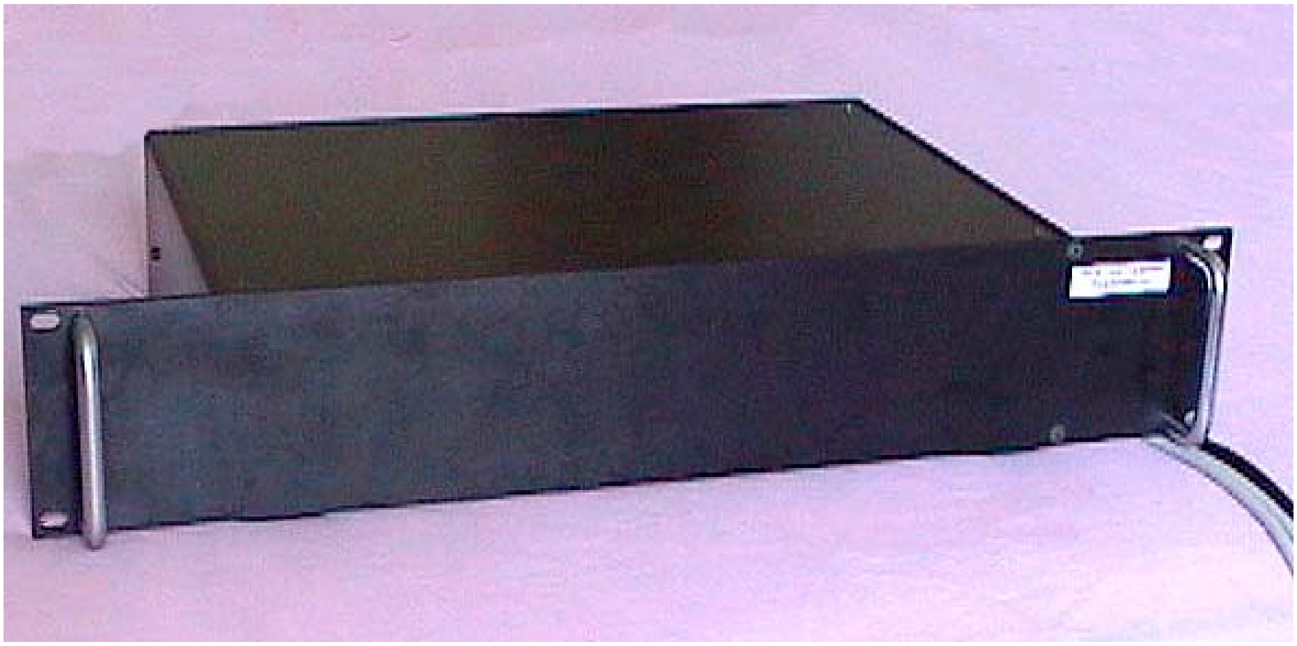
Pacific Laser Equipment

C-400 User Manual



Name: C-400UM
Release: 1.30
Release Date: November 19, 2002

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1. Introduction

1.1. Product description.

The ***C-400***© is a unique 19inch rack mountable 4ch DC servo motor controller with integrated DC motor amplifiers on board. It consists of precision amplifiers, power supplies, insulation transformers, rectifiers, and voltage regulators and TTL logic built around the Mitsubishi M 50734SP processor.
All this is compactly packaged in a 6-part 19 x 3.5 x 10" rack-mount anodized aluminum case.

The DC voltage output can deliver up to +/-12V making the controller compatible with most mechanics from: **Newport, PI, OptoSigma and ThorLabs.**

PC control is done via a null modem serial-interface cable that can be purchased as a STANDARD.
On the rear panel the user has access to the AC power plug and the ON / OFF switch.
The fuses are located inside the 19" chassis.

The controller is delivered with this User Manual, power cord and one null-modem serial cable.

This manual is provided as an aid in operating and programming the ***C-400***© DC-Motor Controller.
This servo-controller is intended for motion control in research and industrial applications providing in a single package a complete stand-alone control system for the smaller DC servo motors used in high-precision positioning systems.
The ***C-400***© utilizes quadrature encoder signals for position feedback and depending on the resolution of the encoder scale, incremental resolutions of 50nm to 0.1µm can be achieved.
The ***C-400***© provides servo-control of position, velocity, and acceleration. Although each parameter is programmable, each is also set to a programmable default value upon power-up.
Using the built-in commands and features, the user will very quickly be able to command the motor to move to any desired position. During the motion the velocity and acceleration will be controlled in accordance with the most recent settings of the controller parameters. It is not necessary to set them up anew for each move. The starter package comes with all connecting cables and software necessary for immediate operation.

Each axis has provision for two limit switches, in addition to a differential quadrature encoder input with index capabilities. For highest precision in a homing application, motion is commanded until the reference switch is encountered, then continues at a slower rate until the encoder index is found. With this procedure, the home position may be repeated to an accuracy of one encoder count, or the ultimate accuracy of the system.

All limit and reference switch inputs are sensed through line receivers with 1 volt of hysteresis for noise rejection. The encoder inputs use differential line receivers with 300 mV of hysteresis. They may be used with single encoders, as well. A capture/compare circuit is used to sense any change in the state of the limit and reference switches. When any one of them changes, a maskable interrupt is generated. These are several additional sources of interrupt, including excessive error, encoder error index, and absolute and relative position breakpoints.

1.2. Labels.

Rear panel labels indicate the functions for every connector, the unit serial number and display the power requirements.

1.3. Operation.

Controller operates only controlled by a host PC via the serial cable provided with the unit.
The operating voltage for the DC motors may change in the range from –12V to +12 V.
Serial communication is set by factory to 9600 baud, 8 data, 1 stop, no parity. Internal buffers are used, so there is no handshake required. Use a null modem cable for connection.

Setting Motion Control Parameters

Prior to commanding the connected motor or stage to move, the servo-control as well as the velocity and acceleration values have to be set. If you are using host software with valid configuration files or the ***C-400***© is set up to default to correct parameter settings, then you may skip this section.
Each stage could require its own set of parameters for proper operation.
They can be modified as appropriate for the actual setup. The settings are not particularly critical, so you can vary parameters by +/- 50% to achieve better settling performance.

