VME rack talking to a CLC-V card designated as unit 'B'.
	"ISA_1"	PC talking over the ISA bus to a CLC-P01 card designated as unit 1.
	"PC104_0"	PC talking over the PC104 bus to a CLC-P02 card designated as unit 0.
	"SERVER"	Exchange CLC_DDE server information.

Item Name

The item name identifies the specific data to exchange. When exchanging CLC data, the item name consists of a string which contains the class, subclass and data identifiers of the information for the CLC card. The strings follow the ASCII serial protocol. Refer to *Appendix A,* ***Direct ASCII Communications*** for an explanation of these codes. When exchanging server data the item name should consist of the section and entry name from the INI file (clc_dde.ini). The two names must be divided by a pipe ('|') character. Not all server data has read/write capabilities.

Example:	**"RX 0.10"**	Specifies register 10 in hexadecimal format.
	"TP 2.20"	Specifies task B parameter 20.
	"CP 1.122"	Specifies card parameter 122.
	"SERIAL|Baudrate"	Specifies the baud rate to use for serial connections.

Note: Serial connections directed at different units will be passed through the VME backplane to the proper unit (CLC-V only). This allows communications with any CLC_V card in the VME rack with only one serial connection.

4.2 The Communication Servers Main Window

CLC_DDE displays the unit number and current status for the selected CLC control card. To display the status for a different CLC card or to disable this feature, open the server configuration dialog box under the settings menu item. Select the desired connection/unit from the CLC status display combo box.

When CLC_DDE is in an icon state the tip of the arrow will change colors depending on the communication state. A green tip means that the server is actively communicating, and a red tip indicates that the server is in an error state. If the monitored CLC card's status indicates an error state while the application is an icon, the server window will be restored to the normal state.

When the CLC DDE Server is running, either the icon or the dialog box below is displayed. If the icon is displayed, double-clicking the icon restores the dialog box.

The CLC DDE Server dialog box contains three selections on the main menu bar: File, Settings and DDE.

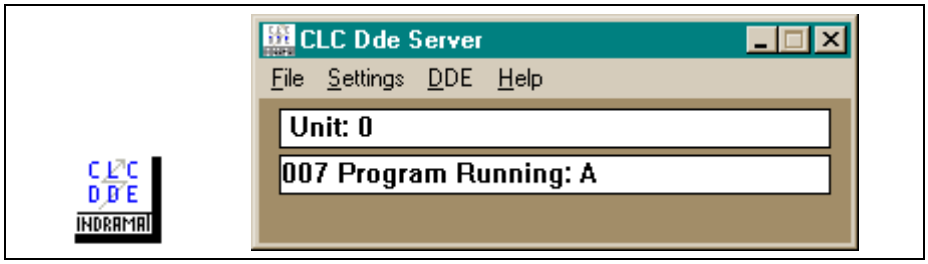


Figure 4-1: CLC DDE Server

Settings Menu - CLC Server Configuration

The CLC Server Configuration allows setting of various system parameters as well as providing performance status information.

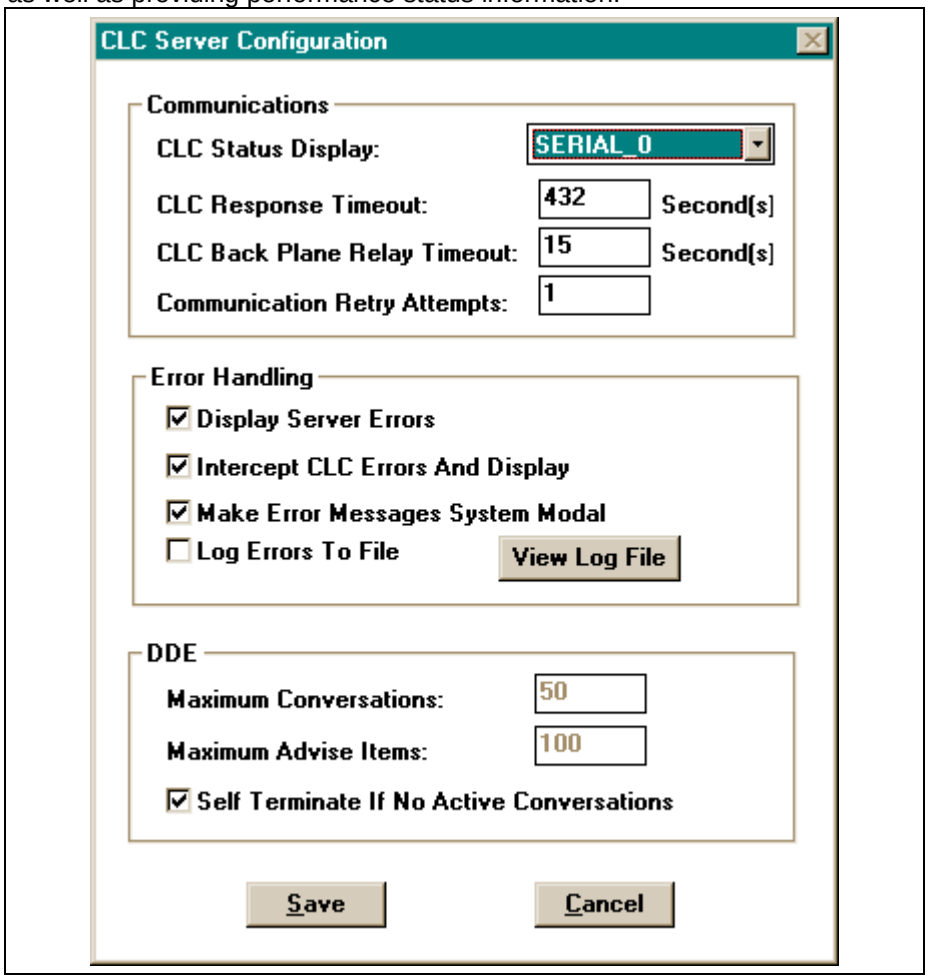


Figure 4-2: CLC Server Configuration

Communications

CLC Status Display	Selects the CLC device/unit (i.e. serial_0) combination to be displayed in the status window of the server . The request will be inserted into the standard client advise loop queue. This feature can be turned off by selecting “Disable Status”.
CLC Response Time-out	The amount of time in seconds that the server will wait for a completed response from the CLC control card before diagnosing a disconnect. The valid range of values is 1-900 seconds.
CLC Back Plane Relay Time-out	CLC-V control cards have the ability to redirect incoming serial messages over the VME back plane to other CLC-V cards in the same rack. This allows a host to address multiple control cards with one serial connection. These transmissions may require more time than a direct serial link. The relay time-out value is used for these transactions. The valid range of values is 1-900 seconds.
Communication Retry Attempts	The number of times the server will re-send a message before it issues an error. The valid range of values is 0-255.

Error Handling

Intercept CLC Errors And Display	Checking this box will cause the server to intercept CLC error responses and displayed them in a message box. Request and poke transactions will return failure to the client application. Advise links will remain active, however they will return nothing until the error is resolved. The error response will be written to the error log file if that feature is enabled. If this box is not checked the error string will be returned to the client.
Make Error Messages System Modal	Checking this box will cause all server generated message boxes to have system modal attributes. This means that all applications will be suspended until the user responds to the message box. The window can not be forced to the background.
Log Errors To File	Checking this box will cause the server to log all server errors to a file. The current system date and time will be associated with each log entry. As a default this feature is not enabled.
View Log File	Pressing this button will cause the current error log file to be displayed in notepad.

DDE

Maximum Conversations	This is a static display of the maximum number of allowed DDE conversations as specified in the INI file. The server will refuse any DDE connection requests in excess of this value.
Maximum Advise Items	This is a static display of the maximum number of allowed DDE advise links as specified in the INI file. The server will refuse any requests for advise links in excess of this value.
Self Terminate If No Active Conversations	Checking this box will cause the server to close itself when the last DDE conversation with it has terminated. This is the default state.

Settings Menu - Serial Communications

The Serial Communications dialog box allows the user to select the serial communication parameters the server will use. When this dialog box is open all communications are suspended. If changes are made to the configuration they will take affect when the “Save” button is pressed.

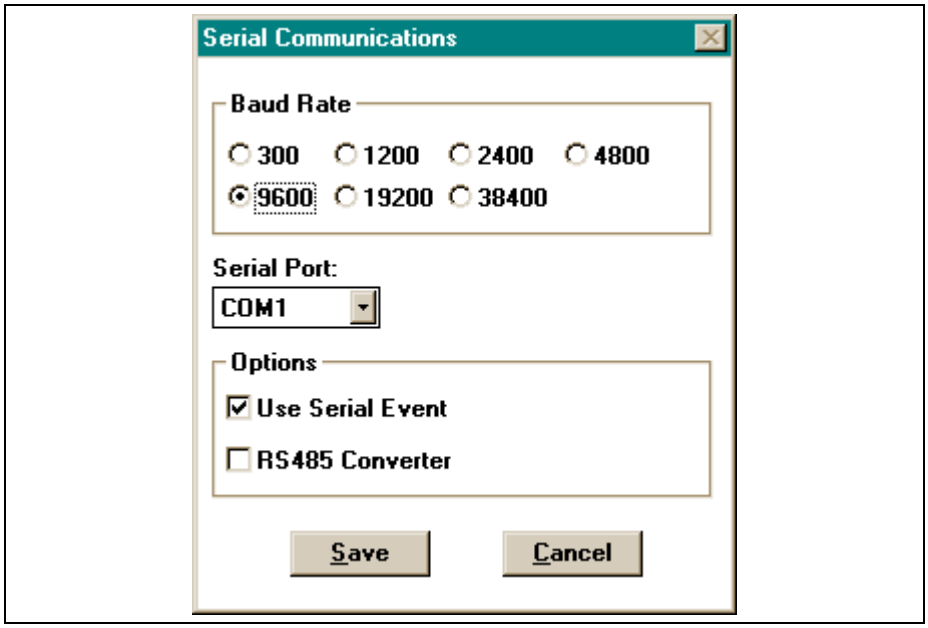


Figure 4-3: Serial Communications

Baud Rate	Check the proper baud rate to use when communicating serially with a CLC card.
Serial Port	Select the serial communications port to use on the PC.
Use Serial Event	Checking this box causes Windows to notify the server when a completed message is in the receive queue. This will increase the number of serial messages sent over polling for a response. Slower computers may not be able to utilize this feature.
RS485 Converter (not available with TRANS 01-D)	This option should be used when an RS232 to RS485 converter is present. A delay will be inserted between messages which is equal to at least one character transmission at the selected baud rate. This is necessary to ensure that the CLC card has had sufficient time in which to turn the RS485 transmitter off and enable the receiver. Please note that the converter must toggle the transmitter and receiver automatically, and also that echo back must be disabled.

Settings Menu - VME Communications

The VME Communications dialog box allows the user to edit parameters which the server uses when talking over the VME bus using a XYCOM embedded PC. When this dialog box is open all communications are suspended. If changes are made to the configuration they will take affect when the “Save” button is pressed. The dynamic link library “XVME984.DLL” must be in the CLC directory or the windows path.

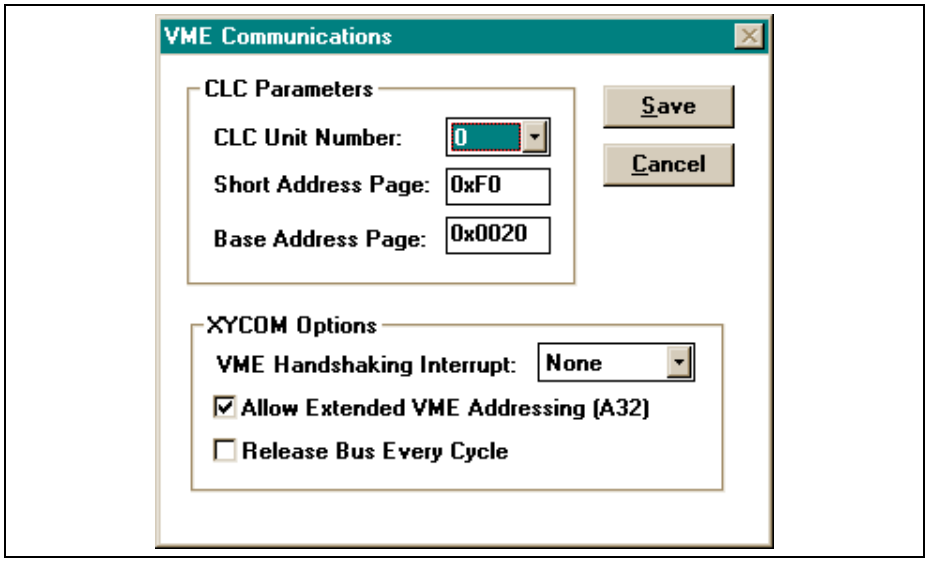


Figure 4-4: VME Communications

CLC Parameters

CLC Unit Number	The CLC unit number for the currently displayed data.
Short Address Page	The address page in short VME memory space where the selected CLC card resides.
Base Address Page	The address page in Standard or Extended memory space where the CLC's shared RAM is located.

Note: The default server settings correspond to the default CLC control card settings and should not need to be altered.

XYCOM Options

VME Handshaking Interrupt	Select the VME interrupt which all CLC-V control cards should use to terminate a communication response. If this option is not used, the server will poll for a communication response every 55 milliseconds. Refer to your XYCOM owners manual to configure the computers BIOS to acknowledge the selected VME interrupt.
Allow Extended VME Addressing (A32)	Check this box if the XYCOM PC can support A32 addressing.
Release Bus Every Cycle	Check this box if the PC should release the VME bus after every cycle. This will increase communication overhead due to the additional bus arbitration cycles

Settings Menu - PC Bus Communications

The PC Communications dialog box allows the user to view CLC status indicators and set communication parameters. When this dialog box is open all communications are suspended. If changes are made to the configuration they will take affect when the “Save” button is pressed. The dynamic link library “CLC_P.DLL” must be in the CLC directory or the windows path.

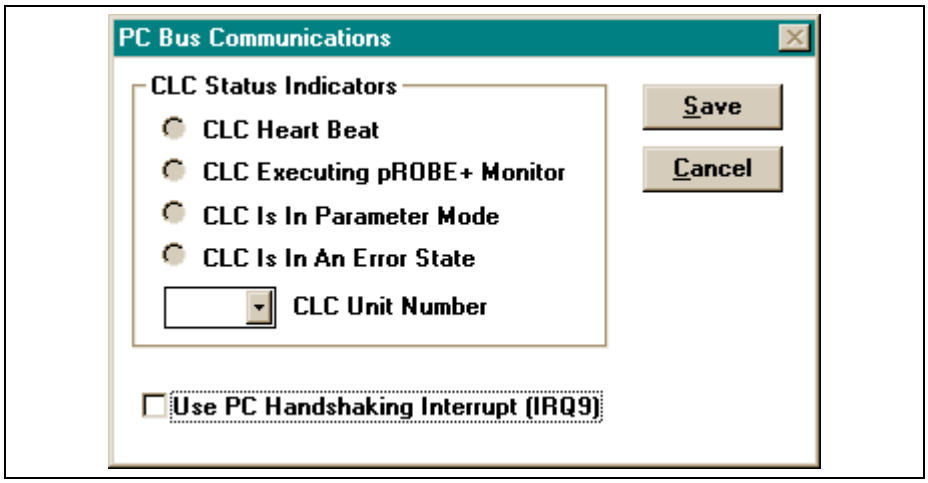


Figure 4-5: PC Bus Communications

CLC Status Indicators

CLC Heart Beat	This indicator will blink indicating that the selected CLC control card is running.
CLC Executing pROBE+Monitor	This indicator will be marked if the selected CLC control card has faulted and is running the pROBE+ monitor.
CLC Is In Parameter Mode	This indicator will be marked when the selected CLC control card is in parameter mode.
CLC Is In An Error State	This indicator will be marked when the selected CLC control card is in an error state. Card parameter 122 will contain the specific error message.
CLC Unit Number	This option selects the card number. This card number must match the settings of hardware switches S8 through S11. To locate a card without knowing the switch settings, use the following procedure: ⇒ Start with card number 0 ⇒ If sounds are active on your PC and 0 is not the correct card number, a sound will be heard. ⇒ Continue this procedure until a sound is not heard. This is an indication that the correct card number has been selected. Once this is established, use the same card number under ***Setup ⇒ Card*** Selection in VisualMotion Toolkit. Connection method must also be set to PC ISA Bus.
Use PC Handshaking Interrupt (IRQ 9)	When selected, this option will force all CLC-P control cards to terminate communication responses with a PC interrupt (*IRQ 9*). Hardware jumper S5 must be inserted on the CLC-P card for this option to work properly. If this option is not used, the server will poll for a communication response every 55 milliseconds. **Note**: When using the interrupt option on the CLC-P control card, no other hardware devices may use IRQ 9.DDE Menu.

Settings Menu - P2 Bus Communications

The P2 Communications dialog box allows the user to view CLC status indicators and set communication parameters. When this dialog box is open all communications are suspended. If changes are made to the configuration they will take affect when the “Save” button is pressed. The dynamic link library “CLC_P.DLL” must be in the following Windows system directories.

