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User Manual

SERVO**STAR**® Product Series
M-SS-008-0302

Firmware version 1.1.0

MOTIONLINK version 4.4.3

Ignite CD-Lite version 1.0.5



Caution – MOTIONLINK version 4.4.3 only works with Firmware version 1.1.0 and vice versa!

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Record of Manual Revisions

ISSUE NO.	DATE	BRIEF DESCRIPTION OF REVISION	FIRMWARE
01	09/01/2001	Initial release	0.1.2
02	02/02/2003	Second edition updates for new firmware.	1.1.0

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Product Description

The SERVO**STAR**® CD-Lite is a new economic addition to the SERVO**STAR** family. Designed primarily for current loop applications, this amplifier provides high performance with fully digital current and velocity loop control. Digital control brings with it all the advantages of ease of use, eliminating the need adjusting potentiometers. Since the control loop parameters are stored digitally, there is no drift in performance over time. Operating modes enable internal sinusoidal from a ±10 VDC command.

The documentation provided for the SERVO**STAR** CD-Lite includes this document, the *SERVO**STAR**® CD-Lite Quick Start manual*, and the *SERVO**STAR**® CD-Lite Variable and Command Reference*. These are provided to assist you in installation and use of the SERVO**STAR** CD-Lite product.

Product Features

The SERVO**STAR** CD-Lite includes a vast array of features. Its various control techniques, interfaces, and user tools give the customer a fully compatible amplifier to meet most motion control applications. The user features are:

Main Features

- Digital current loop
- Velocity loop mode
- Available in 3, 6, or 10 amp continuous current
- Self protecting power stage
- Encoder feedback
- PWM switching frequency up to 16 kHz
- Supports Danaher Motion Kollmorgen's wide range of motor solutions
- Optional 24 VDC logic input supply, to separate from main supply
- Easy tuning and setup using **MOTIONLINK**® for Windows®
- Easy initialization utilizing a Personality Module.

Robust Design

- Fully isolated electronics
- Fault Protection against output phase to phase short circuit, over-voltage, under-voltage, over-current, over-temperature (motor and drive), feedback loss
- Current foldback (I2t) provides protection against over-heating drive
- Can be optionally used with Danaher Motion Kollmorgen's Regeneration Resistor

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FeedBack Devices

- Incremental Encoder A/B/Z with HED (Hall Effect Device)
- Incremental Encoder A/B with HED (Hall Effect Device)
- HED (Hall Effect Device) sine wave or six step
- Resolver (only w/ Logic power supplied from external 24 VDC)

Amplifier Configuration

- Use **MOTIONLINK**® to configure the amplifier
- Use the Personality Module to quickly and easily configure additional amplifiers

MOTIONLINK Software Environment

- **MOTIONLINK** version from 4.3
- Easy setup, commanding, and monitoring techniques
- Setup wizard to assist users in fast, easy setup
- Contains an extensive database for many of Kollmorgen's motor series
- A Backup screen that provides automatic loading of system parameters
- Realtime measuring of many system parameters
- Status screen indicating system operation and fault/error checking
- Extensive On-line Help file (F1) designed to assist the user in **MOTIONLINK**'s intuitive nature
- A set of limit folders allowing you to manipulate the, velocity, current, and filtering limits from one screen
- An Input/Output (I/O) screen for easy manipulation of the I/O, thermostat options, encoder output, and hardware position limits capabilities
- A Feedback Device screen that provides realtime pictorial positioning information. It also includes a Resolver Zeroing routine and an encoder initialization screen
- A Control Loop screen that provides direct manipulation of velocity loop gain parameters

Monitoring and Troubleshooting Tools

- Control loop monitoring via terminal
  - Current/torque (I, IA, IC,ICMD, IMAX, ICONT, DICONT, DIPEAK)
  - Speed (V, VCMD, VE)
- Dual-state digital output (O1, can be used to communicate occurrences of foldback)
- Software status switch indicator provided for Configurable Inputs IN
- Analog output to monitor Current/Velocity (V,VE,I,ICMD)

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Fault and Safety Detection

- Watchdog faults
- Speed and current protection (VOSPD, VLIM, ILIM)
- Fatal and non-fatal error coding with text explanation to the host (FLTHIST, FLTCLR). Also includes a run-time counter (TRUN) that records the time the error occurred
- Configurable drive thermal protection through the foldback feature (FOLD, FOLDMODE). It sets the maximum time limit the drive can provide peak current (3:1) to the motor
- Hardware position limit switch detection (INx, where x is 1 or 2)
- Configurable fault relay output (RELAY, RELAYMODE)
- Active enable indicator through the Status Display decimal (ACTIVE, DRIVEOK, SWEN, READY, REMOTE)

General

- Many enabling and disabling features (K, REMOTE, EN, DIS)
- Flash firmware memory for easy field upgrade installation
- Danaher Motion Kollmorgen's patented "Torque Angle Control" for buried magnet motor designs (MTANGLC, MTANGLP, MVANGLF, MVANGLH - defined as speed and torque optimization through commutation angle advancing of the drive's output current waveform with respect to the motor's back EMF waveform
- Firmware and serial number information (VER, MOTOR) via terminal