Operating Motors and Stages

Type *MN*<return>. ***C-400***© is now on-line and ready for motion. *If the motor oscillates or begins to "run away" when the MN command is given, remove power and read further before continuing.*
Enter *MR1000* <return>. The motor should move 1000 encoder counts in the positive direction. When it stops, enter *TP* <return>. The position should be very close to 1000. Now enter *TT,TE* <return> in order to read the target and the position error. This reports where the motor should be (1000) and the distance of the actual position from this target. If the reported position was 998, then the reported error will be 2. If the reported position was 1002, the reported error will be -2.
To read all values at the same time, enter *TT,TP,TE* <return>. Now all three values are reported.
Now enter *MR-1000* <return>. The motor should return to zero, or home, position.
Press <return> again. The motor should move another 1000 counts in the negative direction. Press it again and again. The motor should move each time.
Now try *GH* <return>. The motor should return to the position it occupied when power was applied.
Now for advanced programming: enter *MR1000,WS100,TE* <return>.
The motor should move 1000 counts positive. When it arrives at this position, it should report how close it came to the target.
For a longer move, enter *MR100000*<return> and verify that the motor has moved that distance. Press the <return> key again and see that the motor moves the same amount in the same direction. Press it again and again. A *GH*<return> command will return to the previously defined HOME position.
While in motion, we could have entered *TV* and pressed the <return> key
as often as desired to read the actual number of encoder counts moved during the last 0.4 seconds.
Set the acceleration to a lower value, such as *SA10000* <return> and see the velocity increase and decrease over a longer period. Set the velocity to various values and issue commands to move to various positions using either *MA* or *MR* commands.
Move the stage some distance away from the end, say 100,000 counts, and try this:
MR50000,WS100,WA500,MR-50000,WS100,WA500,RP9 <return>.
The stage should cycle back and forth 50,000 counts with a delay of a half-second at each end.
It should do this ten times—once by command followed by nine repetitions.

Multi-Axis Control

The axis number will proceed whenever a specific axis needs to be moved or read.
Example: 1MR50000, 2MR-30000, 3TP, 4GH.

Default Values

C-400© has been designed to be as easy to use as possible. When shipped, the ***C-400***© comes with (factory) default settings. These settings can be read and changed using the Read_C400.vi and the SET_C400.vi In most cases, the factory default values will be appropriate for the application.

Limit Sensors

During operation, the limit sensors (or switches) are used to stop the motion at the end of the allowable travel range. Only one of the two switches will interrupt motion in a given direction.
When connecting other motor drives or mechanics, the correct limit switch wiring must be determined. To do this, set the system into a safe position, set a low velocity with the *SV* command, begin motion with an *MR*, *MA* or *FE* command and enable limit switch operation with the *LN* command. While the motor is moving, actuate the limit switch toward which it is moving. If the motor stops, that is the correct switch to connect at the end of desired motion for that direction. If the motor does not stop, actuate the other limit switch. If the motor still does not stop, remove power and read further.
Each axis has provision for two limit switches and a reference switch, in addition to a differential quadrature encoder input with index capabilities. For highest precision in a homing application, motion is commanded until the reference switch is encountered, then continues at a slower rate until the encoder index is found. With this procedure, the home position may be repeated to an accuracy of one encoder count, or the ultimate accuracy of the system.

All limit and reference switch inputs are sensed through line receivers with 1 volt of hysteresis for noise rejection. The encoder inputs use differential line receivers with 300 mV of hysteresis. They may be used with single encoders, as well.
A capture/compare circuit is used to sense any change in the state of the limit and reference switches. When any one of them changes, a maskable interrupt is generated. These are several additional sources of interrupt, including excessive error, encoder error index, and absolute and relative position breakpoints.

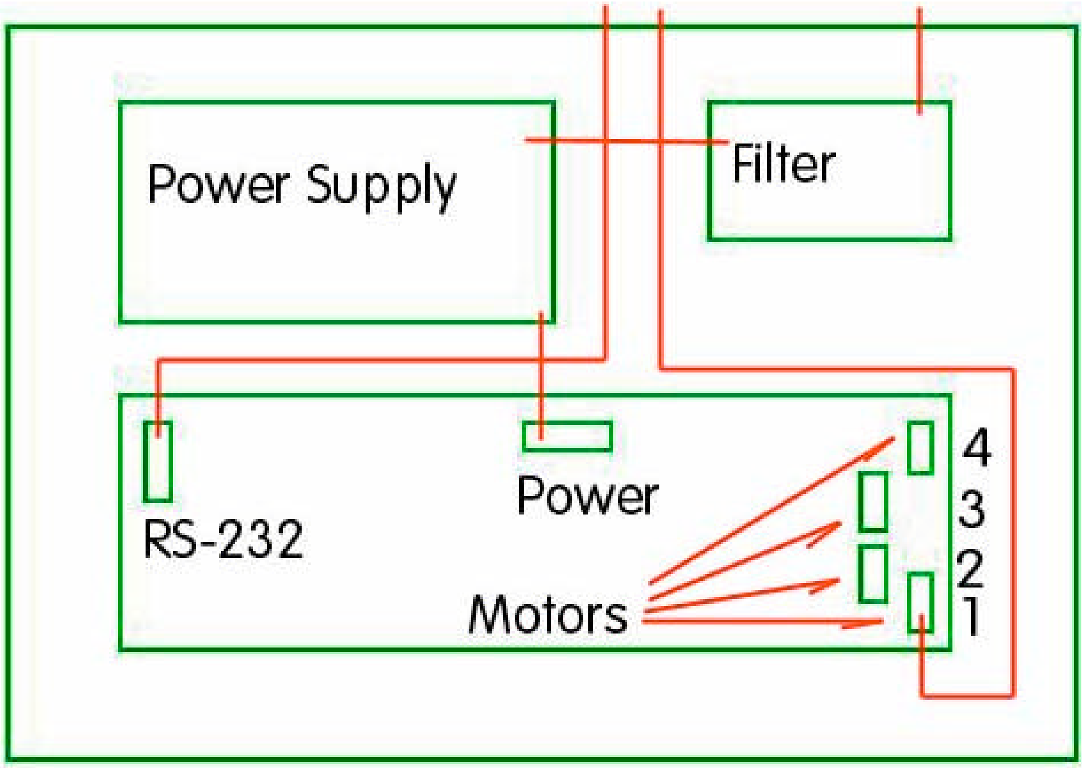
LM629 Data	1
Input register	6 (Read only)
Software reset	7 (Read only)
Interrupt register	2 (Read only)
Limit switch register	3 (Read only)
Configuration and output	6 (Read only)
LM629 Commands	0