- For Windows 95/98: \WINDOWS\SYSTEM
- For Windows NT: \WINNT\SYSTEM32, also required for Windows NT: CLC_P2.SYS in directory \WINNT\SYSTEM32\DRIVERS

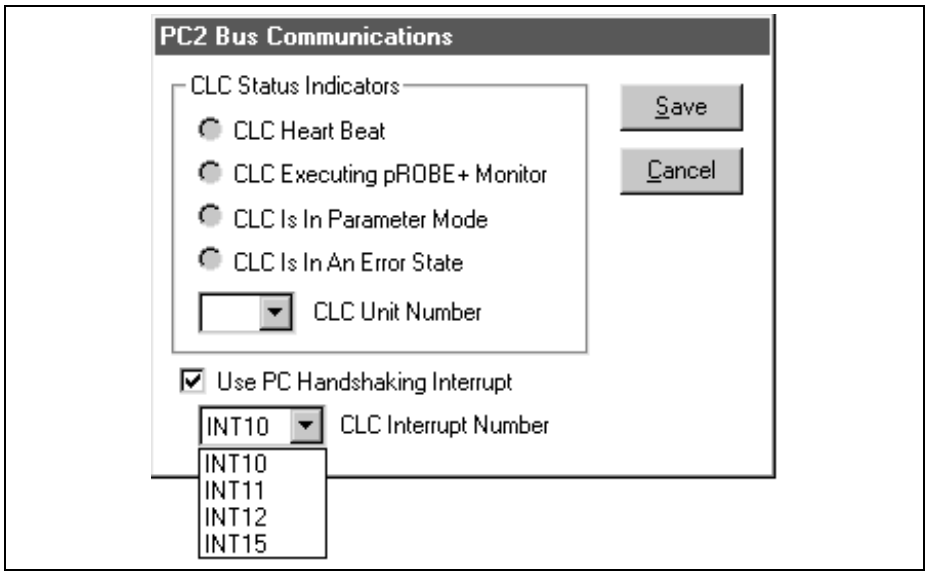
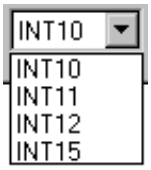


Figure 4-6: P2 Bus Communications

CLC Status Indicators

CLC Heart Beat	This indicator will blink indicating that the selected CLC control card is running.
CLC Executing pROBE+Monitor	This indicator will be marked if the selected CLC control card has faulted and is running the pROBE+ monitor.
CLC Is In Parameter Mode	This indicator will be marked when the selected CLC control card is in parameter mode.
CLC Is In An Error State	This indicator will be marked when the selected CLC control card is in an error state. Card parameter 122 will contain the specific error message.
CLC Unit Number	This option selects the card number. This card number must match the settings of hardware S1 DIP switches 1 through 4. To locate a card without knowing the DIP switch settings use the following procedure: ⇒ Start with card number 0 ⇒ If sounds are active on your PC and 0 is not the correct card number, a sound will be heard. ⇒ Continue this procedure until a sound is not heard. This is an indication that the correct card number has been selected. Once this is established, use the same card number under ***Setup ⇒ Card*** Selection in VisualMotion Toolkit. Connection method must also be set to PC-104 Bus.

Use PC Handshaking Interrupt  	When selected, this option will force all CLC-P02 control cards to establish communication responses with a PC interrupt selected. Hardware S1 DIP switches 5 through 8 settings must match the interrupt selected for this option to work properly. If this option is not used, the server will poll for a communication response every 55 milliseconds. When selected, this option will increase the handshake response time. **Note**: The default interrupt setting is INT10.

DDE Conversations

The DDE Conversations dialog box displays the **Conversation, Service and Topic Handles** for all of the current DDE conversations. The **Item Count** column shows the total number of active advise links, request transactions and poke transactions. Double click on a specific conversation entry in order to view the item transaction list. A second method is to select the conversation and then use the “expand” button. This dialog box is useful when creating client applications which talk to the CLC communications server.

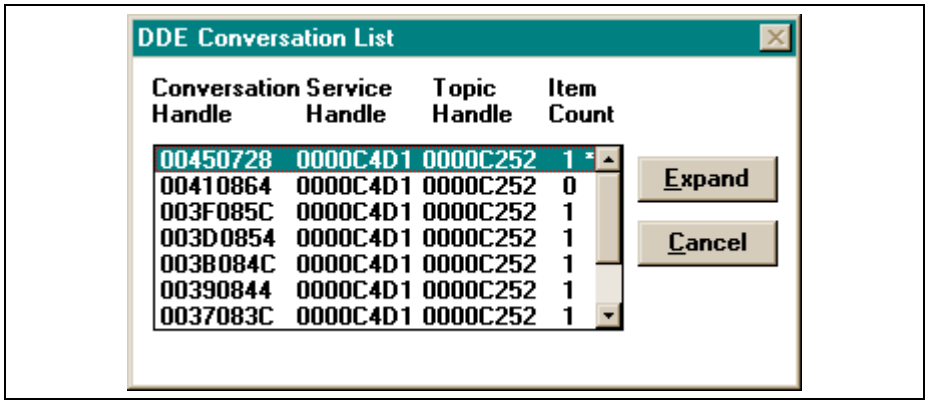


Figure 4-7: DDE Conversations

DDE Conversation Item Dialog

The DDE Conversation Item dialog box can be used to view the item transaction list for a conversation. The Service name, Topic string, Item string, clipboard Format and Transaction Type are displayed in text format. Use the “Next” and “Previous” buttons to cycle through the current list.

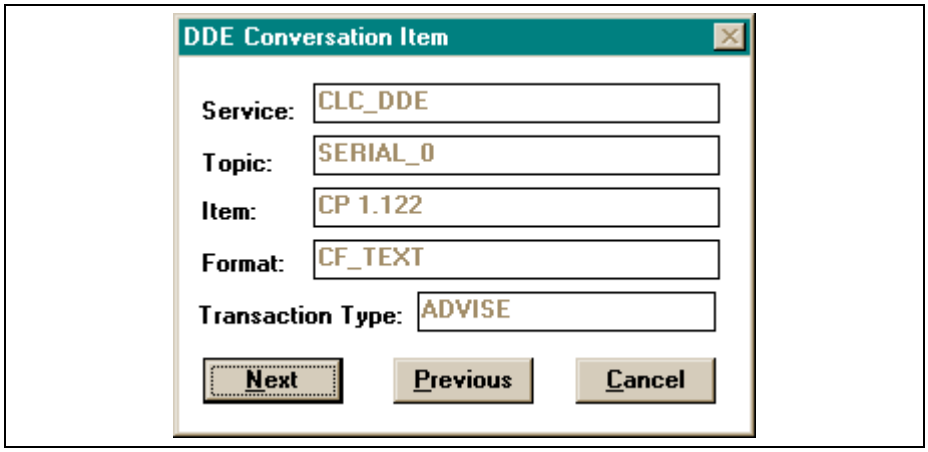


Figure 4-8: DDE Conversation Item

Communication Monitor

The DDE Communication Monitor displays all of the current DDE conversations. The monitor can display DDE requests and/ or responses depending the selection made under the *Settings* menu.

The active window builds a communications log of all DDE conversations that occur while the monitor is running. Selecting *Clear* will empty the log. Selecting *Stop* will stop the conversation monitoring and allow users to scroll through the log. The Monitor window can be resized to enlarge the active viewing area.

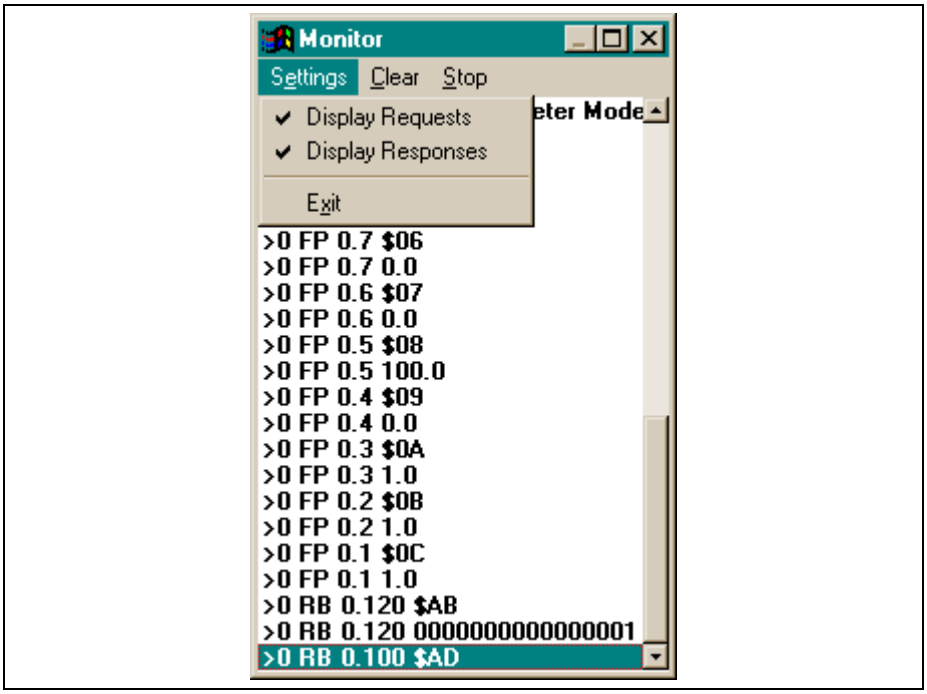


Figure 4-9: DDE Communication Monitor

4.3 AT Modem Configuration Dialog

Note: Currently ***not*** supported in Win95 or NT

CLC_DDE supports communications with a telephone modem which uses the AT protocol. The server will initiate the modem link and instruct it to dial the desired number by sending standard AT commands. The AT Modem Configuration dialog box is automatically displayed when a DDE conversation which specifies the “AT_MODEM_x” topic is started. The box will again appear when the conversation is terminated. The dialog contains setup data and connection status. To initiate the modem connection first enter the baud rate, serial port and phone number. The next step is to select the “Connect” button and watch the status box. After the sending and receiving modems have connected press the “Cancel” button to close the dialog box.

The modems used for communication must respond to the AT protocol. CLC_DDE will initialize the sending modem and establish a connection with the receiving modem. The receiving modem should be configured in auto answer mode. The CLC card must be configured to the same baud rate as the receiving modem.

Baud Rate	Select the baud rate to use to talk to the sending modem.
Serial Port	Select the serial port to use to talk to the sending modem.
Telephone	Enter the complete phone number to dial including any numbers required to get an outside line. Placing a comma in the number will insert a delay.
Attempt To Connect On Start Up	Check this box if you wish CLC_DDE to automatically attempt a connection when a conversation is started. The telephone number is saved in the INI file. If this box is not check the user will need to select the “Connect” button.

4.4 SERVER Topic Name

The “SERVER” topic name allows a DDE client application access to CLC_DDE’s parameter set and status. The server will accept request and poke transactions. When accessing a parameter the client application should specify the section and entry names from the INI file. The two names must be separated by a pipe character (‘|’). When requesting status information the client should use “STATUS” as the section name (i.e. “STATUS|ErrorState”). RW = Read/Write RO = Read Only

Section: GENERAL	Response_Timeout	RW	1-900 Seconds	Message response time out.
	Relay_Timeout	RW	1-900 Seconds	Message time out when using VME pass-through.
	Communication_Retry	RW	0-255	Number of times to re-send a message.
	Suspend_Polling	RO	0 or 1	If 1 CLC_DDE status polling will be disabled.
	Display_CLC_Errors	RW	0 or 1	If 1 CLC_DDE will intercept & display CLC Errors.
	Log_Errors	RW	0 or 1	If 1 all server errors will be logged to the error file.
	Modal_Errors	RW	0 or 1	Displayed errors with the system modal attribute.
	Self_Terminate	RW	0 or 1	Close CLC_DDE when last conversation terminates.
	Monitor_List_Size	RW	1-500	# of entries in communication monitor window.
	Editor	RW	256 Characters	Name & path of text editor to use to display error log.
Section: SERIAL	Baudrate	RO	38400..300	Baud rate for serial connection to CLC card.
	Port	RO	1-4	COM port number to use for serial connection.
	Serial_Event	RW	0 or 1	Use serial event option to increase performance.
	RS485_Converter	RW	0 or 1	Activate RS485 adapter code.
Section: VME	Sustain_Bus	RW	0 or 1	Release every cycle option for XYCOM PC.
	A32_Addressing	RW	0 or 1	Use A32 addressing for XYCOM PC.
	VME_IRQ	RO	0-7	Number of VME IRQ to use (0 = disabled).

Section: AT_MODEM	Baudrate	RO	9600..300	Baud rate to use to communicate with the modem.
	Port	RO	1-4	COM port number the modem is on.
	Auto_Connect	RW	0 or 1	Initialize & connect on conversation connection.
	Phone	RW	50 Characters	Phone number to dial.
	Initialize_Script	RW	100 Characters	Script to initialize modem.
	Disconnect_Script	RW	100 Characters	Script to disconnect modem.
	Dial_Prefix	RW	50 Characters	Script to send to modem before phone number.
	Escape_Sequence	RW	50 Characters	Script to send modem to return to command mode.
Section: PC	PC_IRQ	RO	0 or 1	if 1 use PC interrupt for communications.
Section: P2	PC_IRQ	RO	0 or 1	if 1 use PC interrupt for communications.
Section: DDE	Status	RO	200 Characters	CLC_DDE's status request item.
	Max_Conversations	RO	1-3274	Maximum allowed conversations.
	Max_Advise_Items	RO	1-3500	Maximum allowed advise items.
Section: STATUS	ErrorState	RO	0 or 1	If 1 CLC_DDE is issuing an error.
	ErrorText	RO	256 Characters	Error text message CLC_DDE is displaying.
	RequestState	RO	0 or 1	If 1 CLC_DDE is actively communicating.

5 Human Machine VisualMotion Interfaces

5.1 BTC06 Teach Pendant

Figure 5-1: BTC06 Teach Pendent

An RS485/422 combination interface allows connection of the BTC06 to all INDRAMAT controllers (MTS/P, MTS/R, CLC, DKC, DLC, CLM).

The universal Screen Manager Software allows variables of all INDRAMAT controller families.

For the CLC, there are two additional pre-programmed applications (programming software for TRANS01D and VT100 for GPS) that replace the functions of the CTA10-1 and TPT.

5.2 BTC06 Features

Enclosure, Controls and Display Elements

- Front panel with 48 keys
- 240x128 pixel graphic LCD with backlit LED
- Shock-proof, ergonomic enclosure, protection type IP65
- Plug-in interface cable
- Emergency shut-off with twist release and two floating contacts
- Three-position live-man switch with two floating contacts
  - Position 1 - Off
  - Position 2 - Live-Man
  - Position 3 - Panic

  TÜV/BG certified integrated safety circuitry, category 4, according to EN954-1, ensure that the live-man switch will not be activated after a panic event when returning over position 2 to position 1.

Hardware Components

- Series 68000 micro-controller
- 1 MByte Flash
- 256 KByte SRAM
- RS-232 programming interface for downloading firmware and for programming of custom displays
- Communications interface in accordance with Indramat standard, i.e. bus-capable RS485 and RS422

BG Test Certifications

- EN 60204 Part 1: "Safety of Machinery - Electrical Equipment of Industrial Machinery; Part 1: General Requirements"
- EN 775: "Industrial Robots Safety"
- EN 418: "Safety of Machinery - Emergency Shut-Off Equipment, Functional Aspects, Design Guidelines"
- Integrated Safety Circuitry, Category 4, according to EN954-1 for Live-Man Switches

5.3 Optional Features

Override, Hand-Wheel

The BTC06 may optionally be equipped with a 4-bit override switch and a 16-bit hand-wheel. Both are available when using the MTS as I/O information through a corresponding functional module.

Emergency Shut-Off

The emergency stop button is designed to shut-off the system operation in any mode (stop category 0). For category 1 emergency stop functions, appropriate measures must be taken in addition to the electronic safety equipment (see 9.4, DIN EN 60204-1). The emergency stop button is a dual-circuit switch.

Live-Man Switch

The live-man switch is activated with the holding hand. Enclosure and shape of the live-man switch have been ergonomically optimized for right-hand and left-hand operation.

The live-man switch directly affects the post-connected system (drive amplifier, SPS, robot). It is designed to allow hazardous machine movement only upon intentional activation of the operator, when the operator has to work within the hazardous zone of the machine.

The BTC06 interface cable includes the power supply line for the device, the connection cable for the emergency stop button, and the live-man switch as well as the data cables for data transfers between the BTC06 and the controller.

When the user disconnects the connector, the emergency stop circuit and the live-man circuit will be interrupted.

5.4 Safety Concept

If the BTC06 is equipped with the appropriate optional features (emergency stop and live-man switch), it can be used for operation with industrial drive and robot controllers. It includes a dual-circuit 3-position, live-man switch. Both circuits are electrically isolated and operate redundantly. It is important that the subsequent control interprets the switch in accordance with the machine-specific or system-specific standards and rules.

If appropriate interlocks with the safety contacts of the drive or robot control are provided, hazardous movements in certain modes (e.g., manual or test mode) can only be activated if the live-man switch is held in the center (= enabled) position. If this switch is not depressed, or if it is pressed all the way down to the panic position, any movement will be stopped immediately. The return from the panic position is activated electrically, whereby the switch returns to the non-activated position. To start a new movement, enter a command and re-activate the live-man switch.

The live-man switch of the BTC06 provides integrated safety circuitry. A post-connected control must be used to ensure compliance with machine-specific or system-specific standards and rules. It must be linked to the control in a way that meets the safety requirements for the power circuits in accordance with EN775, EN60204, EN954-1, EN1088, VDI2853, and VDI2854.