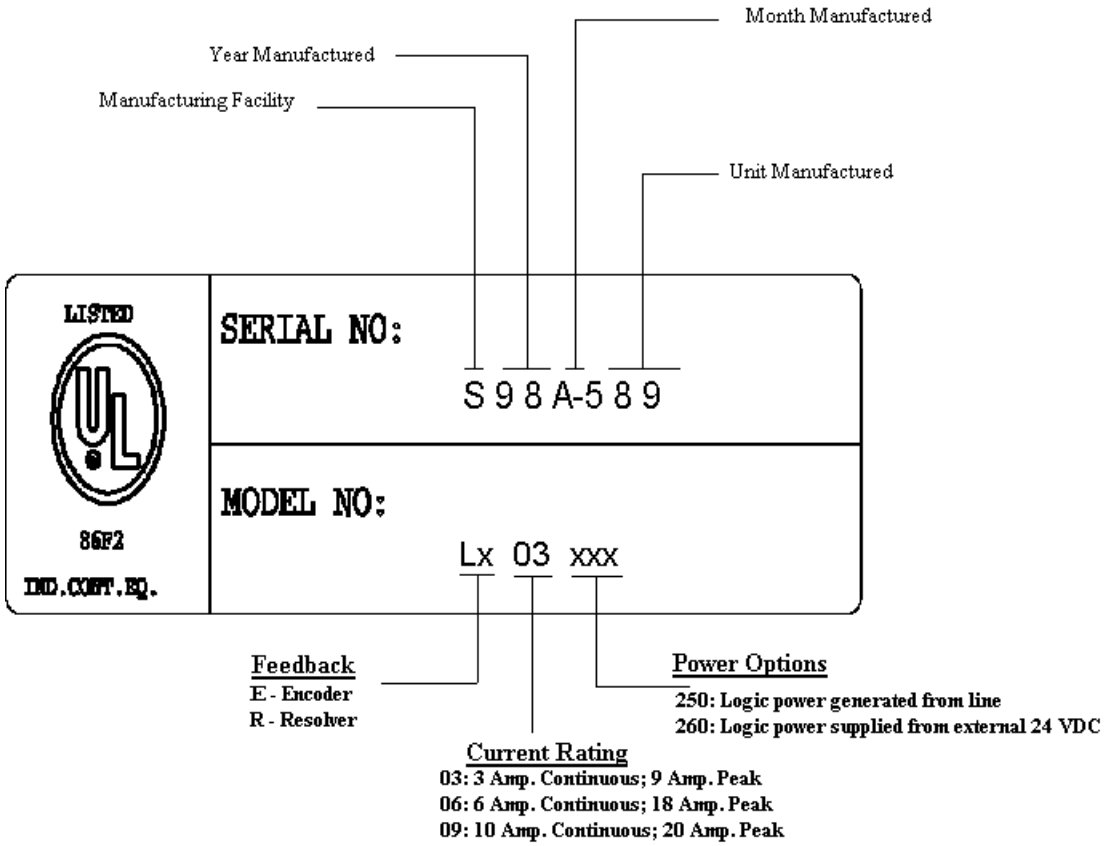
CD-Lite versus CD

- Power board Logic power generated from line (SERVO**STAR** CD without Top switch)
- Power board Logic power supplied from external 24 VDC. (Same as SERVO**STAR** CD.)
- Digital board : Current Card Board (CCB) instead of UCB
- C1 – Serial Communication is RS-232 only (support for personality module)
- C2 – Feedback: Incremental Encoder A/B/Z/Hall, A/B/Hall, Halls only sine wave or SIX step, Resolver (only w/ Logic power supplied from external 24 VDC)
- C3 – Analog input, fault output, I/O, Analog output.
- C4 - Same as SERVO**STAR** CD
- C7 – Not available
- C8 - Not available
- Configuration (DIP) switch settings: CD-LITE defines the RS-232 baud rate, hold switch, drive enable and disable (EN/DIS), and changes to Ember Mode
- **MOTIONLINK** (Same as SERVO**STAR** CD except to Record application)

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Part Number Description

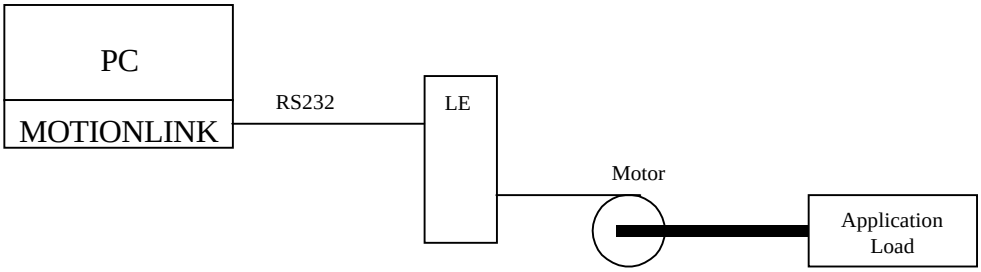
The SERVO**STAR** CD-Lite serial and model numbers are:



Resolver configuration could be ordered only with Logic power supplied from external 24 VDC.

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System Startup



For system startup you need a PC with **MOTIONLINK** for windows, LE- CD-LITE drive brush less motor, and your application connected to the motor. With **MOTIONLINK**, you can initialize and configure you drive to your application. After that, you will connect the drive to your servo controller. You can communicate with the SERVO**STAR** CD-Lite through the serial port.

Since **MOTIONLINK** is designed to guide you through the operation process of the drive, the **MOTIONLINK** discussion in this section covers only general steps of use. A “dumb terminal” can also be used to communicate to the drive. You may find this method of communication very awkward until a certain level of familiarity with the drive’s operation is achieved. **MOTIONLINK** also provides a terminal emulation feature that contains many useful editing tools for this type of communication.