(Desired channel selected by configuration register bits 6, 7, address 6)

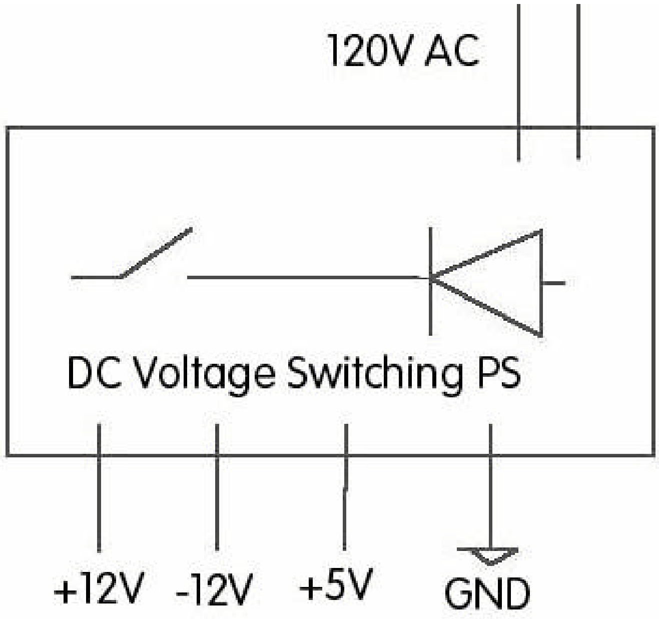
The **C-400**© controller uses National Semiconductor LM629 integrated circuits to perform the servo control functions. If the user wishes to program them directly, the programming is done exactly as described in National's programming manual. For those users wishing to use the **C-400**© in an interactive manual mode, joystick operation is possible also as an add-on option.

2. Block diagrams

2.1 General diagram.



2.2 Power supply block diagram



3. Technical specs

Number of motor channels	1 to 4
Maximum output voltage	- 12V to +12V
Maximum current	2 A peak
Digital I/O channels	8 inputs, 5 outputs
Control modes	Position and velocity
Servo algorithm	Proprietary
Trajectory generation	Trapezoidal
Position encoder compatibility	Incremental, single-ended or differential with index 1 MHz maximum
Communication	RS-232
Output type	Analog 0 to +/-12V
Control language	Two letter mnemonics, LabView 6.1 drivers,
Programmable functions	Acceleration/deceleration, velocity, position, digital filter gains, derivative sampling interval, absolute and relative breakpoint positions, integration limit, interrupt mask, maximum allowable able error stop mode
Dynamic range	30 bits, (+/- 1,073,741,824)
Interrupts	Position breakpoints, limit switches, error limit
Addressing	Switch selectable. I/O mapped
Physical interface, motors & I/O	25-pin and 9-pin Sub D connectors
Analog input:	0 to 5V (Optional through the I/O port).
Display:	LED for internal power supply.
Power out:	2.5W.
Power requirements:	120V AC, 100mA.
Dimensions:	5 x 2 x 3”
Enclosure	19” Rack. Aluminum (Black anodized or Aluminum)

4. Test and troubleshooting

Attention:
The unit uses AC 120V. This is a dangerous voltage.

Front and Back Panel Elements

Connectors :

RS-232	(1)	Sub-D 9(m) Serial network input
STAGES	(4)	Sub-D15(f) Motor connector
AC 120V	(1)	Standard AC 3 pin receptacle.

Indicators:

Power	(1)	Orange LED on front panel.

Fuses

The fuses are located inside the box. When replacing please use slow-blow 100mA.

AC Power

Make sure that the AC power used is always 120V.

Test

To test communication with the ***C-400***© connect all cables and power-up than send the TP command from any program capable to send ASCII commands via the COM port.
If the system is ready for operation the controller will respond with the encoder read-out.

Trouble Shooting

Problem (#1): The controller communicates and reports position values (TP), but the connected stage or motor does not move.
Cause (#1): The 12V could be missing.
Problem (#2): Front panel LED is OFF.
Cause (#1): The FUSE could be blown.

There could be other instances when a failure mode could appear but that can only be determined on a case by case basis.

5. Command structure

Over 40 commands are available for programming the ***C-400***©. Use these commands to control motion and to acquire reports regarding motion control parameters and status.
The command structure has been designed to minimize the effort required to use the ***C-400***©.
Commands can be executed in various ways:
as Single Commands One function, executed immediately
as Compound Commands Multiple functions, executed immediately in sequence
as Macro Commands Command sequences, stored for later execution.

5.1. Single Commands

A ***single command*** is executed immediately after a carriage return is received and will be repeated each time a carriage return is received, until a different command is entered.
Examples:
MR2000 <return> Move motor 2,000 steps relative to the present target
MN <return> Set motor in ON state
TP <return> Report (tell) position for motor
MA20000 <return> Send motor to absolute position 20,000
Both uppercase and lowercase characters are valid, and spaces are allowed.

5.2. Compound Commands

A ***compound command*** is a series of single commands separated by commas.
In this way, it is possible to string together several commands before terminating them with a carriage return. These multiple commands will then be executed sequentially.
The syntax for a compound command is: CMD[***n***], CMD[***n***], ...,..., <return>
Example: *mr5000,ws100,wa500,ma12000,ws100,wa800,tp*<return>

A compound command, such as in the following example, may be entered as one program line. It instructs the motor to move 1,000 encoder counts in the positive direction, wait in that position 500 milliseconds, return to the original position, wait 1 second, and then repeat that sequence 5 times.
Example: *"MR1000,WS100,WA500,MR-1000,WS100,WA1000,RP5"* <return>
Once this compound command is entered, it remains in the buffer until replaced by another command and can be re-executed by sending a carriage return (pressing <enter>).