5.5 BTC06 Connections

Main Connection

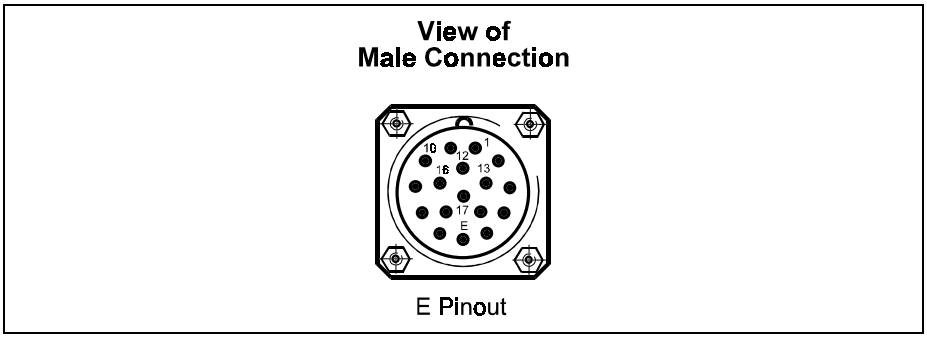


Figure 5-2: BTC06 Main Connection

Pin	Assignment	
1	0 V	
2	+ 24 V	
3	Live-man switch 1 in	
4	Live-man switch 2 in	
5	Live-man switch 1 out	
6	Live-man switch 2 out	
7	E-STOP 1 in	
8	E-STOP 2 in	
9	E-STOP 1 out	
10	RS422 TxD-	RS485 -
11	RS422 TxD+	RS485 +
12	RS422 RxD-	
13	RS422 RxD+	
14	Signal Ground	
15		
16	E-STOP 2 out	
17	*Not used*	

Table 5-1: Pin-out of the 17-Pin Connector

Firmware Download and Projecting Interface

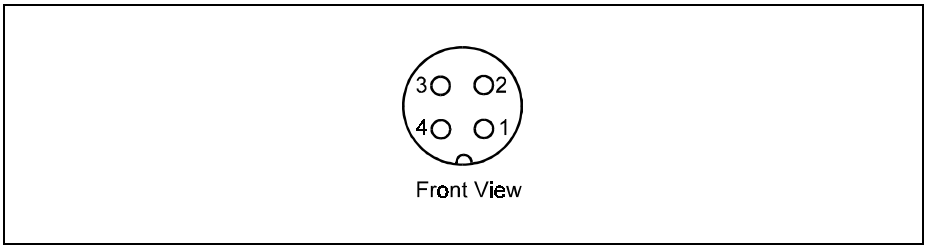


Figure 5-3: RS232 Interface

Pin	Assignment
1	*not used*
2	TxD
3	RxD
4	Signal Ground

Table 5-2: Pin-out of the RS232 Interface

BTC06 Accessories

Firmware

Model / Controller	Name of Firmware
Screen Manager for: MTS/P, MTS/R, CLC	SWA-BTC06*-SCM-01VRS-MS (Runtime) SWA-SCM*PC-CF6-01VRS-MS (PC-Programming Tool)
VT100 Terminal for CLC-GPS	SWA-BTC06*-VT*-01VRS-MS
Programming Software for CLC with TRANS01D	SWA-BTC06*-T01-01VRS-MS

Table 5-3: BTC06 Firmware

IKB0010 PC Connection Cable

This connection cable is used for the downloading of firmware and for the transfer of Screen Manager programs. It provides the connection between the RS232 programming interface and a PC.

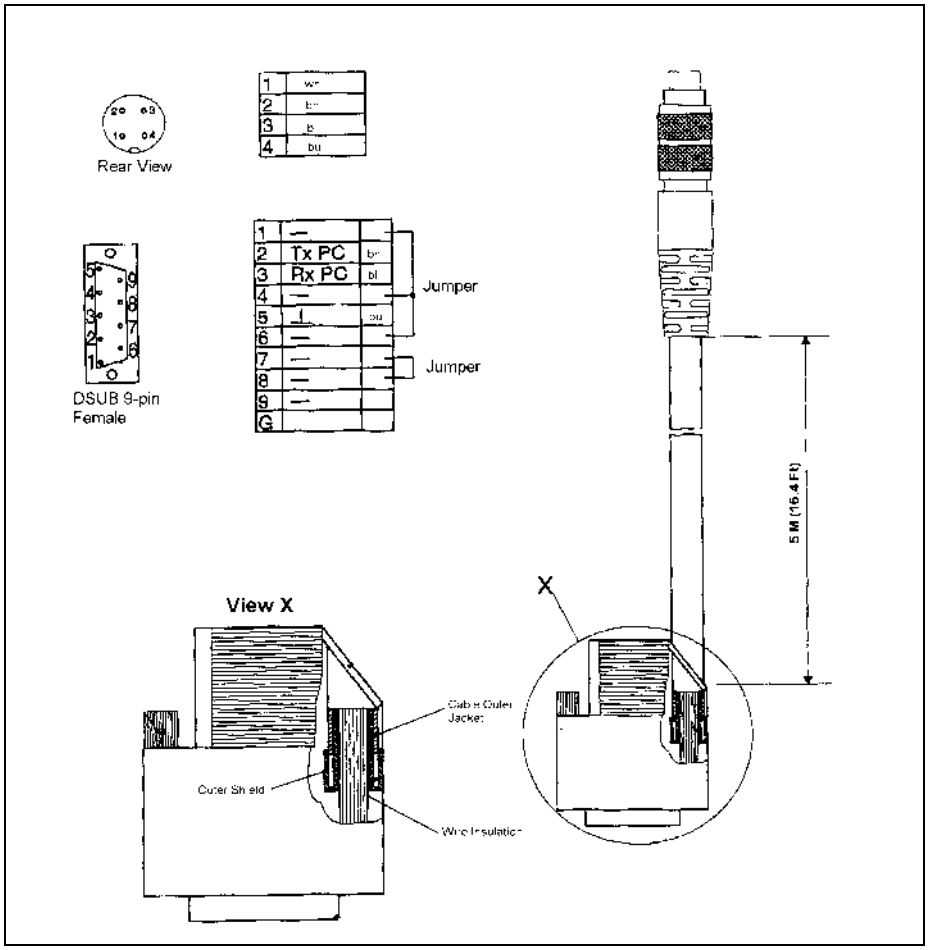


Figure 5-4: Serial Download Cable IKB0010

Note: The firmware for this device is supplied on diskette. Therefore, each customer needs at least one of these cables to load the firmware.

SUP-M01-BTC06 Wall-Mounting Bracket

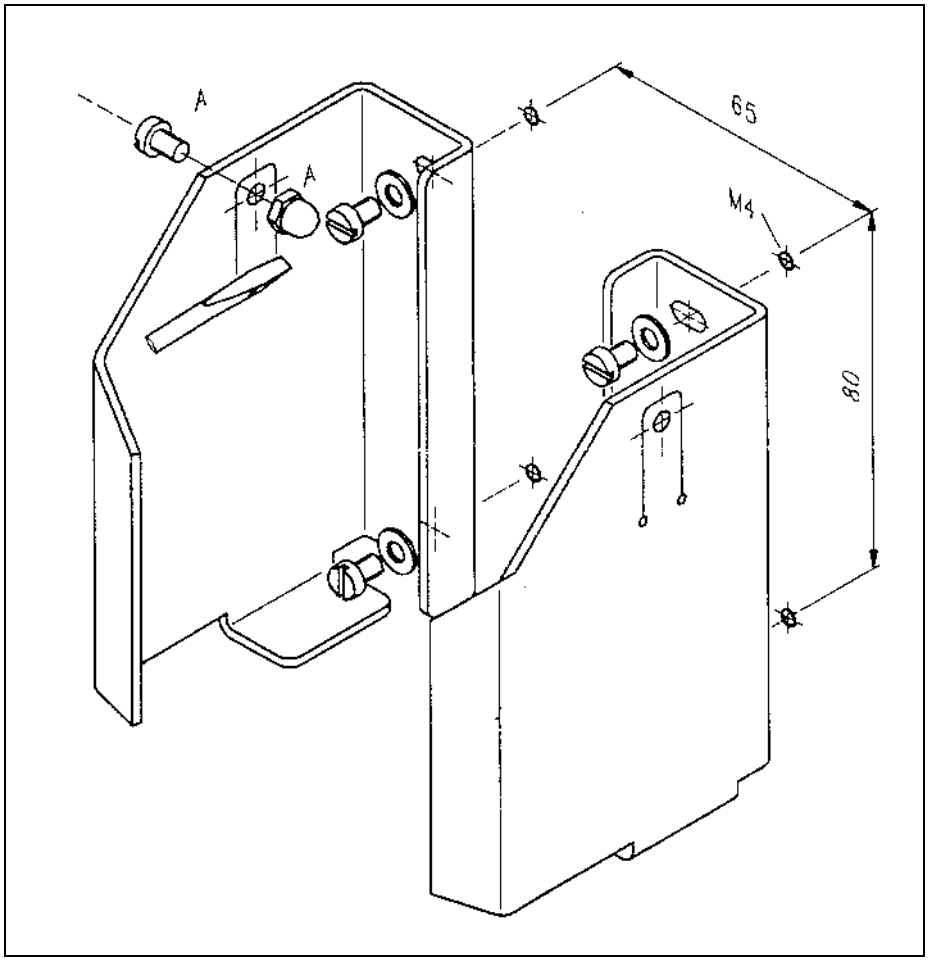


Figure 5-5: Wall-Mounting Bracket

The mounting bracket is provided to attach the BTC06 to a wall or to a machine part. When fastened at the proper height, the display can be read and the device can be operated without removing it from the bracket. The user can mount the two-piece wall bracket so that the live-man switch is enabled when the device is inserted into the bracket. However, this mounting method should be used only if the device is mounted outside of a hazardous zone. In this case, the system must have provisions in accordance with DIN EN 775 to ensure that no persons are present within the room that is equipped with protective safety features.

5.6 BTC06 Specifications

Basic BTC06 Unit

Basic BTC06 Unit	
Supply voltage	24 V (20 to 30 V) DC
Power consumption	max. 400 mA
Display	LCD 240 x 128 pixel, b/w, full graphics function LED, backlit visible area 108 x 58 mm (4.25" x 2.25")
Keyboard	Polyester film with 48 keys
Enclosure material	Polycarbonate
Protection	IP 65 (Main connection cable plugged in, RS-232 connector provided with protective cap)
Temperature range	0 to +55°C (*Operation*) (32 to 131 °F) -20 to +70°C (*Storage*) (-4 to 158 °F)
Weight	ca. 1.3 Kg (2.9 lbs.)
Dimensions	315 x 180 x 57 (LxWxD) (12.4" x 7.1" x 2.2") (363 x 180 x 57 incl. detachable handle) (14.3 x 7.1" x 2.2" incl. detachable handle)

Table 5-1: Electrical Data

Emergency Stop Switch

Emergency Stop	
Switch elements	Two floating N.C. contacts, electrically isolated
Rated voltage	24 V DC / 42 V AC
Rated current	2 A DC / 3 A AC
Operating cycles	> 100,000

Table 5-2: Emergency Stop Switch Data

Live-Man Switch

Live-Man switch	
Switch elements	Two floating N.O. contacts, electrically isolated
Rated voltage	24 V DC / 42 V AC
Rated current	2 A DC / 3 A AC
Operating cycles	> 200,000 for Live-Man range > 100,000 for Panic position
Control category	4 in accordance with EN954-1

Table 5-3: Live-Man Switch Data

5.7 Enclosure Dimensions

Outside Dimensions

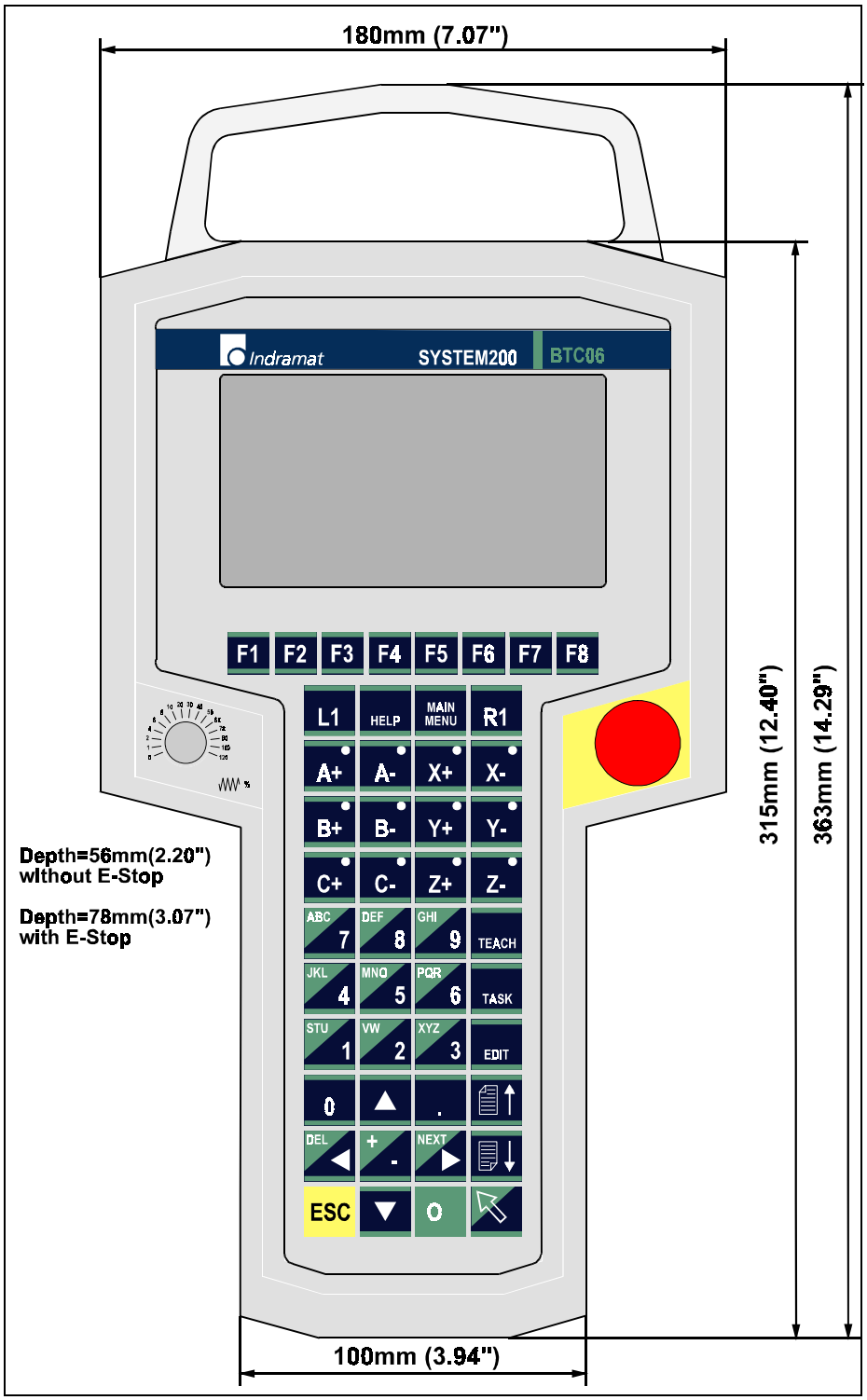


Figure 5-6: Enclosure Dimensions

Rear View

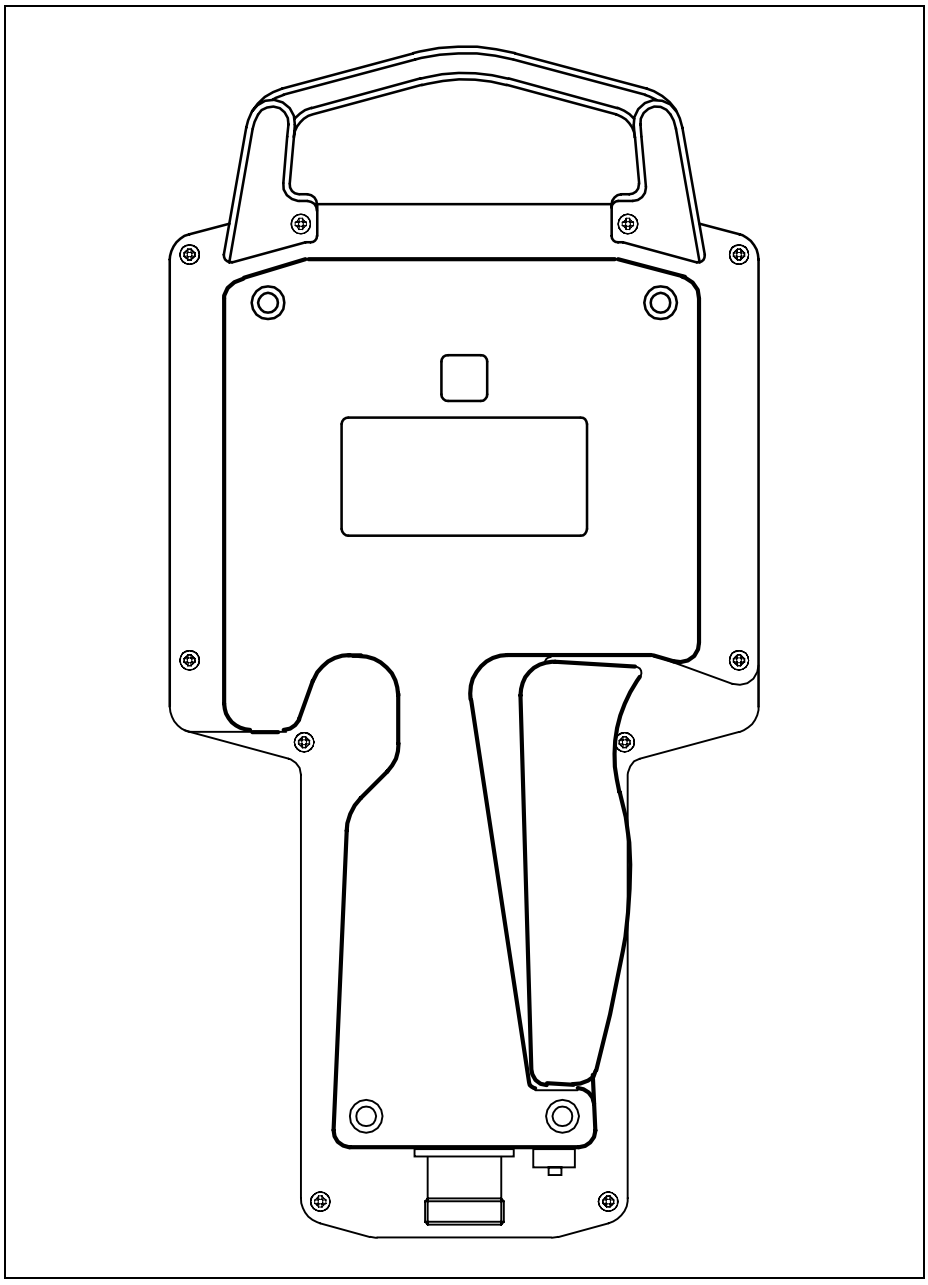


Figure 5-7: Rear View

5.8 BTC06 with CLC-VisualMotion

For the connection with a CLC-VisualMotion, the following components are used:

- IKS0188 Connection Cable available in 4 fixed lengths
  - IKS0188/003.0, 3 meters, material number 279140
  - IKS0188/005.0, 5 meters, material number 279423
  - IKS0188/010.0, 10 meters, material number 279141
  - IKS0188/015.0, 15 meters, material number 279142
- INS0627 Bulkhead Connector material number 279377
- IKB0020 Serial Cable available in varied lengths, material number 282868

Inside the control cabinet, the wires for the live-man switch and the emergency stop function have to be connected. These are connected in the BTZ01.1 junction box.