Computer Requirements

MOTIONLINK requires an IBM-PC or compatible computer with the following features:

- IBM-compatible, Pentium or higher computer.
- 16 M RAM.
- Windows 95, Windows98, WindowsNT 4.0 with Service Pack 3, Windows 2000.
- CD-ROM player.
- Standard Video Adapter (CGA, MDA, EGA, MCGA, VGA, or SVGA).
- Serial Port (for communication link with SERVO**STAR** CD-Lite). The serial communications port may be COM1, COM2, COM3, or COM4. COM1 is the normal configuration:

  COM1: Address 3F8h, Interrupt Request #4
  COM2: Address 2F8h, Interrupt Request #3
  COM3: Address 3E8h, Interrupt Request #4
  COM4: Address 2E8h, Interrupt Request #3

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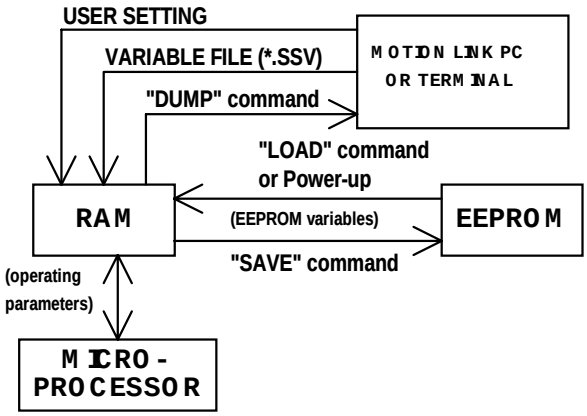
RS-232A Protocol Settings

- Baud rate 9600 or 19200*
- Data bits 8
- No parity
- Stop bit 1

*DIP switch 6 determines the serial communication baud rate for either 9600 BPS or 19200 BPS.

Communication

The following chart shows the flow of data between the PC and the SERVO**STAR** CD-Lite. When logic power is applied to the drive, it loads the variable parameters stored in EEPROM into the dynamic RAM for fast and easy access. You can read (and write) these variable parameters to (and from) the PC by one of several methods described in the INITIAL **STAR**TUP section below.



Memory Flow Chart

The PC transmits serial data to the drive and stores it in dynamic RAM. However, any variable data changed from the PC is lost when logic power is lost, if it is not saved into non-volatile EEPROM. If you configure the same system on similar applications, the variables can be saved on disk in an .SSV file for convenient downloading into other drives.

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Installing MOTIONLINK

- Insert the CD-ROM to load **MOTIONLINK** for Windows.
- The CD-ROM should AUTORUN. If not, select Start | Run (or browse your CD-ROM drive).
- Type "D:AUTORUN.EXE" and press the Enter key (this assumes your CD player has a D: letter designation).
- Select a product and follow the instructions on the screen.

To run the program, go to your Start/Programs listing and select SERVO**STAR MOTIONLINK** from the menu (or click on the SERVO**STAR MOTIONLINK** icon if loaded on the desktop).

Using MOTIONLINK

MOTIONLINK gives you three methods to configure the drive. The first uses a Startup Wizard and is the easiest and most highly recommended approach. Its main purpose is for initial startups. The second approach allows you to more indirectly perform the same configuration as the first using the Main **MOTIONLINK** screen. This method is most convenient when corrections to an existing configuration are required. The third method uses the Terminal Mode screen to directly set (or monitor) values for the same variables and commands that the other two methods configure through a more friendly user interface. You can gain a more thorough understanding of the SERVO**STAR** drive, **MOTIONLINK**, and its variable and command set by using the context-sensitive Help (F1) provided in **MOTIONLINK**. When you begin, the first screen you see is:

Startup Wizard

This screen appears the first time (and any time after should you choice not to deselect it) **MOTIONLINK** is run on a PC. It is designed to guide you through a step-by-step approach to configure a drive. Click the "START" button on the first user screen and walk through the complete sequence of buttons provided to set the drive, motor, and application (Opmode, Tune, Backup, Go) variable parameters.



Should you de-activate this screen, it can be reactivated by going to the Main** MOTIONLINK **screen, pulling down the Configuration menu, and selecting the New Drive (123) option.

Setting Drive Variable Parameters: Click the Drive button. This screen allows you to select a BUS value that corresponds to the incoming line voltage. This selection actually determines the setting of the variable VBUS. Also included is a realtime monitoring of the DIP switch on top of the drive so you can verify the proper setting for the drive address, baud rate, and various other parameters. Click Exit to return to the Startup Wizard screen.

Setting Motor Variable Parameters: Click the Motor button. This screen allows you to access the **MOTIONLINK** motor database. Select a motor family and then a model within that family. Information will appear in the blank parameter fields on the right. Click on the "To Drive" button beneath the fields to send the variable parameters to the drive. Click "Exit" to return to the StartupWizard screen.



For you that has a configured drive, a "From Drive" button is provided to retrieve the motor data already in the drive. Retrieving this data will not erase it from the drive.

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If the motor cannot be found in the database, click on you Define tab. Contact Danaher Motion Customer Support for detailed instructions.

Customizing to Application: Click the "Opmode" button in the Startup Wizard screen to select the mode of loop control desired; velocity, or torque. Click Exit to return to the Startup Wizard screen.

Click on the Tune button in the Startup Wizard screen to set the system bandwidth, the type of loop control, and the filtering necessary for the application.