5.3. Macro Commands

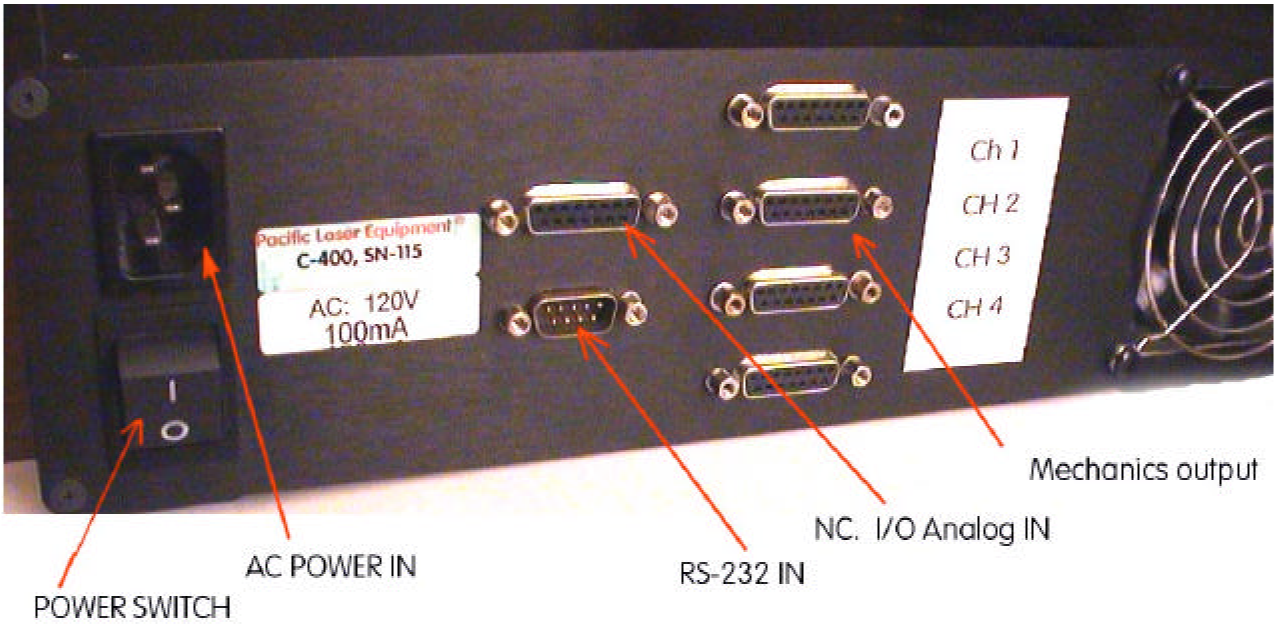
Macros can be a most powerful tool for the programmer. A *macro command* is a grouping of commands to form a short program, stored under a macro number.
To use macros to programming the **C-400**© controller, insert an *MDn* (MacroDefinition) command as the *first* instruction on the line and follow it by a comma and a comma-separated command string. The syntax for macro commands is:
MD(macro#), followed by a compound command string.
Example: *MD3,MR1000,WS100,MR-1000,WS100,RP5* <return>
In this example, *MD3* defines macro #3. To call up (run) this macro, just issue the command *EM3*.
Unlike MD# commands, EM# commands may be used in compound commands and, with some restrictions, in other macro definitions.

A macro command can call other macros, but if the calling macro is to continue after the called macro completes, the called macro must not contain any macro calls. For example, MC1 could call MC2, but MC2 could not then call MC3 and still be able to return to complete the remainder of MC1.
Example: *MD1,EM2,EM3,EM4,EM5,EM6*

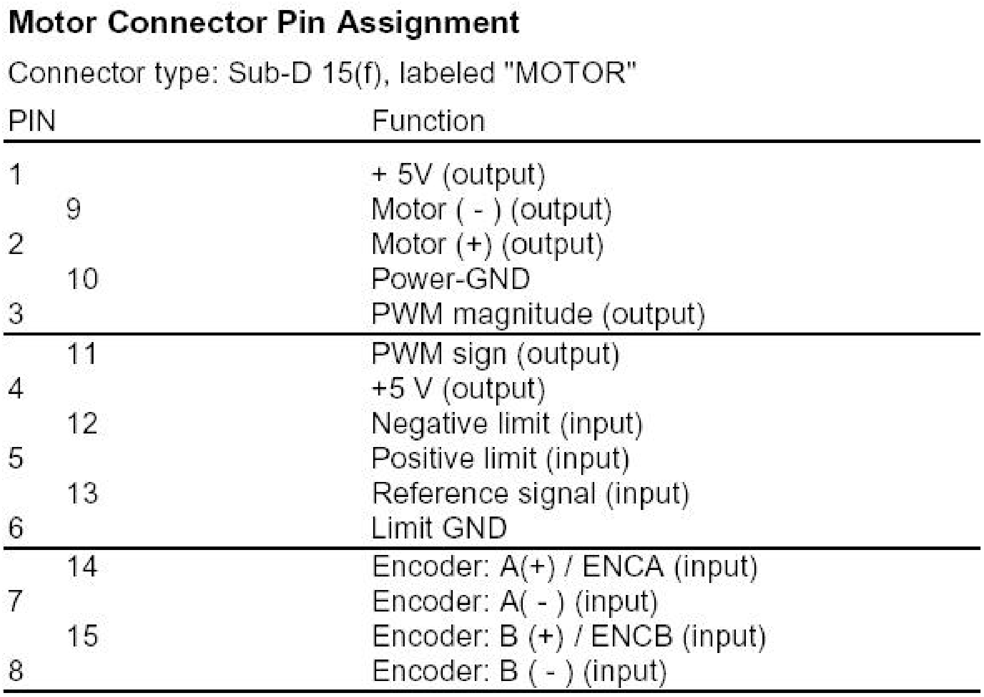
5.4. Reporting commands

Reporting commands are commands, which cause the **C-400**© controller to send a string of data, be it a position, servo-control parameter, help or other information. These commands are easy to remember as they usually begin with a **T (tell)**. For example, *TT* (Tell Target).

6. Cable Connections



There are seven connectors on the **C-400**$^{©}$ to provide access to its functions. The motor connections are included in the D-sub 15-pin connector with the encoder and limit switch signals.
The 9-pin sub-D connector is wired straight to the RJ-11 connector. The DSub-15 connectors are the motor or stage connection.
Compatible with NEWPORT, PI and ThorLabs stages and motor drives.