BTZ01.1 Junction Box

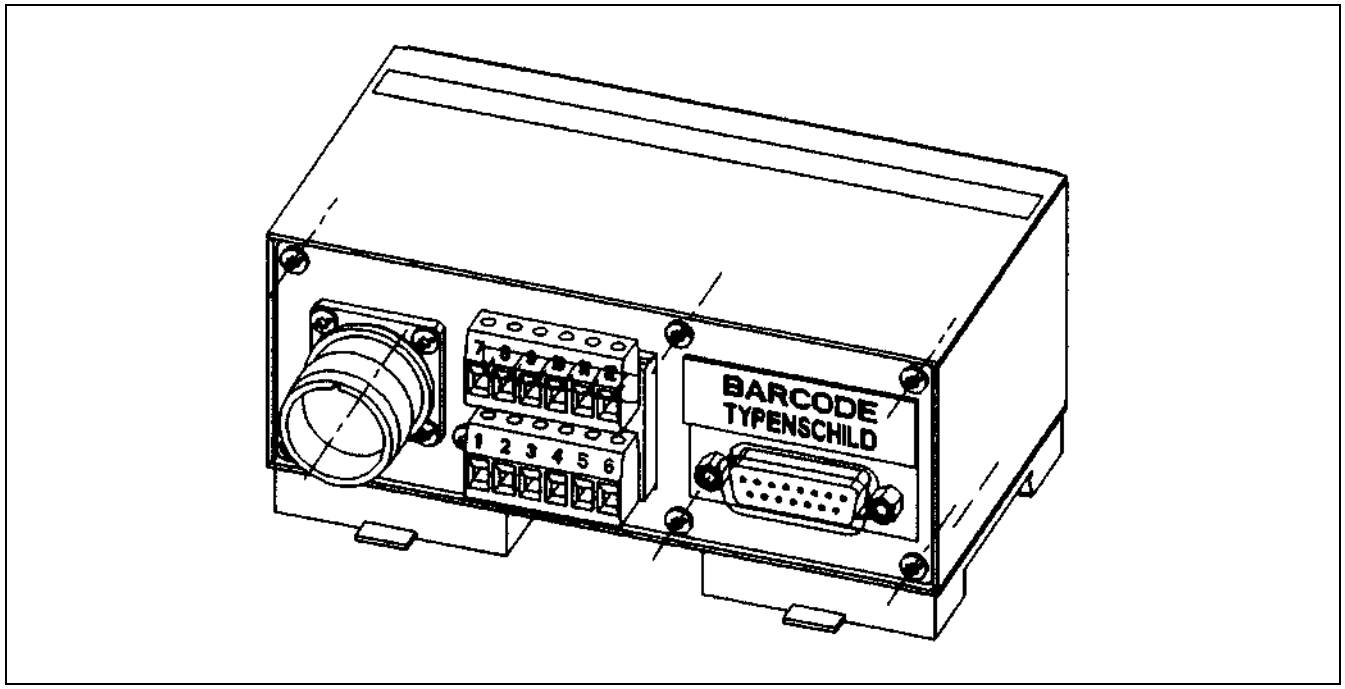


Figure 5-8: BTZ01.1 Junction Box

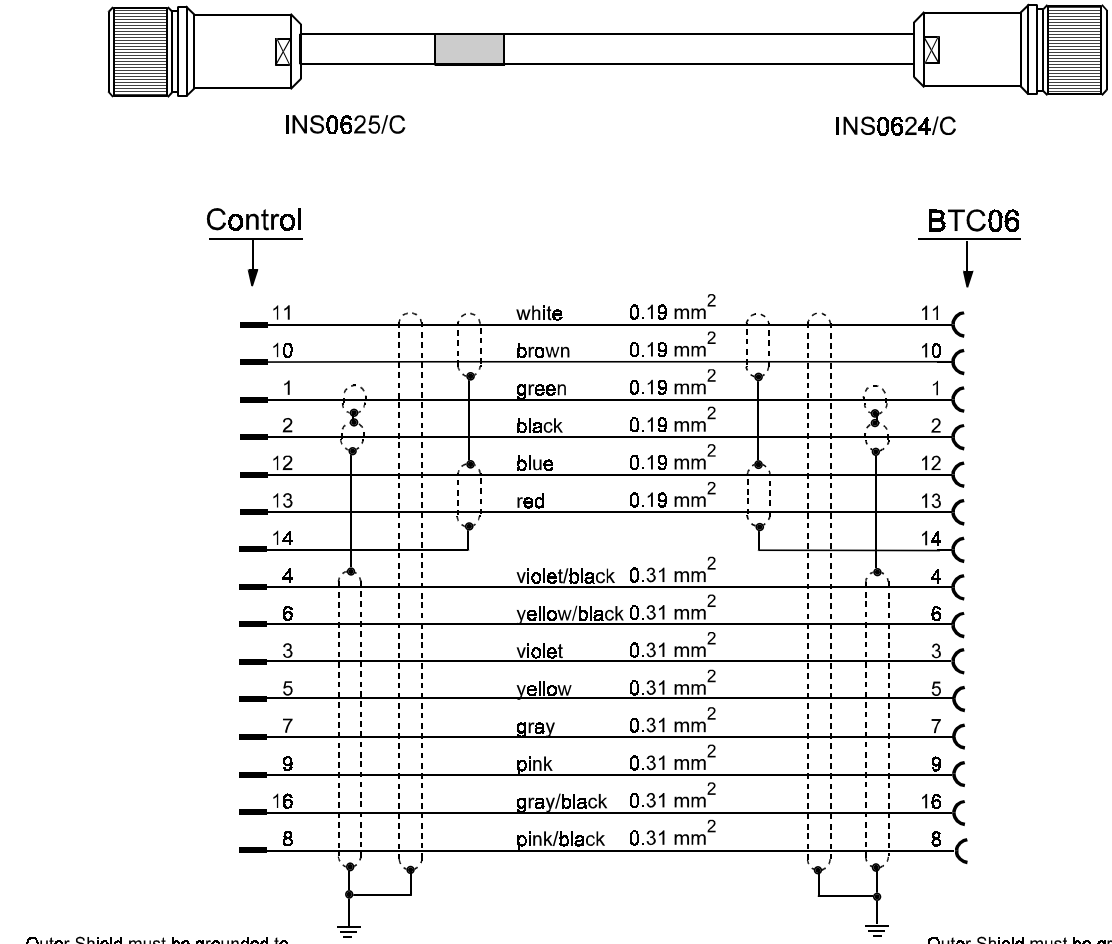
The junction box ensures that the connections for the live-man switch and the emergency stop function can be accessed externally. The IKS0188 connection cable establishes the connection to the INS0627 bulkhead connector. Inside the box, the individual functional units are distributed/wired to the respective connectors on the front panel.

The live-man circuits and the emergency stop function as well as the voltage supply are connected at a 12-pin Phoenix terminal. The connection to the BTC06 is established through a 17-pin female circular connector.

From the BTZ to the CLC, the IKB0020 serial communication cable will be used. RS485 and RS422 ports are connected to the CLC in accordance with Indramat standards.

Note: In order to establish communications between the BTC06 and the CLC card, the serial port on the CLC card to which the BTZ01.1 is connected must be set to the same settings as that of the BTC06.

IKS0188 Connection Cable



Cable Type	Part Number
IKS0188/3	279 140
IKS0188/5	279 423
IKS0188/10	279 141
IKS0188/15	279 142

Figure 5-9: IKS0188 Connection Cable for the connection of the BTC06 and INS0627 Bulkhead connector.

INS0627 Bulkhead Connector

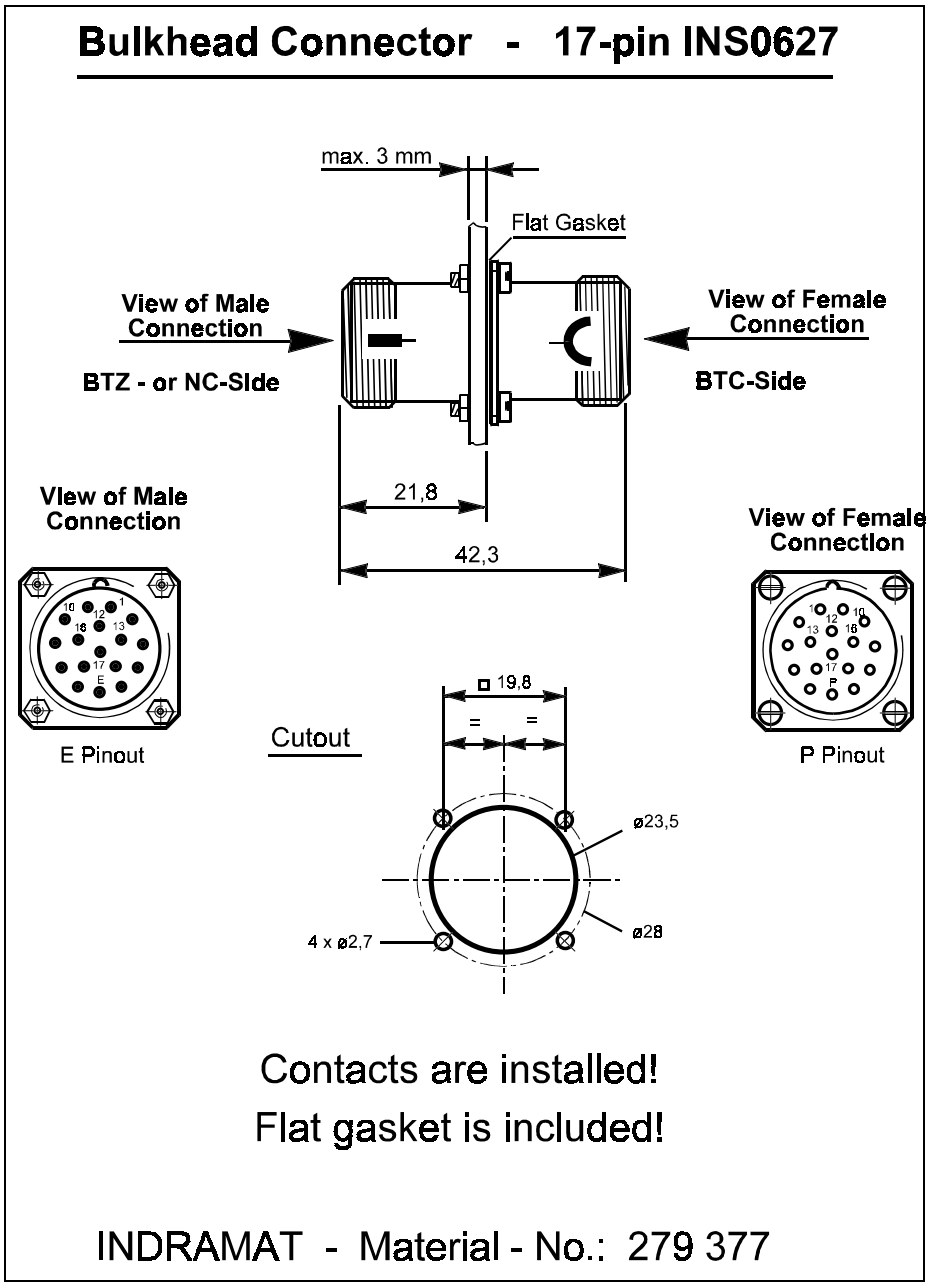
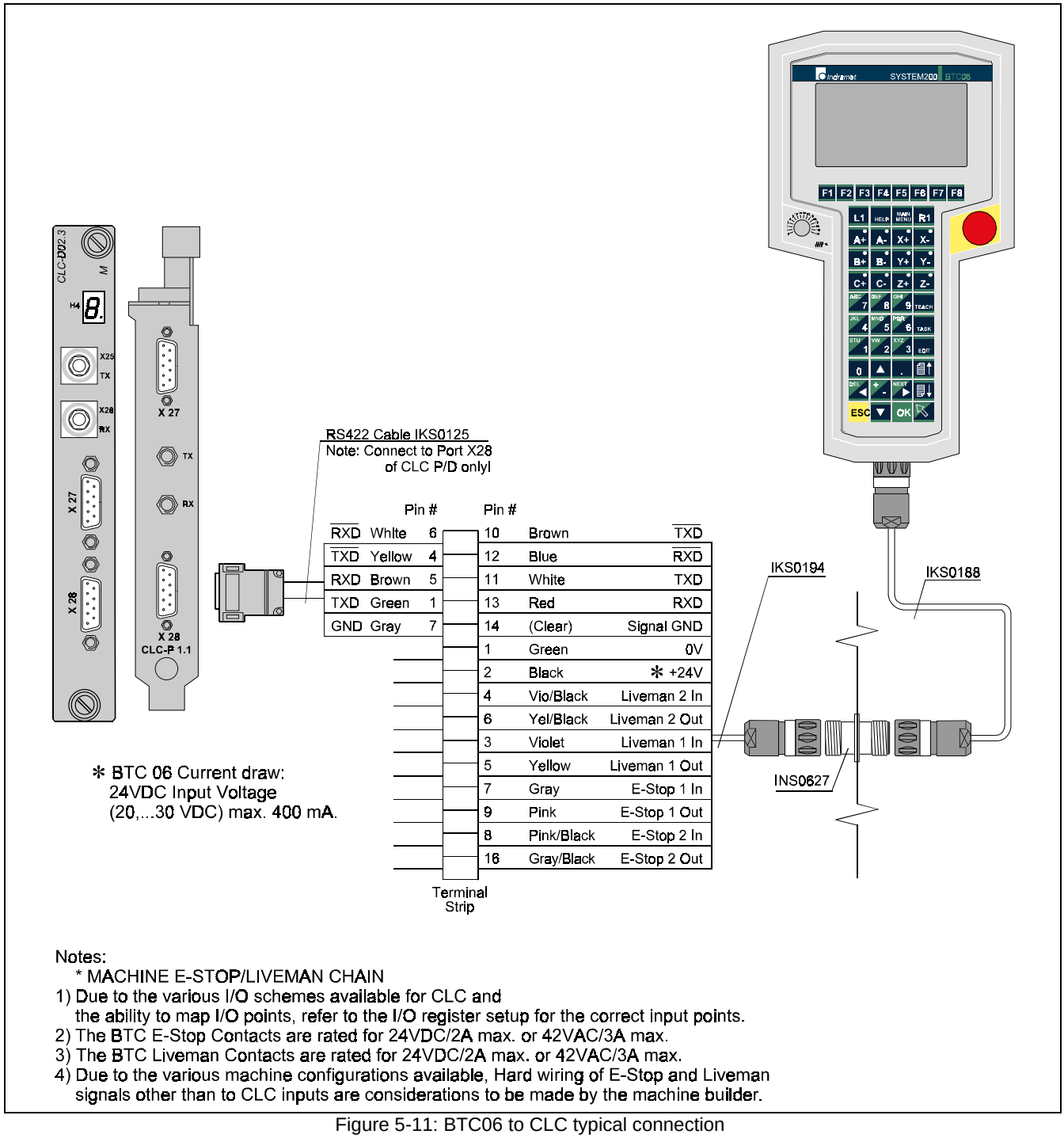


Figure 5-10: INS0627 for bulkhead connection, IP65

5.9 BTC06 to CLC Connections

Typical Interface Connection



Notes:
* MACHINE E-STOP/LIVEMAN CHAIN
1) Due to the various I/O schemes available for CLC and the ability to map I/O points, refer to the I/O register setup for the correct input points.
2) The BTC E-Stop Contacts are rated for 24VDC/2A max. or 42VAC/3A max.
3) The BTC Liveman Contacts are rated for 24VDC/2A max. or 42VAC/3A max.
4) Due to the various machine configurations available, Hard wiring of E-Stop and Liveman signals other than to CLC inputs are considerations to be made by the machine builder.