Caution should be used when executing the AutoTune feature. Some applications are not capable of handling the vibration caused as the shaft senses its load. If this is in question, manually tune the drive. Also, when the load inertia is very large and the selected bandwidth is high, this feature may fail to perform.

Setup Complete: Click EXIT to go to the Main **MOTIONLINK** screen.

For explanation on these functions, refer to the Main **MOTIONLINK** screen.

Saving Variables Parameters to EEPROM
Saving Variables Parameters to .SSV file
Restoring Factory Variable Parameters
Restoring Custom Variable Parameters

Main MOTIONLINK Screen

This screen appears the when you exit out of the **MOTIONLINK** Startup Wizard screen. All the screens mentioned in the method above can be accessed from this screen and should be used to make corrections in the current system configuration.

Setting Drive Variable Parameters: From the Configure menu, click the Drive option. The same screen appears as described in the Startup Wizard screen section. Click Exit to return to Main **MOTIONLINK** screen.

Setting Motor Variable Parameters: Selecting the Motor option under the Configure menu, you can obtain the same parameter screen found in the Startup Wizard screen. Click Exit to return to Main **MOTIONLINK** screen.

Customizing to Application: By dropping down the Operational Mode listing, you can select the mode of loop control desired (velocity, torque). Clicking the "Tune" button, you can select the system bandwidth, the type of loop control, and the filtering necessary for the application. These are the same parameter screens found in the Startup Wizard screen. Click Exit to return to Main **MOTIONLINK** Screen.

Saving Variable Parameters to EEPROM: At the top of this screen, you can click the button labeled "RAM/E^2 " to save the modified variables from RAM to EEPROM.

Saving Variable Parameters to .SSV file: Occasionally, you may desire to backup the variable parameters from one drive for use in another. To do this, you must pull down the Edit menu and select Backup Variables, request the information from the drive ("Receive" button) into the editor, and save ("Save" button) the contents in a .SSV format to a specified disk location.

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Restoring Factory Variable Parameters: To restore the original factory variable parameters, pull down the Configure menu, select Motor, and select the motor family and motor model. Click the "To Drive" button to send the variable parameters to RAM and the "RAM/E^2 SAVE" button to save to EEPROM.

Restoring Custom Variable Parameters: This process assumes that you saved the custom variable parameters to a .SSV file, as described above. To restore the custom parameters, pull down the Edit menu, select Backup Variables, and click on "Open". Highlight the custom .SSV file to import variable parameters into editor. Click "Xmit" to send variable parameters to drive.

Terminal Mode

Use the **MOTIONLINK** Terminal Mode (or any other "dumb" host) to directly monitor or modify the variable set and command the drive. This approach should only be taken when a PC with a Windows operating system is not available and/or you are well-versed with the variable and command set.

Each variable and command are referenced for its syntax and parameter definition. The variables and commands are grouped alphabetically for easy look-up and are found at the end of this manual. Be sure you review this information before you begin.

Initial Startup

Most drives are shipped from the factory already configured for a particular motor. You can verify this by applying logic power and monitoring the Status Display. A factory-configured drive goes through a power-up sequence flashing all segments of the display before settling out to a number indicating the mode of operation. If the drive is not configured with a particular motor, the display will flash a minus sign "-", indicating that you must enter drive, motor, and application variable parameters. The remainder of this section describes the process of setting up a non-configured drive.



Caution must be taken when applying power to the drive. It is factory-configured to enable upon application of power. Verify that the hardware Remote Enable (REMOTE) enable switch is disabled.

Upon powering up, the SERVO**STAR** performs a series of self-tests. If the Status Display illuminates a solid number, then no errors were found and the EEPROM has loaded its variable parameters (or loaded with default values in case of invalid EEPROM data) into RAM. The Remote Enable switch on the I/O connector (C3) may now be energized, thus enabling the servo loops.

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Enabling the System



24 volts must be present at the C3 enable input to get power to the motor.

The drive enable logic is based on the following variable switches and flags:

ACTIVE: This is the overall readiness flag indicating the enable/disable state of the drive. If high (1), the drive is enabled and power is being applied to motor. The following equation must hold true for ACTIVE to go high: **ACTIVE** = **(READY**) AND (**REMOTE**) *where* **READY** = (**DRIVEOK**) AND (**SWEN**)

READY: Flag that indicates the drive is free of faults and ready to hardware enable.

DRIVEOK: Switch indicates the status of the drive faults.

SWEN: Switch indicates the status of the software enable (EN or DIS).

REMOTE: Switch indicates the status of the hardware Remote Enable line on the C3 connector.

Ready Flag		
DRIVEOK (fault status)	**SWEN (software enable)**	**READY (drive ready)**
0 (fault exists)	0 (disable)	0
0 (fault exists)	1 (enable)	0
1 (no faults)	0 (disable)	0
1 (no faults)	1 (enable)	1

Active Flag		
READY (drive ready)	**REMOTE (hardware enable)**	**ACTIVE (power to the motor)**
0	X	0 (no)
X	0	0 (no)
1	1	1 (yes)

If the drive will not enable, check the state of the switches and flags by clicking the “Status” button in the upper right-hand corner of the Main **MOTIONLINK** screen. If using a terminal, you can query the drive for the value stored in the STATUS variable. The Status Display indicates an enabled drive when the decimal point is illuminated solid.