Motor Connector Pin Assignment

Connector type: Sub-D 15(f), labeled "MOTOR"

PIN		Function
1		+ 5V (output)
	9	Motor (-) (output)
2		Motor (+) (output)
	10	Power-GND
3		PWM magnitude (output)
	11	PWM sign (output)
4		+5 V (output)
	12	Negative limit (input)
5		Positive limit (input)
	13	Reference signal (input)
6		Limit GND
	14	Encoder: A(+) / ENCA (input)
7		Encoder: A(-) (input)
	15	Encoder: B (+) / ENCB (input)
8		Encoder: B (-) (input)

7. Software

Windows Library (DLL)

On the CD provided the user will find the C812Lib202.dll file under the \DRIVERS directory.

LabView Driver Library

See content in the \DRIVERS folder on the CD.

Command Reference

All **C-400**© commands use two-letters to identify the type of operation followed by pertinent data values, if necessary. For example, *TP* by itself is adequate to display the motor position, but *MR* alone would be useless, because the system would not know how far you wished to move. All commands are checked for acceptability as they are entered. *MR*, for example, must be followed by a minimum of 1 and a maximum of 9 digits to accommodate the allowable range of motion.

C-400© commands are arranged by group for the following discussion.

Motion and sequencing commands

AB Abort motion
DH Define home
GH Go home
MN Motor on
MF Motor off
MR Move relative
MA Move absolute
RP Repeat from beginning of line
WA Wait absolute time
WS Wait stop
FE Find edge (find limit)

Parameter setup commands

SV Set Velocity
SA Set Acceleration
SM Set maximum following error
LN Limit switch operation ON
LF Limit switch operation OFF

Reporting commands Report Identifier

CS Report checksum C:
TI Tell iteration number X:
TM Reports all listed macro commands
TY Tell programmed velocity Y:
TL Tell programmed acceleration L:
TE Tell error (distance from target) E:
TP Tell position P:
TT Tell target position T:
TV Tell actual velocity V:

8. Commands

MOTION and SEQUENCING COMMANDS

AB Abort motion

This command stops the motor at the present position; any further motion requirements are ignored. The target position is changed to be equal to the present position.

FEn Find Edge (*n* = 0,1)

This command is used to move the system to a given initial position. The direction of motion depends on the value of n. The target is set to + or - 16,777,013 depending on the value of ***n***. The motor runs at the programmed speed until the limit switch is activated.
Example: *FE0* <return> causes motor to move in a positive direction until the reference input changes state. If the reference input is high when the command is issued, the motor runs toward the positive limit until the input changes to low, and vice versa.
FE1 <return> causes the motor to move in a negative direction until the reference input changes state. These commands assume that your system has the reference input line connected to a reference switch. *FE* can be useful in calibrating the home position on start-up or for simply slewing long distances at the most recent velocity setting.
If limit switches are not in use, a command string such as
"FE0,WS100,WA500,DH,MN" could be used on startup to find the Home position value of a mechanical stop. This command tells the motor to run toward a target value of +1,000,000,000 until stopped. When the motor encounters the mechanical stop, the following error will rise quickly, triggering a halt because of an Excessive Error condition. (See *SM* command.) This error halt will disable the motor loop, so the *MN* command at the end is required to maintain the new position against any forces that might be attempting to move it. It may be desirable to use the *SM* command to set the maximum allowable following error to a low value at the start of motion. Do not forget to restore it to a better working value after the operation is complete.
Note: This procedure requires that limit switches not be in use. If they are in use, they will automatically stop motion without causing an Excessive Error condition.

GH Go Home

The Go Home command causes the motor to move to the absolute zero position.
Equivalent to an *MA0* (Move to zero position) command.
Example:
GH <return>: Moves motor to zero position.

MA*n* Move Absolute (- 1,073,741,823< *n* < 1,073,741,823)

This command generates a motion to the absolute position ***n.*** The zero, or home position, may be redefined by the *DH* (Define Home) statement. If not otherwise defined, it is the position where the controller was when powered on.
MA0 <return>: Tells motor to go to Home position

MR*n* Move Relative

This command generates a motion of relative distance of ***n*** counts in the specified direction from the current motor position. ***n*** may be either a positive or negative number. The resulting absolute target position must be between + and - 1,073,741,823.
Examples:
MR5000 <return>: Motor moves 5,000 counts in positive direction.
MR-330 <return>: Motor moves 330 counts in negative direction.
MR2000,WS100,MR-1200 <return>:

MF Motor OFF

When this command is issued, the motor is no longer held in position (servocontrol is turned off) and may be moved freely. The *MF* command is used to prevent unwanted movement or to allow for manual positioning of the unit. When manually positioned, however, the motor position is still monitored in the *MF* status and may be reported by the *TP* command. The opposite command is *MN* (Motor ON).
Use caution when turning the motor back on. The target position remains the same as when the MF command was issued and the motor will try to return there unless the target position is redefined.

To set a manually selected position as the new target position before putting the motor back in the *MN* (Motor ON) state use the *DH* (Define Home) or *AB* (Abort) command as follows:
AB,MN <return>
DH,MN <return>
The DH command is also useful for determining the encoder resolution. Issue the *MF* command, manually position the motor/encoder at some known angle, issue a *DH* command to set the position to 0, then turn the motor/encoder one revolution.

Now the *TP* command will report the number of encoder counts/ revolution. PI stages have incremental encoders with from 2000 to 4000 counts/ rev.

MN Motor ON

This is the normal system control mode, in which ***C-400***© controls the axis position continuously. Any deviation between actual and target position causes the motor to be driven toward the target, possibly with maximum force, depending on the distance moved during the motor off condition.

Use caution when turning the motor back on. ***C-400***© keeps track of both the motor and target position even when in the MF state. When it receives an MN command, The controller will try to return the motor to the old target, unless the target has been redefined.
Example: *MN* <return>

RP*n* Repeat (0 < *n* < 65,535)

This command causes the command string to repeat ***n*** times. If ***n*** is not specified, the command(s) in the string are repeated 65,536 times. The repeat loop may be interrupted by sending any character. This character should not be the first character of a new command, because it will be discarded.
Example: *TE,WA500,RP99* <return>
Will display the distance to the target every 500 milliseconds (0.5 second) for a total of 100 times.