Figure 5-11: BTC06 to CLC typical connection

EMC Compliant Option

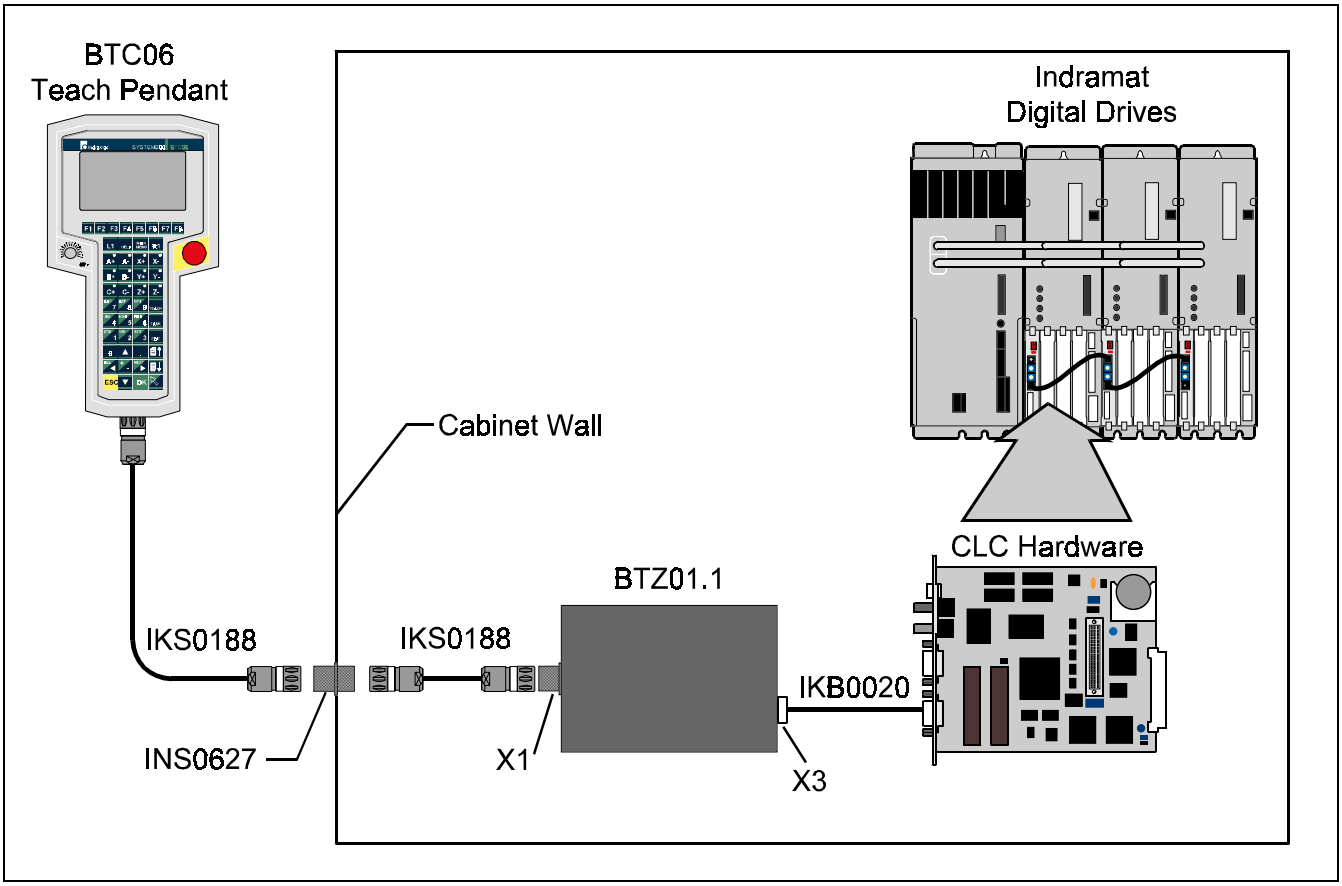


Figure 5-12: BTC06 to CLC EMC Compliant connection

5.10 BTC06 Teach Pendant Screens

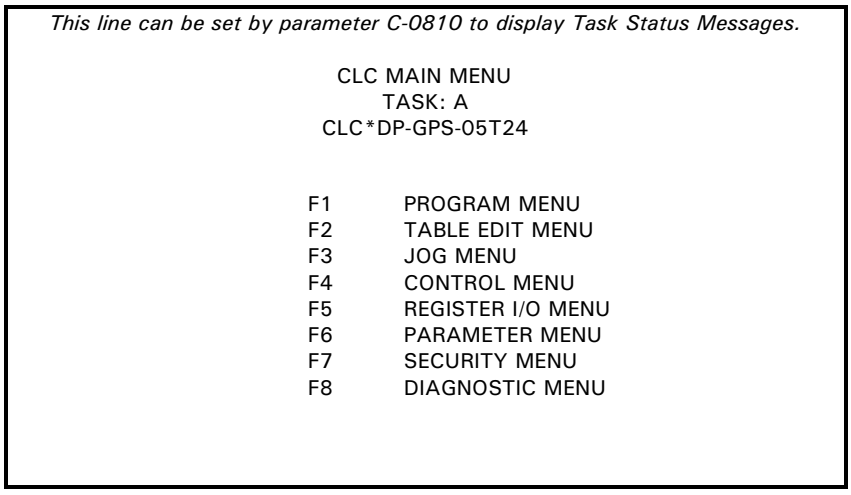
This section explains how to use the BTC06 - VisualMotion Teach Pendant.

The Teach Pendant is a hand-held instrument with 16 x 42 character display and a 48-key sealed membrane keypad. The pendant provides a convenient operation and position programming interface for Indramat's VisualMotion Control.

The BTC06 Teach Pendant gives users a hand held operating interface which allows them to:

- Select operating modes and axis jogging.
- Access multi-level menus for functions.
- Teach and edit motion control points, events and variables; edit parameters.
- Select and activate VisualMotion resident programs.

Each category of functions has its own set of menus. The following function categories are available through the pendant BTV06 Main Menu:



Note: *The first screen that is displayed on the Teach Pendant is the Control Menu. See section 5.12 Task Control.*

Menu Map

The following chart maps the submenus and menu links that are found within the main menu. Some menus have direct links to diagnostics, parameters and I/O registers.

Note: Pressing the ESC key will backtrack the Teach Pendant and display the previously viewed screen until it reaches the main menu.

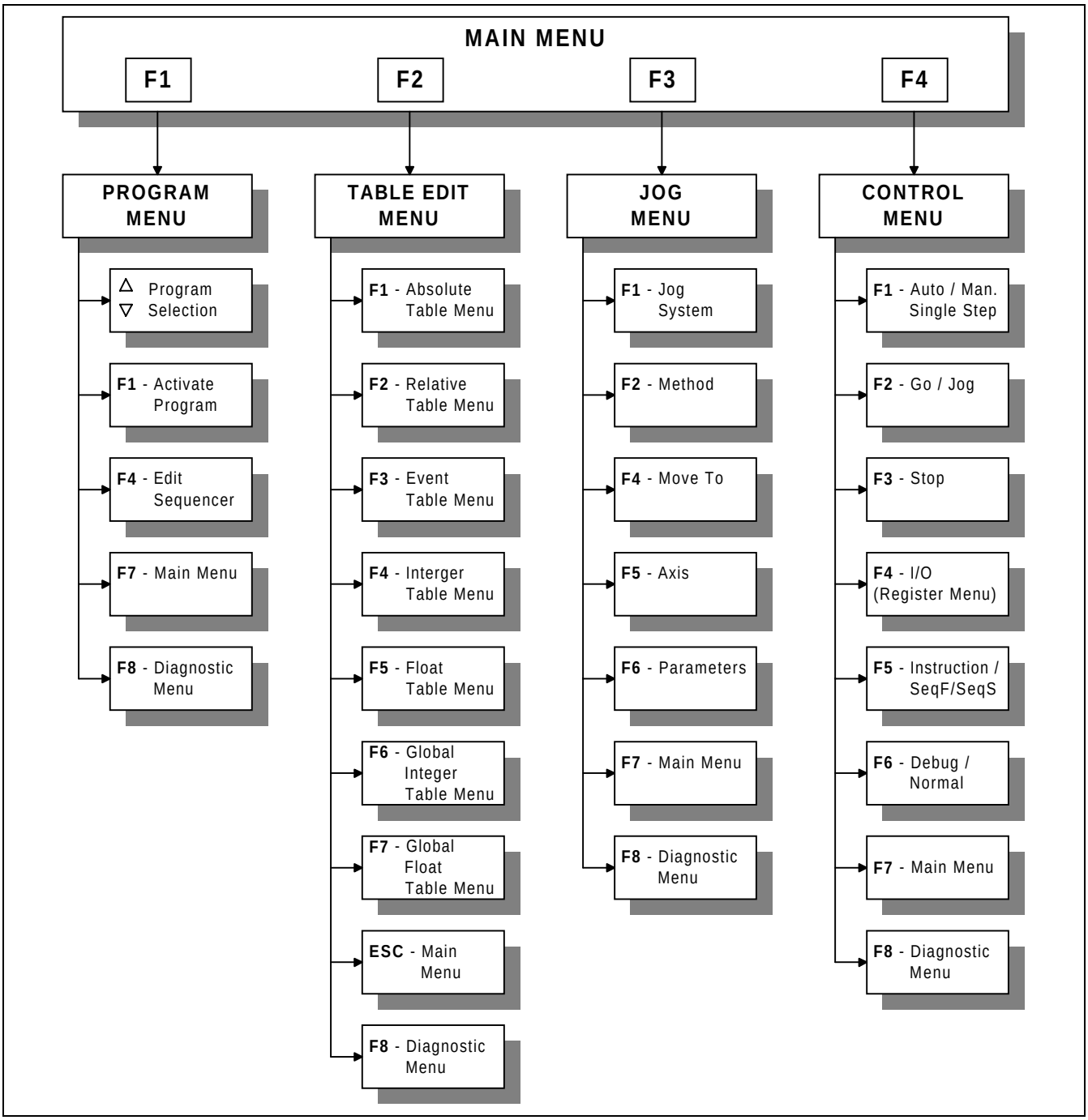


Figure 5-13: Menu Map (F1-F4)

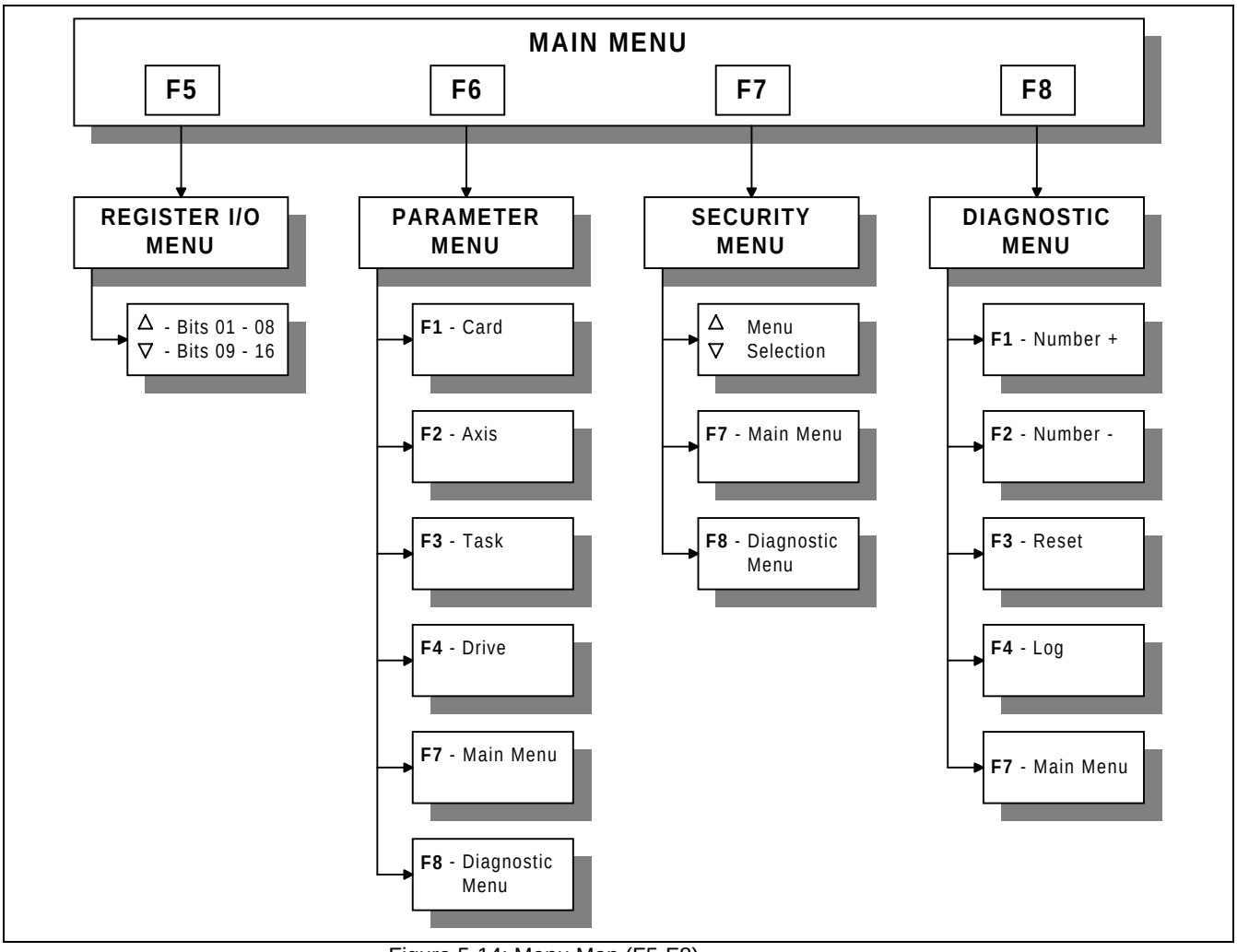


Figure 5-14: Menu Map (F5-F8)

5.11 BTC06 Teach Pendant Setup

Note: *To use the pendant function keys, as well as the pendant edit features, the System Control Register 1, bit 14 (Pendant Enable) must be set to 1.*

When the Teach Pendant is enabled, the following registers and bits shall be forced at all times by the BTC06. The VisualMotion Toolkit provides a register forcing capability that allows a Host system to directly change the state of individual I/O register bits overriding both the physical I/O and the CLC I/O Mapper.

Task A Control Register 2:	bit 1	Mode Auto nManual
	bit 4	Single Step
	bit 6	Cycle Start/Resume
	bit 7	nTask Stop
	bit 12	Step Sequence Step
	bit 13	Step Sequence Function

Task B-D Control Registers 3-5: same as above.

Registers 98 and 99 define blocking bits for task A, B, C and D. The bits in the register can disable Teach Pendant control of the selected function for the corresponding tasks A-B, C-D. The following functions can be blocked:

Reg. - Bit	Description	Reg. - Bit	Description
98-1	Block Task A Manual	99-1	Block Task C Manual
98-2	Block Task A Auto	99-2	Block Task C Auto
98-3	Block Task A Step	99-3	Block Task C Step
98-4	Block Task A Jog	99-4	Block Task C Jog
98-5	Block Task A Entry	99-5	Block Task C Entry
98-6	Block Task A Teach	99-6	Block Task C Teach
98-9	Block Task B Manual	99-9	Block Task D Manual
98-10	Block Task B Auto	99-10	Block Task D Auto
98-11	Block Task B Step	99-11	Block Task D Step
98-12	Block Task B Jog	99-12	Block Task D Jog
98-13	Block Task B Entry	99-13	Block Task D Entry
98-14	Block Task B Teach	99-14	Block Task D Teach

If a block bit is set, its corresponding function is blocked. If a user selects the function an error message is issued by the TPT.

The pendant parameters are automatically preset to the following specifications:

Menu	Item	Default Setting
Comm.:	Baud Rate	9600 (Fixed)
	Parity	None
	Data and Stop Bits	8, 1
	Display Serial Errors	Yes
	Audible Serial Errors	Yes
	Support for XON/OFF	Yes
Display:	Display CTL Characters	No
	Display ESC Characters	No
	Cursor Visible	Yes
	Auto Line Wrap	No
	New Line on CR	Yes
	Display Self-Test	No
	Backlight Level	7
	Backlight On	Yes
Keyboard:	Local Echo	No
	Key Repeat	Off
	Audible Keys	No
	Simplified KB	Yes

Note: *When the Teach Pendant is initializing, it automatically sets the baud rate to 9600.*

5.12 BTC06 Keyboard Operation

The following defines the keys for the Teach Pendant:

Key	Action
F1	Soft key defined by active menu
F2	Soft key defined by active menu
F3	Soft key defined by active menu
F4	Soft key defined by active menu
F5	Soft key defined by active menu
F6	Soft key defined by active menu
F7	Soft key defined by active menu
F8	Soft key defined by active menu
L1 R1	left and right refresh of the BTC06 screen
HELP	First press function key help, then press item help (only available for Parameter Menu)
MAIN MENU	Display all main menu functions
A+ A-	Jog A coordinate plus/minus
B+ B-	Jog B coordinate plus/minus Main Menu: respectively turns backlighting on and off
C+ C-	Jog C coordinate plus/minus
X+ X-	Jog X coordinate plus/minus
Y+ Y-	Jog Y coordinate plus/minus
Z+ Z-	Jog Z coordinate plus/minus
0	numeric key
STU 1	numeric key and letter combination (use the shift key to access letters)
VW 2	numeric key and letter combination
XYZ 3	numeric key and letter combination
JKL 4	numeric key and letter combination

Key	Action
	numeric key and letter combination
	numeric key and letter combination
	numeric key and letter combination
	numeric key and letter combination
	numeric key and letter combination
	decimal point
	Teach current position to absolute point table
	Select a user task
	Clear field of current item and allow editing
	page up / page down
	up and down arrows
	delete and left arrow (use the shift key to access delete)
	next and right arrow (use the shift key to access next)
	plus and minus (use the shift key to access plus)
	Terminate current operation or return to previous menu
	Confirm entry
	Shift key

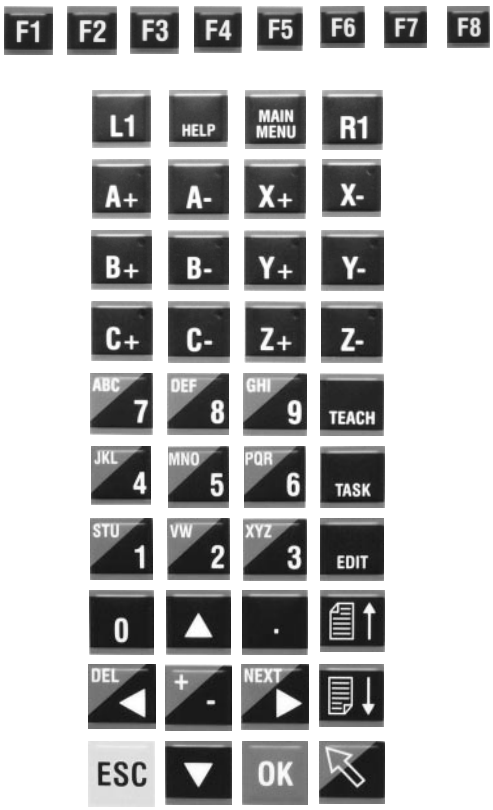
Keyboard Map

The BTC06 keyboard is mapped to register 95, 96 and 97. The figure below and to the right outlines the register and bit location in the following format:

Register - Bit

Example: **95 - 01** ; *key is mapped to register 95, bit 01*

When a key is pressed its corresponding bit turns on and remains on for as long as the key is pressed.

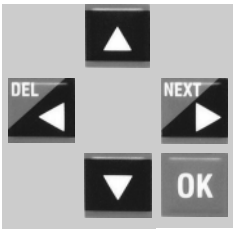


95-01	95-02	95-03	95-04	95-05	95-06	95-07	95-08

97-13	95-09	97-14	97-15
96-05	96-06	96-07	96-08
96-13	96-14	96-15	96-16
97-05	97-06	97-07	97-08
95-10	95-11	95-12	95-13
96-02	96-03	96-04	95-14
96-10	96-11	96-12	96-09
97-03	95-11	97-02	95-15
96-02	97-04	96-04	95-16
96-01	96-11	97-01	

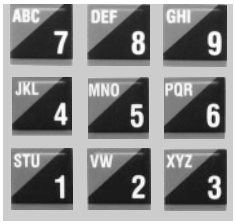
This shift key is not mapped to a register.