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Feedback

The SERVO**STAR** provides a motor position output to you in the form of quadrature encoder signals eliminating the need for an additional position feedback device. The outputs are differential line drivers. There is an associated DC common output (C4: pin 3) which can connect to your port to keep common mode noise and voltage spikes minimized for device protection. Because there are normally differences of potential between your controller and the drive, connection is recommended (if ground loops occur, disconnect and retest).

The source of the Encoder Equivalent Output (EEO) signals depends on the type of motor feedback device:

This section describes the various feedback types and how they function beginning with firmware version 0.1.8.

Type	MENCTYPE	Comments
Incremental A/B/Z/Halls	0	
Incremental A/B/H	6	
Resolver	NA	
Halls only w/ sinus commutation	5	Defined in **MOTIONLINK**
Hall only w/ six step commutation	10	Defined by setting DIP switch 2 to ON

Incremental Encoder

The output signal is the actual encoder feedback signal that is pre-configured (MENCRES) in the drive's motor parameters. It can be scaled down by multiples of two (ENCOUTO: 1, 2, 4, 8, 16) and has a maximum frequency limit of 3 MHz.

The SERVO**STAR** can use encoder feedback to monitor the motor shaft position. As opposed to a resolver, which is an absolute position feedback device, the encoder is an incremental device that indicates changes in position. The encoder resolution of the SERVO**STAR** (and therefore the drive's encoder equivalent output) is fixed because it is a hardware characteristic of the encoder device. The encoder interface includes three groups of wires:

1. A/B (and complements) lines make up the encoder quadrature signals. The signals are received differentially through line receivers before being passed through a wire-break detection circuit.
2. The narrow Index pulse normally appears once per revolution and indicates a known physical position of the shaft. This pulse is received differentially through a line receiver before being passed through a wire-break detection circuit. This signal is hardware-capturable.
3. Hall signals provide information representing the approximate absolute location of the motor shaft. From this information, the motor can sinusoidally commutate forward until the index signal is detected - at which time, true position is known. These signals are isolated by an opto-coupler and can be differential or open-collector type signals.

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Specifications

Encoder Requirements	
Required Signals	Types: A, B with or without Index pulse A, B, Index with or without Hall Channels * Halls may be integral or discrete
Signal Type: A-quad-B and Marker Halls	Differential: do not connect single-ended Differential or Open Collector
System Voltage	5 VDC
Maximum Input Frequency	From encoder: 3 MHz (before quad), 12 MHz (after quad)
Maximum Cable Length	System Dependent: 50 ft. (15 m) Recommended
Maximum Line Count Per Motor Electrical Cycle	10,000,000
Maximum Supply Current from SERVO**STAR**	250 mA
Protection	Separate Voltage Regulator, Broken wire detector for A, B, Index, and Hall channels, Illegal Hall Code Detection

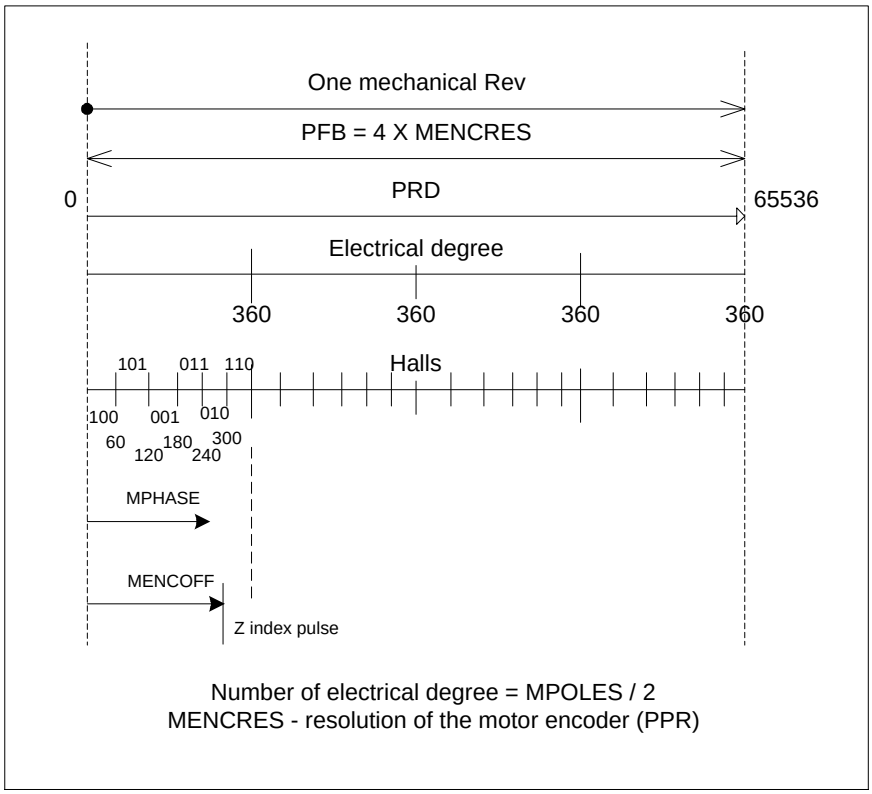
Cable Lengths

The recommended cable length when using the SERVO**STAR** to source the encoder is no longer than 50 ft. (15 m). Long encoder cables tend to have high DC resistance that may create significant loading effects in the supply lines to the encoder. Please consider this carefully when designing the system. An option that would allow the use of longer lengths, implements a separate supply located at the motor to source the encoder. Quadrature signals returned to the drive are differentially connected which normally do not constitute a problem with longer cable lengths.