WA*n* Wait (0 < *n* < 65,535)

This command inserts a wait period of ***n*** milliseconds before going to the next command.
Example: *MR2000,WA3000,MR-2000* <return>
This command line will move the motor by 2,000 steps, then, 3 seconds after the start of the move, the motor will move back 2,000 steps. Note that the wait period of 3 seconds includes the time the motor is moving. If the motor is to be at rest for 3 seconds, an additional command must be inserted to prevent the wait interval from beginning until the motor has completed it's motion:
MR2000,WS100,WA3000,MR-2000 <return>

WS**n** Wait for motor stop

The WS command waits until the motor has reached the end of its trajectory and then waits for another n milliseconds before continuing to the next command.
Example: *MR5000,WS100,TE* <return>
This command line moves the motor for 5000 counts and then waits for 100 ms after the motor has completed the move before executing the TE command (Tell error) and reporting the error.

PARAMETER SETUP COMMANDS

DH Define Home

Defines the current motor position as the zero position (Home position).
Example: ***DH*** <return>: Sets the current motor position to 0.

SG*n* Sets the static gain (0 < *n* < 32,767)

This command sets the slope of the proportional relationship between the position error and the motor voltage. The higher the gain value set, the greater the stiffness of the position coupling, meaning that a small error value causes a proportionally larger motor current driving the motor towards the target.
The default gain value usually ensures stable operation. The optimum value depends on friction, inertia, motor power, and the resolution of the encoder. It must be determined by the user.
If the error reported by an axis after completing its motion is excessive, the gain value may be increased in small increments until the error is within acceptable limits. If the axis becomes unstable and begins to oscillate, the gain must be reduced until the oscillation stops.
Example: *SG80* <return> Sets a gain of 80

SA*n* Set Acceleration (0 < *n* < 2,000,000)

Sets the maximum acceleration rate in encoder counts per second squared.
Acceleration values are in the range from 100.000 to 800.000. The default value is set to 150.000.

SV*n* Set Velocity (0 < *n* < 500,000)

Causes the motor to run at maximum velocity of n counts/s for subsequent motion commands***.*** The value is given in encoder counts per second. If the torque load changes on the motor, the controller attempts to maintain the velocity by varying the motor current.
Example:
SV40000 <return> Sets the velocity of motion to 40,000 counts per second.

SM*n* Set Maximum following error (0 < *n* < 32,767)

Sets the maximum allowable error between the dynamic target and the actual position. May be changed as often as desired to provide maximum protection to the system. The normal following error can be monitored during motion with the TF command. For maximum system safety, use the SM command to limit following error to a value slightly above that required for normal operation.

LN Limit Switch operation ON

Enable software limit switch operation. When a limit switch is encountered during motion, motion is halted and is no longer possible in that direction as long as the switch remains closed. The target is changed to the position at which the limit switch was encountered. Movement in the reverse direction is not affected.

LF Limit switch operation OFF

Disables software limit switch operation. ***C-400***© also has logic circuitry to disable motion in the direction of a hardware limit switch when the switch is actuated, whether or not the software limit switch operation is enabled.
The LN and LF commands affect only the software. The LF command should only be used when hardware limit switches are not installed.

REPORTING COMMANDS

Reporting commands cause the ***C-400***© controller to emit a string of data. These commands are easy to remember as they usually begin with a **Tell** statement.

TG Tell gain

Reports programmed SG values This value can be changed with the

TI Tell Iterations

This command reports the state of the repeat counter. It is useful for determining the number of times a repetitive action has taken place.

Example: *MR100,WS100,WA250,TI,RP99* The motor will make repetitive moves of 100 steps, with a delay of .25 seconds between steps, for a total of 100 times. The TI command will report the number of iterations remaining to be performed after each iteration.

TP Tell Position

Tell Position reports the absolute position of the motor***.*** *TP* may be used to monitor motion during both motor on and motor off status.

TT Tell Target

Reports target position. This is the absolute position to which the servo-loop will try to drive the motor any time the *MN* (Motor ON) state is in effect.

TY Tell programmed velocity

Reports the Programmed Velocity value. This value can be changed with the *SV* command. The values reported with the *TV* and *TY* commands should differ by only a few counts.

Command: *TY* <return>
Report: "Y:+0000020000"

TV Reports actual velocity

Command: *TV* <return>
Report: "V:+0000020006"

CS CheckSum

Calculates and reports the check-sum. This command is useful to test the integrity of the firmware. The reported value should be the same every time.

Report: "C:50EE_FBF2"CRETX

TL Tell acceLeration

Reports programmed acceleration value.

Command: *TL*<return>
Report: "L:+0000170000"

TF Tell Following error

Reports the difference between the dynamic target and the actual position. During motion, it is normal for the actual position to lag behind the target position by some amount, usually dependent on the programmed velocity. If the velocity is higher than physically possible for the system, or if an obstruction has been encountered, the Following Error will increase. If the obstruction is temporary, the servo-action will attempt to reduce the error to zero when the obstruction is removed. If the condition is not temporary, the error will increase until the programmed limit is reached.

Command: *TF* <return>
Report: "F:+0000000117"

TD Tell deceleration

Reports programmed SD values

Command: *TD* <return>
Report: "N:+0000126317"

MACRO COMMANDS

MD*n* Macro Definition (1 < *n* < 16)
This command is used to define a new macro command. Defining more than one macro with the same value of n, will simply result in the loss of all but the last macro so defined. To define a macro, choose the desired macro number in the allowable range, enter **MD** followed by this number and a comma and then type the command or command sequence just as you would if running it directly.
Examples:
MD1,MR50000,WS100,GH <return> Defines macro #1
MD2,TT,TP <return> Creates a macro command to Tell Target, then Tell Position. Defines macro #2.
EM2 <return> Executes macro #2, (Same as entering *TT,TP*<return>)

EM*n* Execute Macro Command *n* (1 < *n* < 16)
This command is used to run a previously defined macro command.
Example: *EM3* <return> Execute macro #3

RM Reset Macro
Used only to initialize the memory reserved for macro commands. It clears the macro storage.
Example: *RM* <return> Removes all stored macros
Note: This command needs 5 seconds for execution. During that time no communication is possible.