Cursor Control and Editing



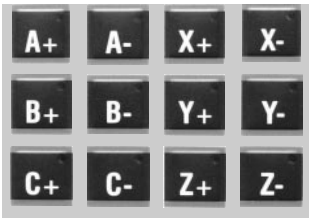
The cursor may be moved up or down, left or right by pressing the corresponding arrow key. The left and right arrow keys double as delete and next, respectively. To edit an item, position the cursor over it and press the EDIT key. Doing so clears the field used by the item allowing a new value to be entered. Pressing OK terminates the editor and enters the new value into the system. Sometimes the cursor can be positioned on an item but the EDIT key does nothing when pressed. In this case the item cannot be edited. The cursor may be positioned there for another reason, such as item selection or viewing.

Number or Letter Selection



The number keys labeled 1 - 9 also double as letter keys when the shift  key is pressed. To select the second or third letter contained in the upper left position of the key, the shift key must be pressed and held. If the shift key is pressed and not held, only the first letter will be selected and the key will then default to the number specified.

Jogging Control



Press the *coordinated jog keys* (X+, X-, Y+, Y-, Z+, Z-) to jog in World, Joint or Tool coordinates. For robotics, the (A+, A-, B+, B-, C+, C-) keys function as Row, Pitch and Yaw in coordinated motion. The jog keys are active only while in the Jog Menu (***F3***). If other coordinated axes are defined in other tasks, then that task must be activated in order to jog from the Teach Pendant. When in single axis mode within the Jog Menu, the (A+, A-) keys light up and are used to jog the axis.

Task Control

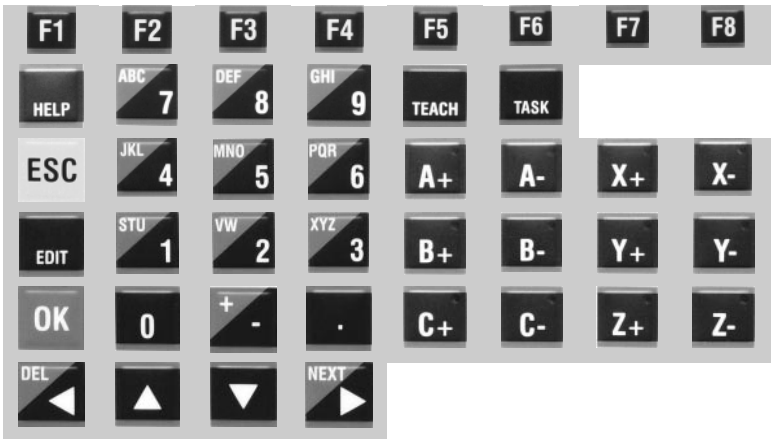
Press the TASK 

key to display the task menu. Use the arrow keys to position the cursor in the desired task and press OK, then press ESC to return to the previous menu.

Teach Control

The Teach 

key allows the user to store the current position (during a coordinated jog) into the Absolute Point Table. The table point number will flash indicating that point has been recorded in the table.



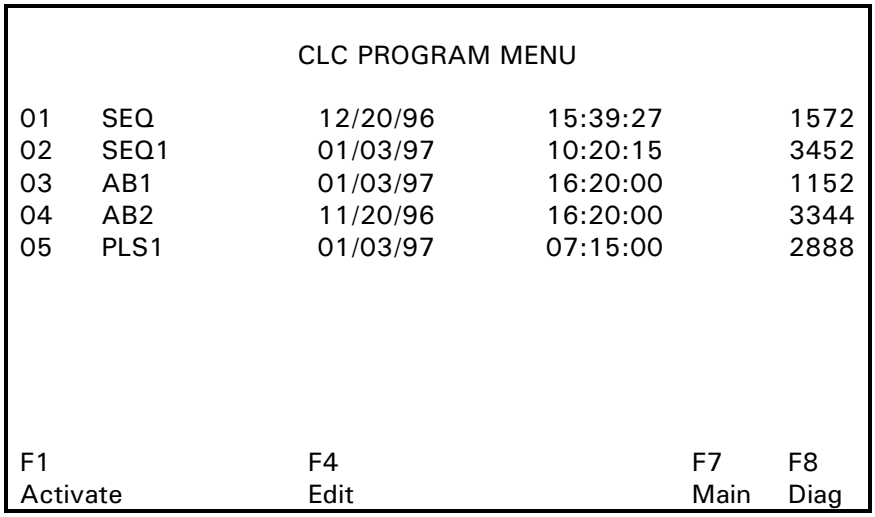
5.13 F1 Program Menu

The Program menu allows pendant selection and activation of any of the programs that have been downloaded to the CLC card.

Each program consists of one to four user tasks (A, B, C, and D), and the associated Absolute and Relative Point Tables, Event Table, and Variable Tables. Activating a new program replaces the current four motion tasks and tables with the tasks and tables for the new program selection.

Table Includes:

- Program number (CLC card ID, 1-10)
- Program date
- Program name
- Program size (in decimal bytes)



The up and down arrow keys move the cursor to select a program. Pressing **F1** activates the selected program.

Note: The currently active program must not be running when activating another program.

Sequencer Editing (F4)

The **F4** key (Edit) only applies to programs which contain Sequencers. Pressing **F4** allows the user to edit the Sequencer list, steps and functions of the selected program. ***Refer to the VisualMotion 6.0 Reference Manual, material number 282762, for more Sequencer information.***

Sequence List Menu

The first screen that appears after pressing **F4** in the *CLC Program Menu* is the *Sequence List Menu*. Use the arrow keys to navigate with the cursor to select the desired *Sequence List*. Press **F4** again to edit the contents of the selected list name within the *Sequence Edit Menu*.

```
                    SEQUENCE LIST MENU

PROGRAM:     SEQ1

01       INITIALIZE_SYSTEM
02       PRODUCT_1
03       PRODUCT_2
04       Sequencer_4
05       Sequencer_5
06       Sequencer_6
07       Sequencer_7
08       Sequencer_8
09       Sequencer_9

F1       F2              F4                    F7      F8
PgUp     PgDn            Edit                  Main    Diag
```

The name of each list can also be edited. Position the cursor at the end of the list name and press the **Edit** key. The letters of the alphabet are located within the numbered keys. These letters can only be accessed when used in conjunction with the **Shift** key. Use the **F1** key to delete characters to the left of the cursor. Use the **Shift** key to Select **Shift On** and **Off**. This allows you to toggle the keyboard map between numbers and letters. Refer to Number or Letter Selection on page 5-25 for details.

This editing process is functional within all of the following Sequencer menus.

The Sequence Edit Menu

The *Sequence Edit Menu* displays all of the steps within the selected Sequence. Use the arrow keys to navigate the cursor to the desired Sequence Step. Press **F4** again to edit the contents of that Step within the *Step Table Edit Menu*. Press **F3** to cut the selected Sequence Step. Press **F6** to paste a Sequence Step in the current cursor position

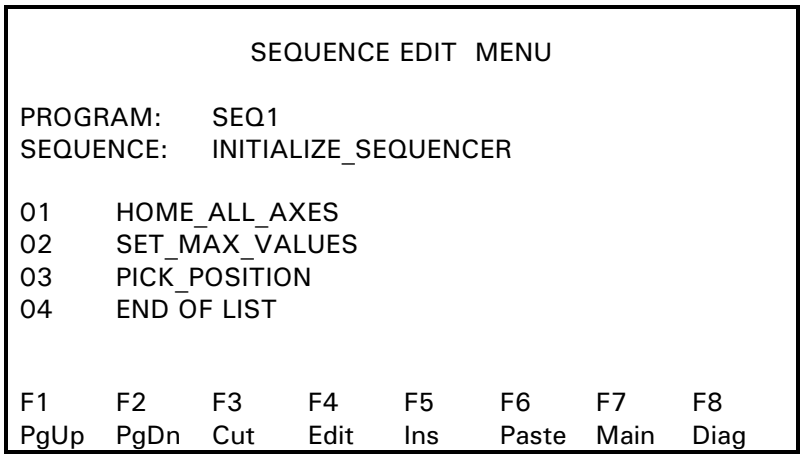
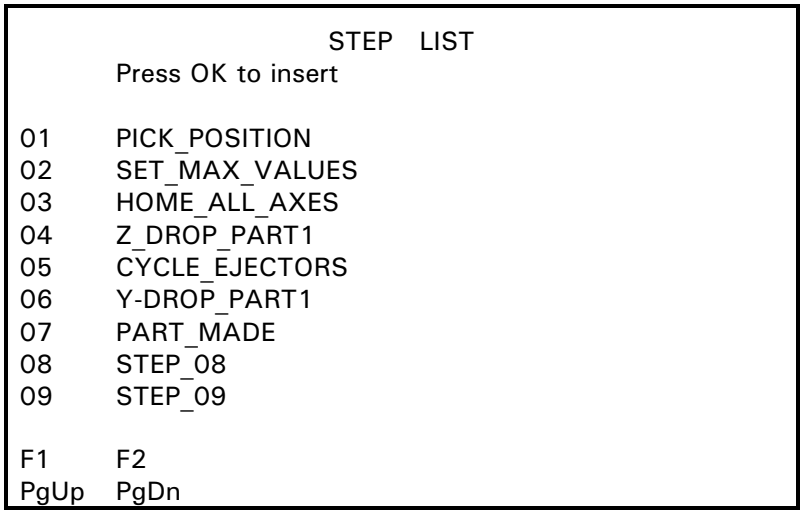


Table List Menu

Pressing **F5** (Ins) from the *Sequence Edit Menu* will open the *Step List Menu*. This menu contains a list of all the step tables available within the selected Sequence. Use the arrow keys to navigate the cursor to the desired S*tep Table*. Press OK to insert that function into the previous *Sequence*.



The Step Table Edit Menu

The *Step Table Edit Menu* displays all the functions within the selected Sequence Step. Use the arrow keys to navigate the cursor to the desired Sequence *Function*. Press **F4** again to edit the contents of that function within the *Function Edit Menu*. Press **F3** to cut the selected function. Press **F6** to paste a function in the current cursor position

```
                    STEP TABLE EDIT MENU

PROGRAM:      SEQ1
SEQUENCE:     INITIALIZE_SEQUENCER
STEP:         HOME_ALL_AXES
EMPTY SLOTS:        00011

01      DISABLE_CLAMP_MOTION
02      CHK_MOLD_OPEN
03      PERMIT_EJECT_BACK
04      CHK_EJECTORS_BACK
05      HOME_AXIS

F1      F2      F3      F4      F5      F6      F7      F8
PgUp    PgDn    Cut     Edit    Ins     Paste   Main    Diag
```

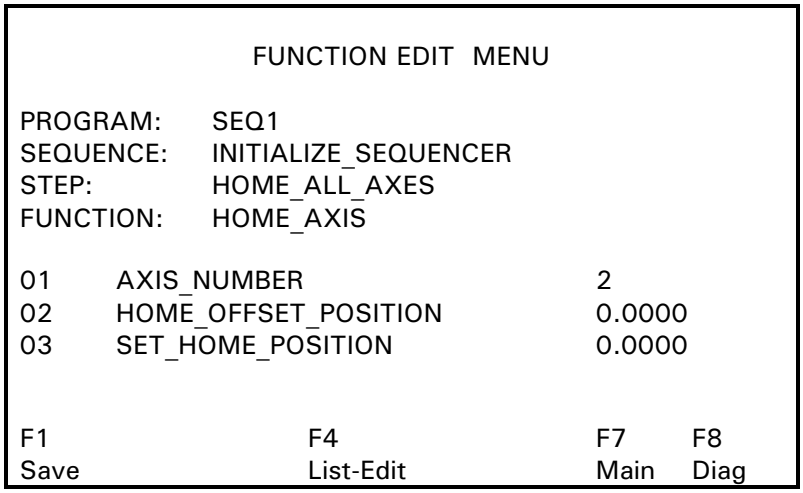
Function List

Pressing **F5** (Ins) from the *Step Table Edit Menu* will open the *Function List Menu*. This menu contains a list of all the functions available within the selected Sequence. Use the arrow keys to navigate the cursor to the desired *Function*. Press OK to insert that function into the previous *Step Table*.

```
                    FUNCTION LIST
          Press OK to insert

01      HOME_AXIS
02      INIT_POS_VELOCITY
03      CHK_EJECTORS_RETRACT
04      CLEAR_SYSTEM_TIMERS
05      DWELL
06      PERMIT_EJECT_BACK
07      DISABLE_CLAMP_MOTION

F1      F2
PgUp    PgDn
```

Function Edit Menu

The *Function Edit Menu* contains a list of all the arguments and their corresponding values. Use the arrow keys to navigate with the cursor to the desired *Function*. Press **F4** again to edit the values assigned to the arguments of that function.



5.14 F2 Table Edit Menu

The Table Edit menu allows editing of the Absolute and Relative Point Tables, the Event Table, and the Integer and Float variable Tables.

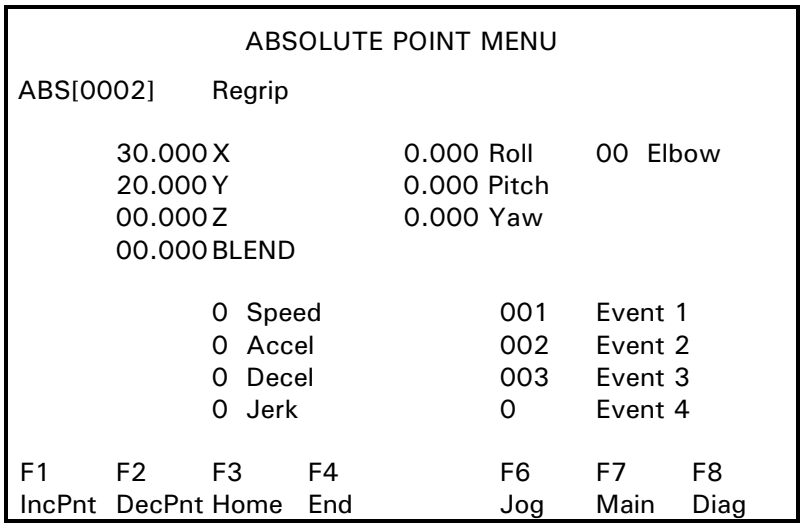
```
                    CLC TABLE EDIT MENU

              F1    Absolute Table Menu
              F2    Relative Table Menu
              F3    Event Table Menu
              F4    Integer Table Menu
              F5    Float Table Menu
              F6    Global Integer Table Menu
              F7    Global Float Table Menu

                                        Esc   F8
                                        Main  Diag
```

Absolute Point Table Edit

The Absolute Point Table Edit menus permit editing taught or programmed points.

```
                    ABSOLUTE TABLE MENU

NUM   NAME
001   Part_Pickup
002   Regrip
003   Leave_Part
..

..

F1    F2    F3    F4    F5    F6    F7    F8
PgUp  PgDn  Home  End   Edit  Jog   Main  Diag
```

Select a point by moving the cursor up and down with the arrow keys. Pressing F5 (Edit) will bring up the following menu:



X	X coordinate of the point
Y	Y coordinate of the point
Z	Z coordinate of the point
Roll	Roll angle
Pitch	Pitch angle
Yaw	Yaw angle
Elbow	Elbow state
Blend	Blend Radius

Speed	Speed Percentage (of task maximum)
Accel	Acceleration Percentage (of task maximum)
Decel	Deceleration Percentage (of task maximum)
Jerk	Jerk Limiting Percentage (0 trapezoid, 100 s-shape, 50 between)

Event 1	First event for the point
Event 2	Second event for the point
Event 3	Third event for the point
Event 4	Fourth event for the point (This value represents an event number from the event table)

Refer to **Event Table Edit** on page 5-35

Relative Point Table Edit

The Relative Point Table Edit menus permit editing of points either taught or programmed.

```
                    RELATIVE TABLE

NUM             NAME
001             REL[1]
002             REL[2]
003             REL[3]

F1      F2      F3      F4      F5      F6      F7      F8
PgUp    PgDn    Home    End     Edit    Jog     Main    Diag
```

Select a point by moving the cursor up and down with the arrow keys. Pressing F5 (Edit) will bring up the following menu:

```
                    RELATIVE TABLE

REL[0002]               REL[2]

        30.000 X            0.000 Roll      00      Elbow
        20.000 Y            0.000 Pitch
        00.000 Z            0.000 Yaw
        00.000 BLEND

                0 Speed             001     Event 1
                0 Accel             002     Event 2
                0 Decel             003     Event 3
                0 Jerk              0       Event 4

F1      F2      F3      F4          F6      F7      F8
IncPnt  DecPnt  Home    End         Jog     Main    Diag
```

X	X coordinate of the point
Y	Y coordinate of the point
Z	Z coordinate of the point
Blend	Blend Radius
Roll	Roll angle
Pitch	Pitch angle
Yaw	Yaw angle
Elbow	Elbow state
Speed	Speed Percentage (of task maximum)
Accel	Acceleration Percentage (of task maximum)
Decel	Deceleration Percentage (of task maximum)
Jerk	Jerk Limiting Percentage (0 trapezoid, 100 s-shape, 50 between)
Event 1	First event for the point
Event 2	Second event for the point
Event 3	Third event for the point
Event 4	Fourth event for the point (This value represents an event number from the event table)

Refer to **Event Table Edit** on page 5-35

Event Table Edit

The Event Table Edit menu allows pendant editing of the events associated with each task in the Event Table.

The currently selected task determines the portion of the event table allowed to be viewed through the Teach Pendant.