Resolution and Accuracy

A SERVO**STAR** encoder-based system typically exhibits minimal inaccuracies outside of the encoder itself. To get an approximate total value the customer need only look to the specifications listed for the encoder being used.

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Incremental Encoder

A/B/Z/Halls

- The Drive according to the hall section start commutates.
- The Drive set the electrical angle after first hall switch.
- The Drive re-set the electrical angle after first Index pulse switch.
- From now on the Drive calculates the electrical angle according to A/B counter.

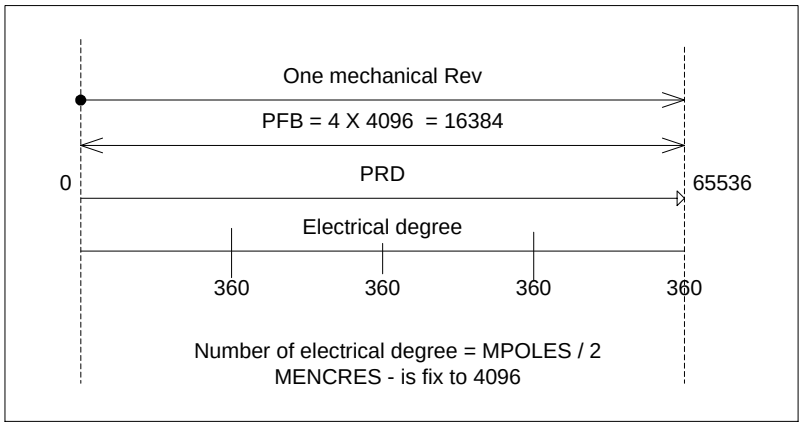
A/B/Halls

- The Drive according to the hall section start commutates.
- The Drive set the electrical angle after first hall switch.
- From now on the Drive calculates the electrical angle according to A/B counter.

Resolver

The SERVO**STAR** uses either single (two poles) or multi-speed (multiple poles) resolver feedback to monitor the motor shaft position. A resolver can be thought of as a transformer whose output is unique for any given shaft position (an absolute position feedback). The transformer is driven with a sinewave reference signal. Two AC signals are returned from the resolver into the Sine and Cosine inputs. All three of these sinewave signals are low-level and susceptible to noise.

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Resolver feed back

The Drive obtains its absolute position from the ATAN of the sin and cos of the Resolver.

Specifications

Resolver Requirements	
Type	Control Transmitter
Transformation Ratio	0.47
Modulation Frequency	7-8 kHz
Input Voltage (From Drive)	4.25 VAC
Max DC Resistance	120 Ohms (stator)
Max Drive Current	55mA AC-RMS
Output Voltage (To Drive)	2 VAC

Cable Lengths

It is important to use properly- shielded cable and to keep it away from other noise-radiating devices and cables. It is not recommended to run the feedback and motor cables in the same conduit. Danaher Motion Kollmorgen has tested cable lengths up to 75 ft. (22.9 m). without degradation of performance. However, performance may vary, depending on motor and resolver type. Tests were performed with standard Danaher Motion Kollmorgen cable and its low-impedance and Danaher Motion Kollmorgen **GOLD**LINE motor resolver. Please consult the factory for cable and resolver impedance specifications when long cable runs above 250 ft. (76 m) are desired. Danaher Motion Kollmorgen recommends twisted-shielded pair for feedback cables.

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Resolution and Accuracy

The SERVO**STAR** calculates motor velocity as the derivative of position (change in position over time). With its patented technique, all readings are extended to a resolution of 16-bit. For velocity feedback calculations, the drive converts the resolver input to 18-bits of resolution, giving smooth motor velocity control. The digital resolution (RDRES) of the Resolver-to-Digital Converter system is determined automatically according to the application velocity limit (VLIM). The following is a summary of the SERVO**STAR**'s resolution capabilities:

VLIM (RPM)	RDRES	Counts/Rev	Encoder Eqv. Output (C4)
> 6100	12	4096	4096 quad counts
1500 to 6100	14	16384	16384 quad counts
< 1500	16	65536	65536 quad counts

R/D Converter Specifications

System accuracy using resolver feedback is effected by several components. The following table gives information on the inaccuracy that each of these components contribute to the total accuracy of a standard SERVO**STAR** system:

Components	**ArcMinutes**
R/D Converter	4
Resolver mechanics (rotational)	8
Resolver mounting on motor shaft	2
Inter-LSB (digital dither over the least significant bit)	5
Total (Worse-case)	**19**

Resolver Accuracy Specifications

Halls Only

Halls only with sinus commutation

According to halls, the drive creates the sine wave for the commutation, which is updated every halls switch.

Hall only with six step commutation.

Electrical Degree	HA HB HC	Current from phase to phase for clockwise direction	Disconnect Phase
0-60	100	A to B	C
60-120	101	C to B	A
120-180	001	C to A	B
180-240	011	B to A	C
240-300	010	B to C	A
300-360	110	A to C	B

Encoder Equivalent Output

The SERVO**STAR** provides a motor position output to you in the form of quadrature encoder signals eliminating the need for an additional position feedback device. The outputs are differential line drivers. There is an associated DC common output (C4: pin 3) which can connect to your port to keep common mode noise and voltage spikes minimized for device protection. Because there are normally differences of potential between your controller and the drive, connection is recommended (if ground loops occur, disconnect and retest).