UTILITY COMMANDS

RT Reset
Restarts controller as if from a power-off condition. All values are restored to their defaults.

EN Echo on
Enables echoing of command characters as they are entered. Each character received is echoed unchanged. This is a very useful feature when the Suprmtr6 is being controlled from a terminal.

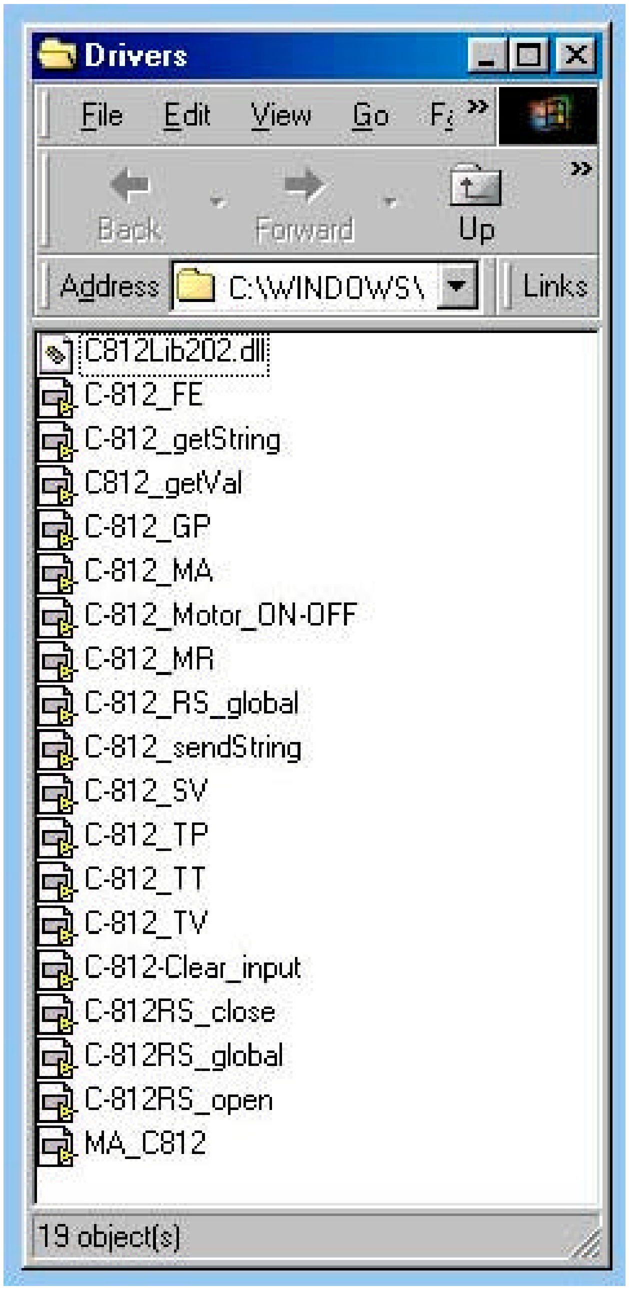
EF Echo off
Disables echoing. When control is from a computer program, it is sometimes easier to program if there is no echo, unless the program uses it for verification of successful transmission.

HE Help
Reports all available commands

9. LabView

9.1 VIs - Drivers –

The following Vis are provided on the enclosed CD. They are based on the C812Lib.dll file.

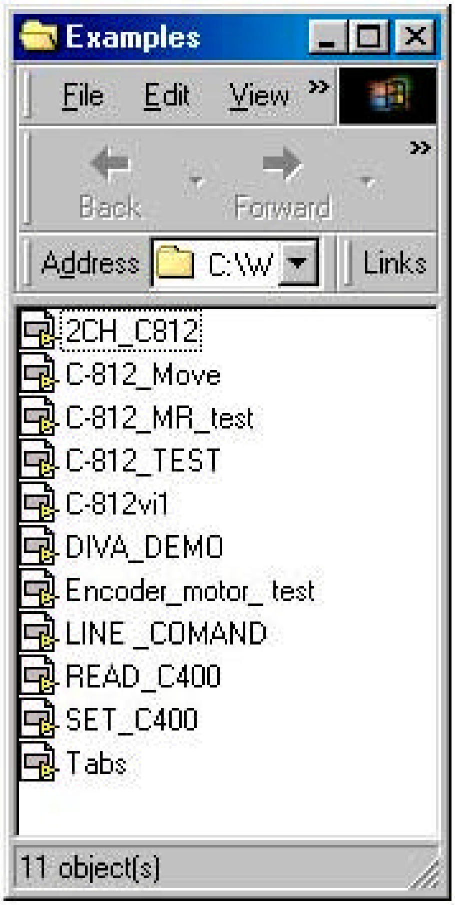


C812Lib202.dll
C-812_FE
C-812_getString
C812_getVal
C-812_GP
C-812_MA
C-812_Motor_ON-OFF
C-812_MR
C-812_RS_global
C-812_sendString
C-812_SV
C-812_TP
C-812_TT
C-812_TV
C-812-Clear_input
C-812RS_close
C-812RS_global
C-812RS_open
MA_C812

19 object(s)

9.2 Example programs

A few example programs are also offered as listed bellow. The 2CH-C812.vi is also shown bellow and please note that only one of the 2 channels has been wired.