EVENT TABLE

NUM	ST	TY	RF	ARG	FUNCTION
001	01	06	00	20.0	Pressure_Switch
002	01	06	00	40.0	Change_Speed
003	01	03	00	60.0	evt_fn_1
004	01	03	00	80.0	evt_fn_2
000	00	00	00	00.0	
000	00	00	00		
000	00	00	00		
000	00	00	00		
000	00	00	00		
000	00	00	00		

F1	F2		F5	F7	F8
PgUp	PgDn		Replace	Main	Diag

St **The Event's status:**
0 = inactive
1 = pending
2 = queued
3 = executing
4 = done

Ty **Event type**:
0 = event inactive
1 = repeating timer
2 = time on coordinated motion path
3 = dist. on coordinated motion path
4 = single axis distance
5 = repeating axis position
6 = task external interrupt input
7 = VME broadcast interrupt
8 = VME short address (mailbox) interrupt
9 = axis feedback capture

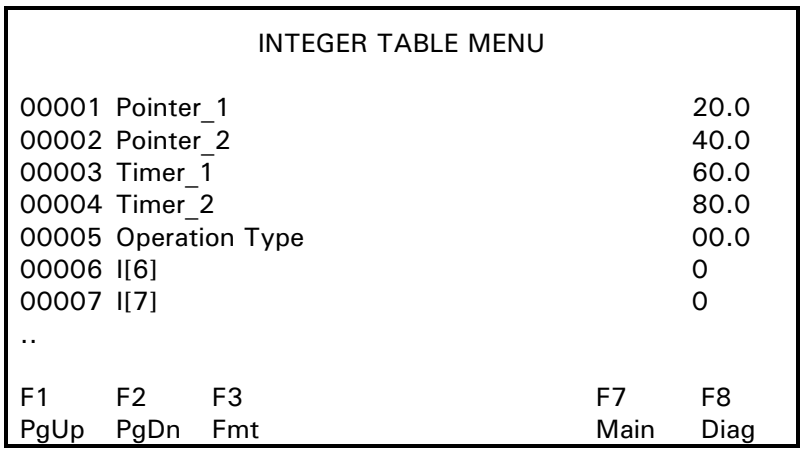
Rf **Event Reference**:
0 = start of segment
1 = end of segment

Arg **Argument for the event**
(milliseconds if time based, or percent of path and axis distance)

Function Task ID and Event number

Integer Variable Table Edit

This menu allows for viewing and editing integers. Variables can be changed by any task at any time. It is possible, therefore, for editing to be in conflict with a motion task. In this instance, unexpected results may occur. It is at the discretion of the operator to determine the usefulness of such an operation.

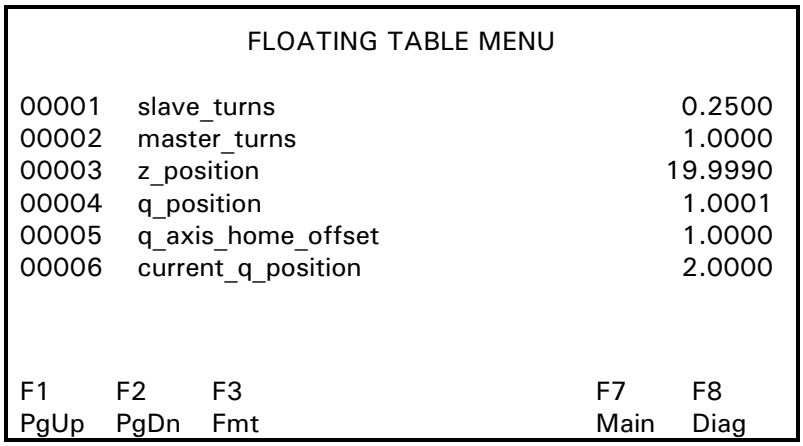


Display Format

Pressing **F3** toggles the display between decimal (20.0) and hexadecimal (0x00000014) notation.

Floating Point Variable Table Edit

This menu allows for viewing and editing of floating point variables. Variables can be changed by any task at any time. Therefore, its possible, for editing to be in conflict with a motion task. In this instance, unexpected results may occur. It is at the discretion of the operator to determine the usefulness of such an operation.

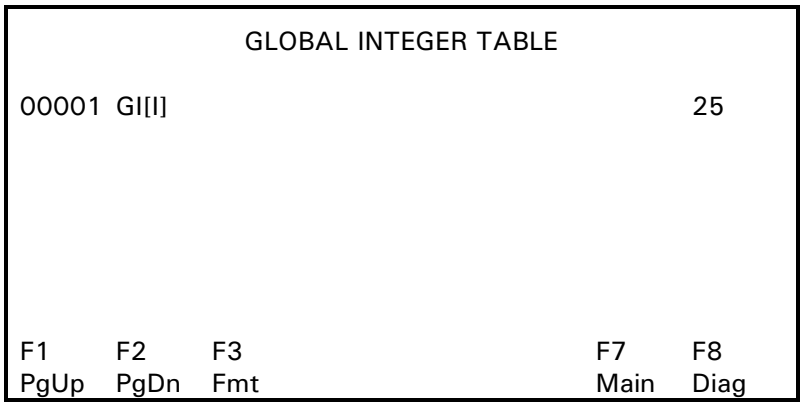


Display Format

Pressing **F3** toggles the display between floating point fixed (100.000) and scientific (1.000e+02) notation.

Global Integer Variable Table Edit

This menu allows for viewing and editing of global integer variables. Variables can be changed by any task at any time. It is possible, therefore, for editing to be in conflict with a motion task. In this instance, unexpected results may occur. It is at the discretion of the operator to determine the usefulness of such an operation.

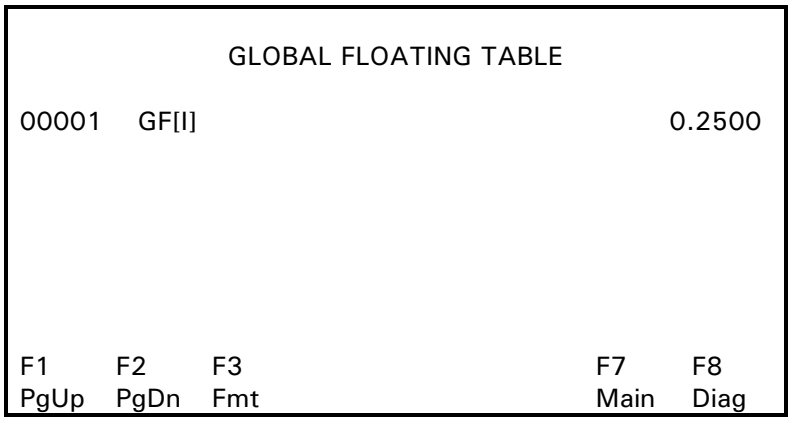


Display Format

Pressing **F3** toggles the display between decimal (20.0) and hexadecimal (0x00000014) notation.

Global Floating Point Variable Table Edit

This menu allows for viewing and editing of global floating point variables. Variables can be changed by any task at any time. It is possible, therefore, for editing to be in conflict with a motion task. In this instance, unexpected results may occur. It is at the discretion of the operator to determine the usefulness of such an operation.



Display Format

Pressing **F3** toggles the display between floating point fixed (100.000) and scientific (1.000e+02) notation.

5.15 F3 Jog Menu

The Jog menu allows you to jog a stopped system. The following I/O register bits must be on before jogging an axis:

Register 1 - System Control		Register 2, 3, 4, or 5 -Task Control	
Bit 6	Pendant Live Man	Bit 1	Mode:! Manual
Bit 14	Pendant Enable		

```
                    ROBOT JOG MENU
                        Task: A
System: Axis
Method: Continuous/Slow
  0001:  ABS[1]
                          AXIS        WORLD        TAUGHT
01          X          12.643         47.5         20.3
02          Y          95.215         18.3         54.2
03          Z          63.609          5.5         16.0
04          A           0.960         36.8         10.0


00      AXS            857.628        180

F1      F2             F4     F5      F6     F7     F8
Syst    Meth           MvTo   Axis    Para   Main   Diag
```

F1 = System **F2 = Method** **F4 = Move To** **F5 = Axis**
F6 = Parameters **F8 = Diagnostics**

Press **F1** to select either the Axis, Joint, World or Tool jog system. **F2** selects the jog method which can be continuos or incremental.

F4 is a "Move To" function that allows the user to enter a position in the TAUGHT column and move the specified axis to that point by pressing OK. Use the up and down arrow keys to move the cursor to the desired TAUGHT axis. This function is only available for coordinated axes.

F5 selects a single axis to jog.

F6 opens the *Edit Jog Parameters* screen which allows the user to adjust the percent distance and speed parameters, as well as, view the values set for each Task and Axis.

Jog Systems

Axis Jog Menu

The **Single Axis Jog** menu allows jogging a single, non-coordinated axis. Only the selected axis is affected. The BTC06 display is continuously updated with the current position of the axis.

Press **A–** to jog in the negative direction.
Press **A+** to jog in the positive direction.
(The teach pendant beeps at the beginning and end of motion.)

Coordinated Jogging

Press **X-** to jog in the negative X direction.
Press **X+** to jog in the positive X direction.

Press **Y-** to jog in the negative Y direction.
Press **Y+** to jog in the positive Y direction.

Press **Z-** to jog in the negative Z direction.
Press **Z+** to jog in the positive Z direction.

Joint Jog Menu

The **Joint** Jog menu allows jogging of individual axes with a joint number.

Robot World Jog Menu

The Robot **World** Jog menu allows jogging a coordinated or single axis for a task in World Cartesian Space. When jogging in world coordinates, motion will be generated parallel to the selected X, Y, or Z coordinate.

The pendant beeps at the beginning and end of motion. The display is continuously updated to display the current position (X, Y, Z) on each of the axes.

Tool Jog Menu

The **Tool** Jog menu allows jogging of the position of the end of a robotic arm.

Jog Method

The following Jog Methods are available with the Teach Pendant:

Continuous/Slow	Continues to jog slowly until the button is released
Continuous/Fast	Continues to jog quickly until the button is released
Incremental/Small	Jogs a predetermined small increment and then stops
Incremental/Large	Jogs a predetermined large increment and then stops

Teaching Points

To teach the current position (during a coordinated jog) into the Absolute Point Table press TEACH. (Confirm each point by pressing the OK key.)

The table point number will flash indicating that point has been recorded in the table. The point number will automatically advance to the next point.

Jog Fine Adjustments

The jog speed and distance increments are set as a percentage of the Maximum Jog Increment and Maximum Jog Velocity parameters (T-0-0025 and T-0-0026).

Separate percents are used for FAST/SLOW and LARGE/SMALL jog settings in coordinated jog.

While in the Axis Jog or World Jog Menus, pressing F6 (PAR key) displays a screen that permits editing the FAST/SLOW and LARGE/SMALL jog percents.

5.16 F4 Control Menu

The Control menu allows the pendant to control the execution of a task.

When the Teach Pendant powers up, the Control Menu is the first menu displayed.

The Control Menu will provide the following information:

Title	Control Menu Title
Task Status	Current task operating status
Program Name	Name of the currently active program
Sequence	Name of the current sequence executing
Step	Name of the current step executing
Function	Name of the current function executing
Position Title	Axis Position Title (Joint, World, & Target)
Axis 1 Label (X)	Axis defined as axis 1
Axis 2 Label (Y)	Axis defined as axis 2
Axis 3 Label (Z)	Axis defined as axis 3
Axis 4 Label (A)	Axis defined as axis 4
Target Name	Point # and label for the current point executing
Function Keys	Function keys control machine operation
Operation Labels	Specify the machine operations

The control menu can run in one of three different modes. The following pages describe the operation of each mode and illustrate the different menu layouts.

Control Menu: Auto Run/Hold Mode

Text appears when the **F6** key, ***DBug*** is pressed.

Text disappears when the F6 key, ***Norm*** is pressed.

```
                    CONTROL  MENU
 INST:  00FC   AXIS_WAIT
STAT:  Task   Running
DIAG:  Task   Running              No Target
AXIS                WORLD        TARGET       STATUS
                    1200.00      1200.00      Task A
                     500.00       500.00      AUTO
                      90.00        90.00      RUN
                                              99%

F1      F2      F3      F4      F5      F6      F7      F8
Auto    Go      STOP    I/O             Norm    Main    Diag
```

F1 - Mode Of Operation

If the *Teach Pendant Enabled Bit (Register 1 bit 14)* is high, pressing the **F1** key will change the mode of operation in the order shown below:

Manual: Jog ⇒ Auto: Step ⇒ Auto: Run/Hold ⇒ Auto: Step ⇒ ↺

F1 = Auto **F2** = Go **F3** = Stop **F4** = I/O
F6 = Debug/Norm **F7** = Main Menu **F8** = Diagnostics

Note: F2,**F3** and **F5** are dependent on the selected mode of operation.

When A*utomatic Mode* is selected by pressing the **F1** key, **F2** will display Go and **F3** will display Stop. By pressing the **F2** key, the active program will start executing instructions. By pressing the **F3** key, program execution will stop. If the **F2** key is pressed again, the program will continue.

To restart at the beginning of the program, the mode of operation must be changed to manual or step and then changed back to auto.

By pressing the **F4** key, the Register Menu will be displayed, allowing the operator to active I/O bits.

In Auto: Step mode **F5** is used to select the step method which can be one instruction, one Sequence Step, or one Sequence Function at a time.

When Debug is selected by pressing the **F6** key, the following text appears in the top half of the screen and the **F6** key text changes to Norm. Pressing **F6** (Normal) again removes this information.

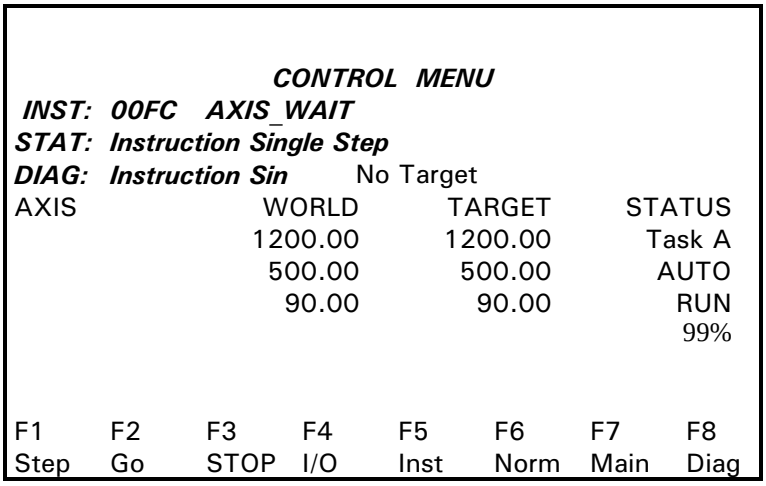
```
                    CONTROL  MENU
 INST:  00FC   AXIS_WAIT
STAT:  Task   Running
DIAG:  Task   Running
```

Screen name
VisualMotion instruction being processed
Task status
Diagnostic status

Control Menu: Auto Step Mode

Text appears when the **F6** key, ***DBug*** is pressed.

Text disappears when the F6 key, ***Norm*** is pressed.



F1 = Step **F2** = Go **F3** = Stop **F4** = I/O

F5 = Instruction/Sequence **F6** = DeBug/Norm

F7 = Main Menu **F8** = Diagnostics

When the Automatic Step Mode is selected by pressing the **F1** key, **F2** will display GO and **F3** will display STOP. Every time the **F2**-GO key is pressed, the program will be sequentially executed one step at a time. The steps can be program instructions, Sequencer steps or Sequencer functions. Pressing the **F5** key selects the step mode that the program will follow:

Instruction	-	INST
Sequence/Steps	-	SEQ/STEP
Sequence/Function	-	SEQ/FUNC

When **F5** (INST) is selected the program will execute only one instruction every time the **F2**-GO key is pressed. When SEQ/STEP is selected the program will execute all the functions within one Sequencer step, one at a time. When SEQ/FUNC is selected the program will execute each Sequencer function, one at a time.

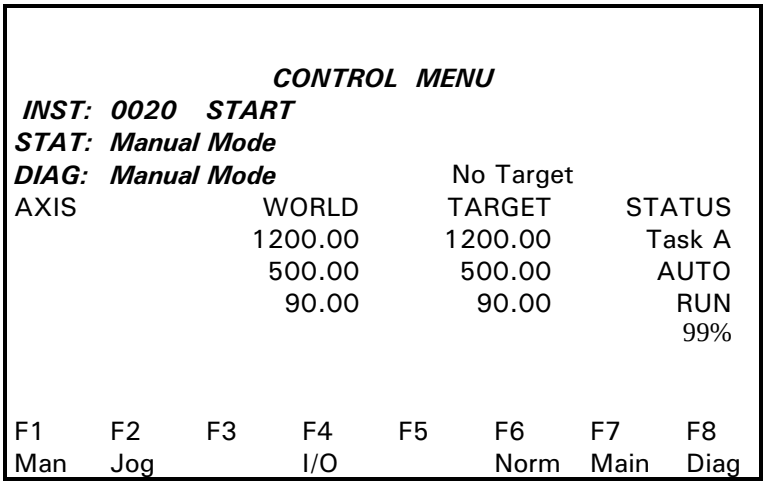
The **F3**-STOP key can be used to immediately halt the execution of the program within a step. If the **F2**-GO key is pressed again the step will continue to run.

By pressing the **F4** key, the Register Menu will be displayed, allowing the operator to active I/O bits.

Control Menu: Manual Mode

Text appears when the **F6** key, ***DBug*** is pressed.

Text disappears when the F6 key, ***Norm*** is pressed.



F1 = Manual **F2 =** Jog **F4 =** I/O **F6** = DeBug/Norm
F7 = Main Menu **F8 =** Diagnostics

By pressing the **F2** key, the Jog Menu will be displayed, allowing the operator to jog and teach each axis.

By pressing the **F4** key, the Register Menu will be displayed, allowing the operator to active I/O bits.

5.17 F5 Register I/O Menu

The **F4** I/O key is provided on every operator interface control screen. The operator will have the ability to view and edit the register bits that the machine builder selects. When the **F4** key is pressed, the register menu will be displayed. The first register displayed is set in CLC card parameter C-0-0805 *Start of User Accessible Registers on Pendant*. Parameter C-0806 defines the *End of User Accessible Registers on Pendant*. The operator can only edit registers within the range of these two parameters.

For example, parameter C-0805 = register 100, which is labeled End_Of_Arm_Tool_1. When the **F4** key is pressed, the first screen displayed is register 100, along with the register label. Bits 1 through 8 are displayed, along with the bit labels and current state (ON/OFF). This screen is only updated when any of the bits change states.