The source of the Encoder Equivalent Output (EEO) signals depends on the type of motor feedback device:

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Resolver Systems

The output signal is developed through the R/D hardware circuitry for minimal phase lag and has a maximum frequency determined by the motor speed and R/D limits. It provides a configurable (ENCOUT) resolution of up to 16384 lines (65536 quad counts) per revolution of the motor shaft. The placement of the index pulse (INDEXPOS) can be varied on resolver systems within 360 electrical degrees of the feedback signal. For single-speed resolvers, this means you can vary the position of this signal over one mechanical revolution. For multi-speed resolvers, the mechanical position variation is determined by the pole-pair count of the resolver (e.g. three-speed resolver gives mechanical variation of the pulse within 1/3 of a revolution).

Encoder Systems

The output signal is the actual encoder feedback signal that is pre-configured (MENCRES) in the drive's motor parameters. It can be scaled down by multiples of two (ENCOUTO: 1, 2, 4, 8, 16) and has a maximum frequency limit of 3 MHz.

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System Operation

The SERVO**STAR** CD-Lite has a seven-segment indicator (Status Display) that indicates four types of states:

Power-up
Steady State
Flashing State
Momentary State

The decimal point directly relates to the global drive enable.

Status Display	
Drive State	**Display Appearance**
Power-up	Momentarily illuminates all display segments (forming an 8) and the decimal point.
Steady State (No Faults)	Displays the operational mode (OPMODE) of the drive (1 or 3). OPMODE 1 is Velocity mode (PDFF velocity controller). OPMODE 3 is Current mode (Current loop parameters).
Flashing State	Used to indicate an abnormal operating state: If the position hold feature is active, the OPMODE number will flash at a 1 Hz rate. If a fault was detected, a flashing code will be displayed to identify the fault. Some codes consist of a sequence of two or more digits (see Troubleshooting section). In general, these faults will cause a latched disable (sometimes controllable through software switches). To clear fault, toggle remote enable (except for OverCurrent). If the encoder initialization function (ENCSTART) is active, the OPMODE number will flash at a 3 Hz rate.
Momentary Fault	Displays a character momentarily for 500 ms before returning to the steady state. You can reset the timer. C = Communications Error F = Drive is in FoldBack mode

Status Display Decimal Point	
Decimal Point State	**Drive Status**
Steady OFF	No power to the motor
Steady ON	Drive enabled, power to the motor
Flashing	Drive enabled, power to the motor, but a motor safety feature has been disabled (for example, LIMDIS = 1).

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Operational Modes

The SERVO**STAR** CD-Lite has the ability to assume different modes of operation. It is factory configured in OPMODE=1 (Analog Velocity Controller) but may be reconfigured by the user. Not all commands and variables are active or meaningful in every OPMODE.

OPMODE = 1 **Analog Velocity Controller**. The SERVO**STAR** CD-Lite is configured as a velocity-loop controller and is controlled via a ± 10V analog input signal. The commanded velocity is proportional to the input voltage.

OPMODE = 3 **Analog Torque (Current) Controller**. The SERVO**STAR** CD-Lite is configured as a torque-loop controller and is controlled via a ± 10 V analog input signal. The commanded current is proportional to the input voltage.

System I/O

This section discussions the I/O features of the C3 connector (except for the Thermostat input on C2 see appendix). Electrical specifications are in the Quick Start Guide.

Analog Input (ANIN1)

The velocity or torque loop can receive its command from an analog voltage source and is selectable through the OPMODE variable. The analog input to the SERVO**STAR** CD-Lite is differential. This means that the signals received at the two inputs are subtracted from each other to create a 'difference,' that is used to command the rest of the system. This type of input has a high degree of noise immunity and, in many cases, will allow for ground isolation between systems. This analog input also has a low pass filter (ANLPFHZ) to prevent high frequency noise from entering the system.

The input voltage from the differential receiver is applied to a precise 12-bit Analog-to-Digital (A/D) conversion system. The A/D conversion system is read by the microprocessor, 250µs for the velocity loop mode, and every 62.5µs for the torque (current) loop mode of operation. Encoder-based units have the additional benefit of a Dual Gain (ANDG) input. When enabled, the system uses two 14-bit A/D inputs to read the user-supplied analog signal. One input is a direct reading of the ± 10V signal, while the other incorporates a 2x gain term. When the input voltage is less than 4V, the 2x channel is used to determine the user's input voltage. This extends the resolution to a 15-bit equivalent. Above 4V, the system uses the straight 14-bit conversion. Special software algorithms are used to minimize cross-over distortion and add 0.25 V hysterisis.

Analog systems often require scaling and offset bias. The SERVO**STAR** CD-Lite adds an analog offset (ANOFF1) variable to this reading, performs an analog deadband (ANDB) adjustment, and scales it through velocity loop input scaling (VSCALE), or torque loop input scaling (ISCALE) before passing the data to the selected control loop. The analog input (ANIN1) variable indicates the analog reading after the offset (ANOFF1) and the deadband (ANDB) adjustments, but before the loop scaling. The ANIN1 variable range is ± 22500 counts (or mV).

The SERVO**STAR** CD-Lite also has an automatic analog input zeroing function. Invoking the ANZERO command while the drive is enabled or disabled samples motor velocity over a 32 ms period and updates ANOFF1 accordingly to cancel out analog input offset. This command uses an internal offset mechanism that has finer resolution than ANOFF1 is capable of providing.