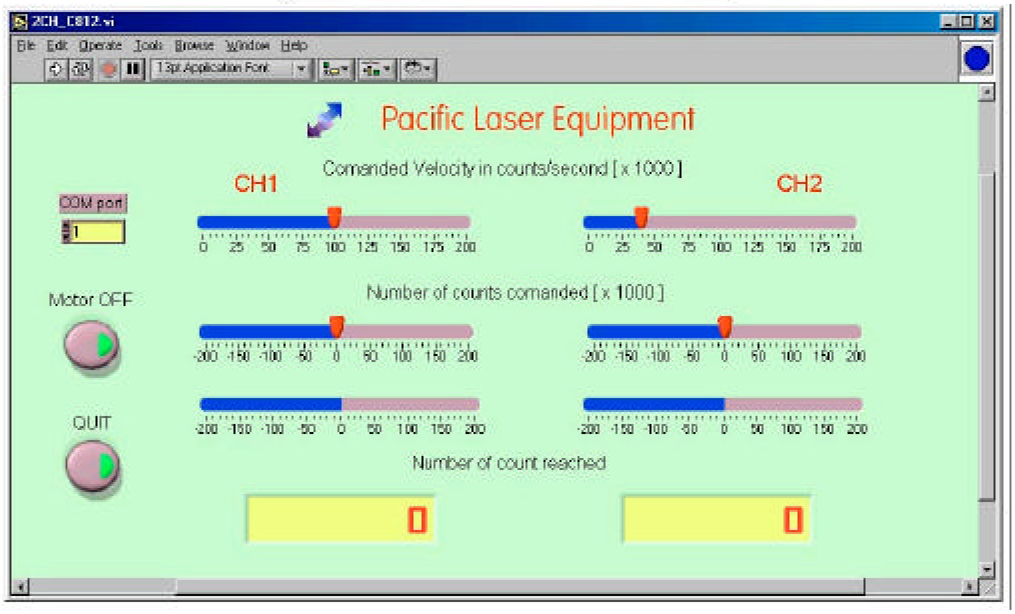


2CH_C812
C-812_Move
C-812_MR_test
C-812_TEST
C-812vi1
DIVA_DEMO
Encoder_motor_ test
LINE _COMAND
READ_C400
SET_C400
Tabs

11 object(s)

CLICK HERE

CLICK HERE

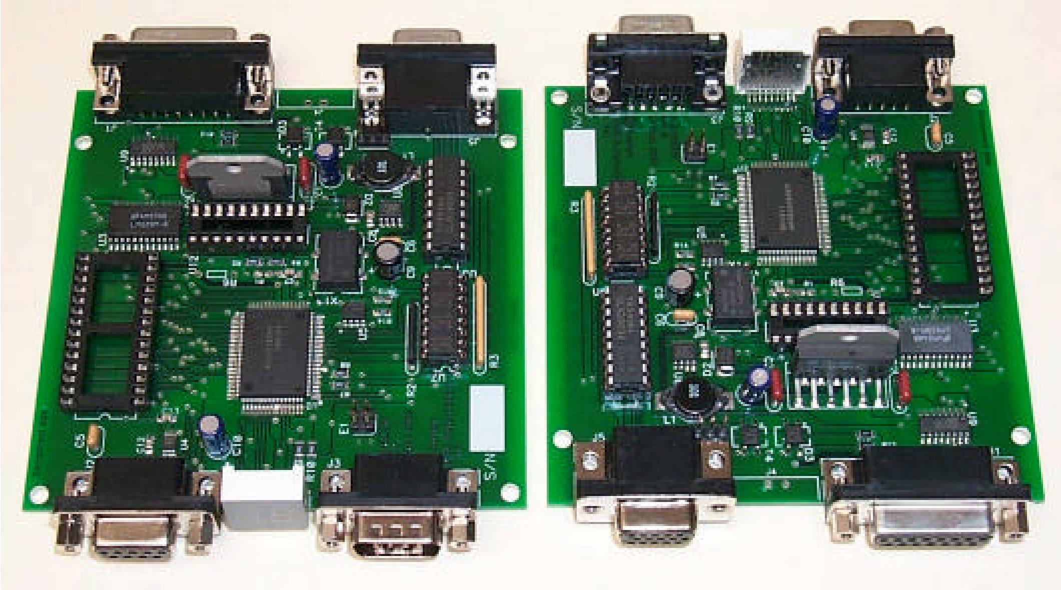


COM port: 1

Number of count reached: 0 0

10. OEM versions

We are offering OEM versions.



For volume buyers custom designs are possible if they make economic sense.

MOTION COMMANDS

AB	Abort motion	Stops the motor
FE	Find edge	Move to reference point
GH	Go home	Moves to the origin
MA	Move absolute	Moves to absolute position
MF	Motor off	No position control
MN	Motor on	Set motor in position control mode
MR	Move relative	Move relative to current position
ST	Stop	Stops the motor

PARAMETER SETUP

BR	Baud rate	Set baud rate
DH	Define home	Define zero position
EF	Echo off	Set echo off
EN	Echo on	Set echo on
IF	I-term oN	Enables Integral Term
IN	I-term ofF	Disables Integral Term
LS	Limit set	Set count number to step back
RT	Reset	Resets the controller
SA	Set acceleration	Set the acceleration rate
SD	Set deceleration	Set the deceleration rate
SE	Set dynamic gain	Sets the dynamic gain
SG	Set gain	Sets the static gain
SO	Set output	Sets output voltage
SP	Set point	Sets the deceleration point
SQ	Set torque	Sets the maximum output voltage
SV	Set velocity	Sets the motor speed

REPORTING

CS	Check sum	Reports the EPROM checksum
TD	Tell deceleration	Reports programmed SD values
TE	Tell following error	Reports the dynamic error
TG	Tell gain	Reports programmed SG values
TI	Tell iteration	Reports iteration count
TL	Tell acceleration	Reports programmed SA values
TM	Tell macros	Reports stored macros
TN	Tell dynamic gain	Reports programmed SE values
TO	Tell output	Reports output voltage command value
TP	Tell position	Reports actual position
TR	Tell deceleration pt.	Reports programmed SP values
TT	Tell target	Reports target position
TV	Tell velocity	Reports actual velocity
TY	Tell commanded velocity	Reports programmed SV values

MACRO & SEQUENCE

EM	Execute macro	Starts macro execution
MC	Macro command	Starts macro execution
MD	Macro definition	Defines a macro command string
RM	Reset macro	Erases macro storage
TM	Tell macro	Reports all listed macro commands
RP	Repeat	Performs a command loop
WA	Wait absolute	Delay next command execution
WS	Wait for stop	Wait for motor stop
WP	Wait for position	Wait until axis reaches specified position
WD	Wait for delta	Wait until axis has moved by the delta amount
WE	Wait for error	Wait until error is < specified value

MISCELLANEOUS

AP	Adjust position	Modifies position in Point storage
CP	Calculate Point	Calculates SP
LN	Limit on	Enables limit switch operation
LF	Limit off	Disables limit switch operation
RS	Reset points	Reset point storage
RG	Reset strings	Clears the string storage
IN	I-term oN	Enables servo loop integral term
IF	I-term ofF	Disables servo loop integral term
HE	Help	Reports all available commands