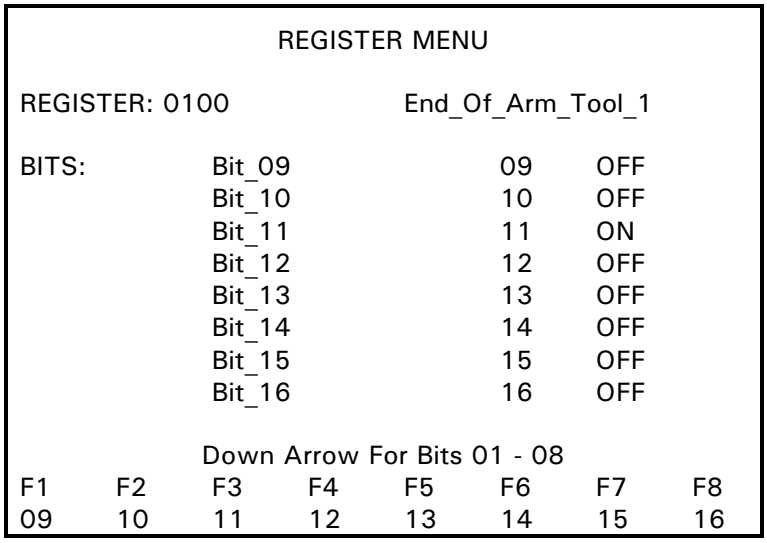
```
                    REGISTER MENU

REGISTER: 0100              End_Of_Arm_Tool_1

BITS:   OAT_Forward              01    OFF
        EOAT_Reverse             02    OFF
        C_Axis_Vertical          03    ON
        C_Axis_Horizontal        04    OFF
        A_Axis_Forward           05    OFF
        A_Axis_Retracted         06    OFF
        Bit_07                   07    OFF
        Bit_08                   08    OFF

                Down Arrow For Bits 09 - 16
F1      F2      F3      F4      F5      F6      F7      F8
01      02      03      04      05      06      07      08
```

The first page of the register menu will display bits 1 through 8. By pressing the down arrow key, bits 9 through 16 will be displayed. Pressing the up arrow key will return to bits 1 through 8.

The page up  and page down  keys move the cursor to the next or previous register available within the limits of card parameters C-0-0805 and C-0-0806.

To jump to a register number:

1. Press the edit key
2. Enter the register number
3. Press the OK key

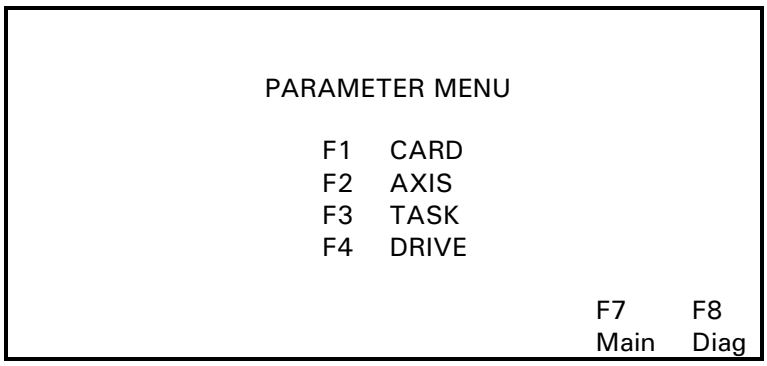


The function keys **F1** through **F8** will allow the operator to toggle the state (ON/OFF) of bits 1 through 8 (first page displayed) or bits 9 through 16 (second page displayed).

Note: *If an operator needs to change a bit in a register outside the range set by parameters C-0-0805 and C-0-0806, a password will have to be entered or the pendant level protection bits will have to be adjusted. See the Security Menu description.*

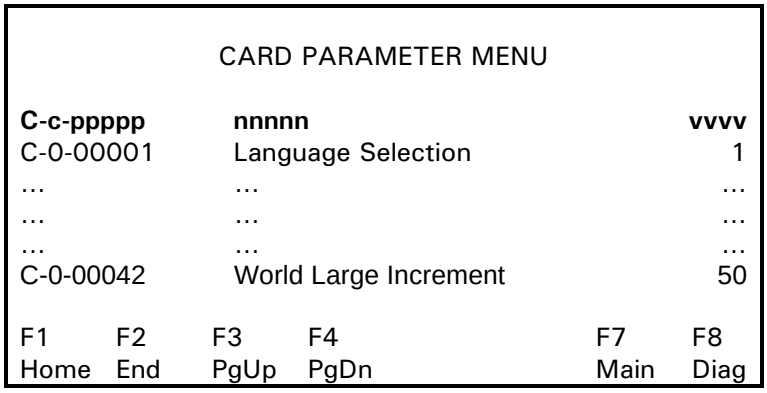
5.18 F6 Parameter Menu

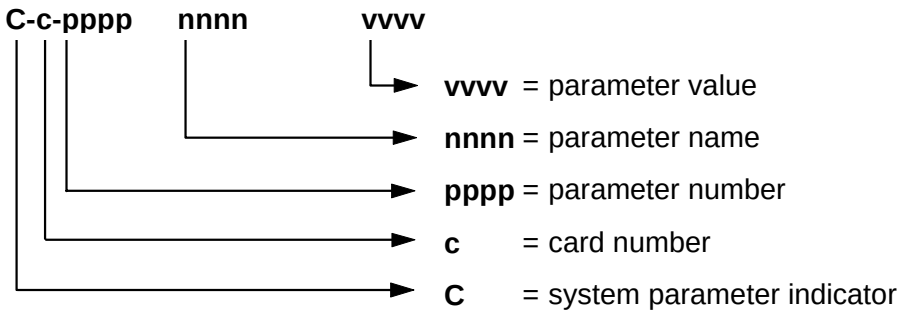
The Parameter menu allows selection of screens for editing the system, task, axis, and drive parameters.



Selecting **F1-F4** will open one of the following Parameter screens.

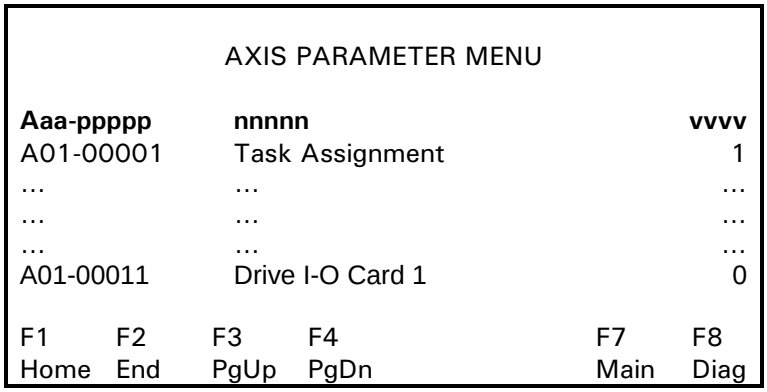
F1 - Card Parameter Screen

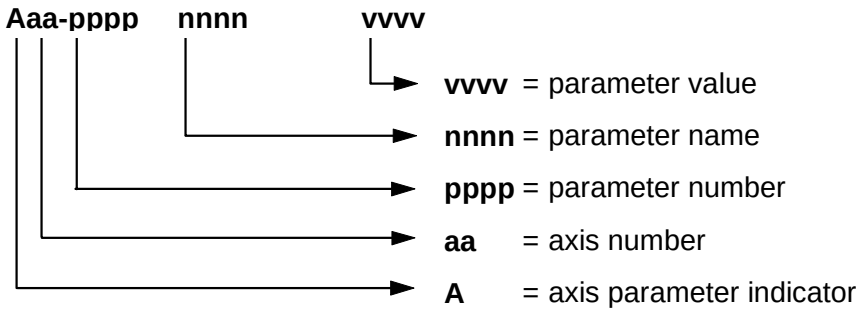




For changing of Card parameter numbers and editing of values refer to **F2 - Axis Parameter Screen** on page 5-50.

F2 - Axis Parameter Screen





When the operator first enters this screen, the cursor will be flashing on the **aa** axis number. This can also be performed by pressing the **F1 Home** key.

To change the axis number:

1. Press the Edit key
2. Enter the new axis number
3. Press the OK key

When done, all of the axis parameter number will be modified to display the new axis number.

To move the cursor to the parameter number (**pppp)** while the cursor is on the axis number, press the right arrow key. Pressing the **F1 Home** key will return the cursor to the axis number.

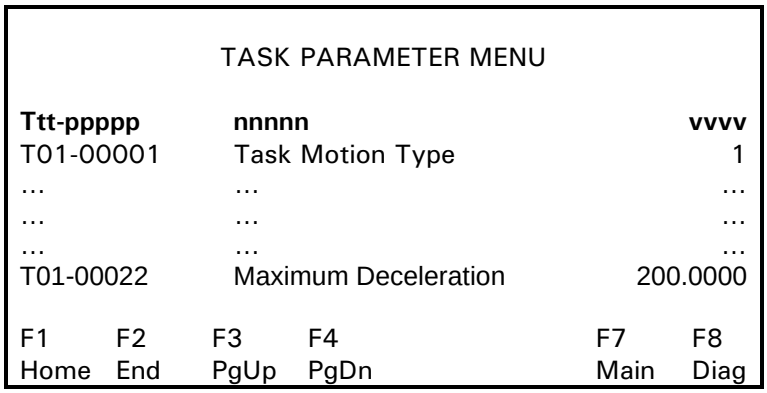
To jump to a given parameter number:

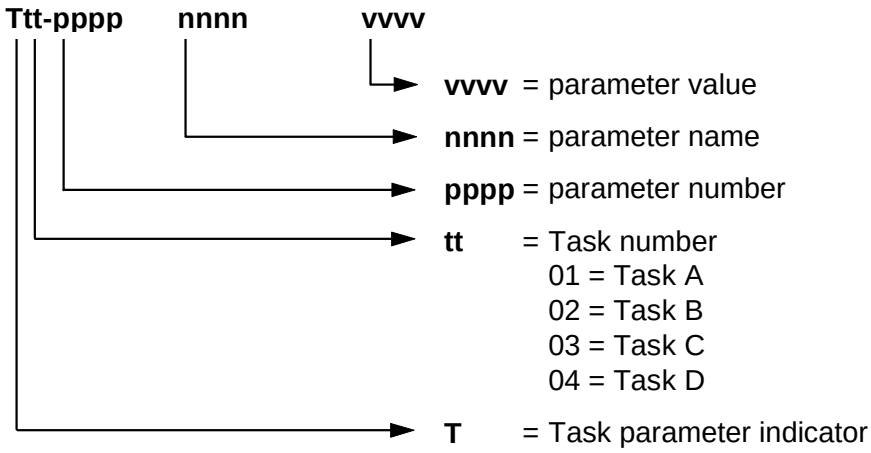
1. Press the Edit key
2. Enter the parameter number
3. Press the OK key

When done, the cursor will jump to the specified parameter number.

To modify the value for a given parameter, press the **F2 End** key to jump to the value field. Press the Edit key, enter the new value and press OK.

F3 - Task Parameter Screen

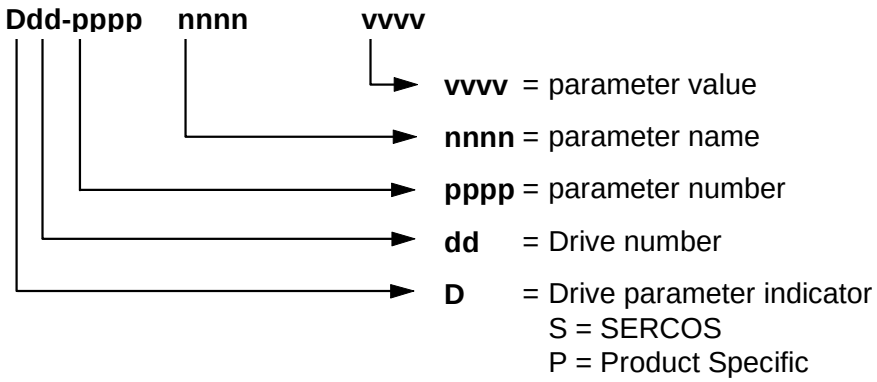




For changing of Task parameter numbers and editing of values refer to **F2 - Axis Parameter Screen** on page 5-50.

F4 - Drive Parameter Screen

```
                    DRIVE PARAMETER MENU

Ddd-ppppp       nnnnn                                  vvvv
S01-00001       NC Cycle Time (TN)                     4000
...             ...                                    ...
...             ...                                    ...
...             ...                                    ...
S01-00010       Length of Master Telegram              12

F1      F2      F3      F4                      F7      F8
Home    End     PgUp    PgDn                    Main    Diag
```



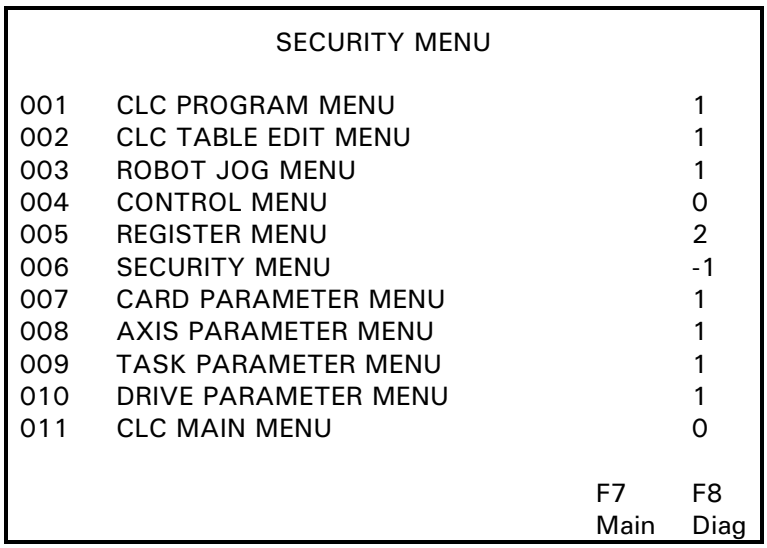
For changing of Drive parameter numbers and editing of values refer to **F2 - Axis Parameter Screen** on page 5-50.

This Drive Parameter Menu screen contains S (SERCOS) parameters and P (Product Specific) parameters. Instead of paging down to view P parameters, use the following steps to quickly reach them.

1. Position the cursor over the parameter number
2. Press the Edit key
3. Enter the last SERCOS number (412) and press OK
4. S-0-0412 will appear at the bottom of the list, press **F4** page down to display the first P parameter (P-0-0004.)
5. To return back to the start of the SERCOS parameters, page up and position the cursor on a SERCOS parameter.
6. Press the Edit key
7. Enter the first SERCOS number (1) and press OK.

5.19 F6 Security Menu

The Security Menu allows the Teach Pendant manager to assign a protection level code between 0 and 2 for each menu. Different access codes can then be set for various users to provide customized security for system data.



To alter a menu protection level, place the cursor over the protection level field and press the EDIT button. Key-in the appropriate code (0, 1 or 2) and press OK. The Security Level Menu has a default of -1 to allow initial access to all users.

The user access status for each menu depends on the menu protection level outlined above and the users access code, which is determined by the System Control Register 1, Bits 15 and 16. The access code has to be greater than the menu protection level to allow the user to view and edit a menu. If the levels are the same the user can only view the menu. A menu with a protection level that is higher than the security level cannot be accessed by a user. The following table lists the level combinations which determine user access privileges.

Bit 15 Status	Bit 16 Status	Access Code (Bit Resultant)	Protection Level (Preset)	Net Access Status
0	0	0	0	View Only
			1,2	No Access
1	0	1	0	View/Edit
			1	View Only
			2	No Access
0	1	2	0,1	View/Edit
			2	View Only
1	1	3	0-2	View/Edit

5.20 F8 Diagnostics Menu

When the **F8** key is pressed from any of the Operator Interface Control Menus, the Diagnostics Menu is displayed. The diagnostics menu displays the current Card, Tasks, Axis, and Drive status. The diagnostics screen updates continuously. When first entering this menu, by default, Axs=1, Drv=1 and the cursor is positioned on the CLC card number.

```
                    DIAGNOSTICS MENU

Crd: 03          007  Program Running: AB
                 Extended Diagnostic Message

Tsk: AA    TASK RUNNING
Tsk: BB    TASK RUNNING
Tsk: CC    MANUAL MODE
Tsk: DD    MANUAL MODE

Axs: 01    No Axis Message

Drv: 01    303 Position Mode Encoder 1 / lag

F1       F2       F3       F4                    F7
Num +    Num-     Reset    Log                   Main
```

Positioning The Cursor

The up/down arrow keys will position the cursor on the menu item the user may wish to edit.

NOTE: *The Teach Pendant cannot edit the card number or task.*

Cursor Positioned Axis and Drive Number

By pressing the (**F1** Num+) or (**F2** Num-), the Axis number will increment up or down, respectively.

By pressing the Edit key, the operator can enter the desired Axis number and press the OK key to accept.

By pressing the (**F3** Reset) key, the information on the screen is refreshed.

By pressing the (**F4** Log) key, the screen will display a list of error that contain the following details:

- Log number
- Date and Time
- Error code

For a complete listing of Diagnostics, refer to Chapter 3, Monitoring and Diagnostics.

5.21 Error Screen

If and error is detected during operation, the pendant automatically enters the Error screen and displays a message about the error condition.

If the *TPT enable bit (Register 1, bit 14)* is on and an error occurs, the TPT will force all tasks into manual mode.

Pressing escape after an error occurs will display the Diagnostic Menu.

```
                    DIAGNOSTICS MENU

Crd: 03          420  Drive 6 Shutdown Error

Tsk: AA      MANUAL MODE
Tsk: BB      MANUAL MODE
Tsk: CC      MANUAL MODE
Tsk: DD      MANUAL MODE

Axs: 01      No Axis Message

Drv: 04      028 Excessive Deviation

F1      F2      F3      F4                          F7
Num +   Num-    Rest    Log                         Main
```

F3 - Reset

A basic “Shutdown” error can be cleared by pressing **F3**. If the error is a configuration or hardware error, the source of that error must first be corrected before it can be cleared by the pendant.

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