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Remote Enable Input (REMOTE)

The opto-isolated Remote Enable input (REMOTE) provides a hardware drive enable switch. This 12-24 VDC input disables or enables the power stage output to the motor. The signal must be customer-supplied to get the drive to enable (in combination with other parameters; ACTIVE) and operate. Tapping the signal off the logic supply (C5) is not recommended. The toggling of this switch also initiates an attempt to recover from a fault condition.

Fault Output Relay (RELAY, RELAYMODE)

The SERVO**STAR** CD-Lite provides a drive ready/drive up output in the form of a relay (RELAY) output. The relay (RELAY) output is controlled by the SERVO**STAR** CD-Lite's microprocessor. There is a software switch (RELAYMODE) that configures the relay (RELAY) output to act as a 'Drive Ready' or 'Drive Up' indicator:

If **RELAYMODE = 0**, the relay is closed when the drive is error free and ready to run. This is a 'Drive Ready' configuration.

If **RELAYMODE = 1**, the relay is closed only when the drive is enabled. This is a 'Drive Up' configuration (ACTIVE equals 1).

If **RELAYMODE = 2** is not avalible with CD-LITE.

If **RELAYMODE = 3**, the relay is open when no faults are latch and closed when the drive detects a fault.

Limit switches

The SERVO**STAR** CD-Lite provides two limit switches only in Velocity mode, one for CW direction of the shaft and one for CCW direction of the shaft. To enable limit switch mode LIMIDIS should be zero.

Operational mode for both sides

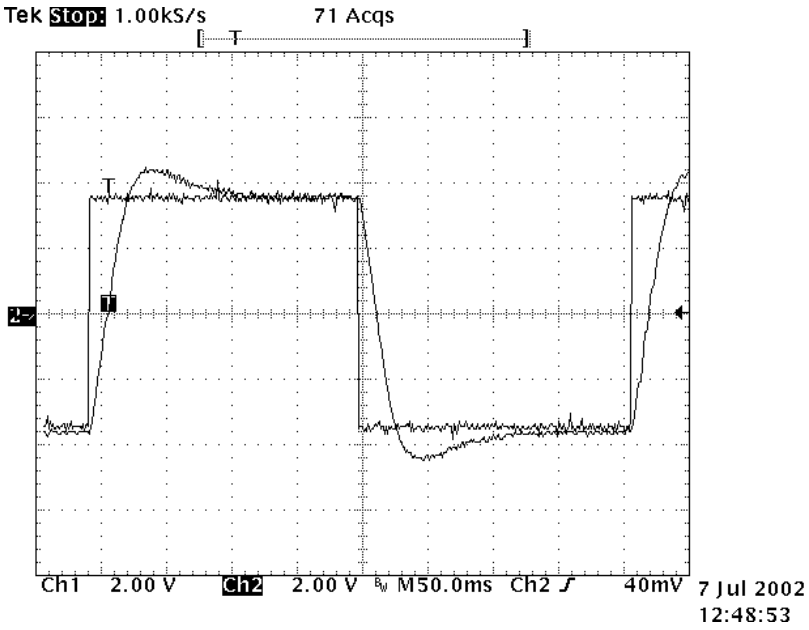
	Type	**Operational mode for both sides**	**Motor rotate CW**	**Motor rotate CCW**
CWLIM	(R)	0	1	0
CCWLIM	(R)	0	0	1
IN (IN 123)	(R)	110	010	100
CW Switch	H/W	Close	Open	Close
CCW Switch	H/W	Close	Close	Open
7 Segment display	H/W	X	L1	L2
Drive status		X	Disable	Disable

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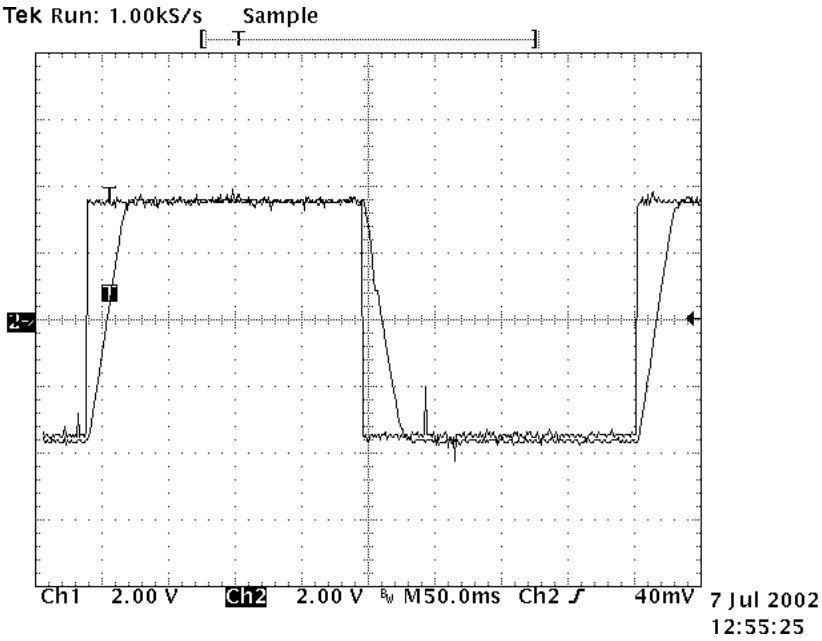
Configurable Analog output (ANOUT)

The ±10 V, 8-bit analog output (ANOUT) is used as a monitoring tool only. The setting of this variable allows you to measure the Velocity, velocity error, current command and current feedback. This enables you to tune the CD-LITE. This pin must be referenced to DC common (pin 4)

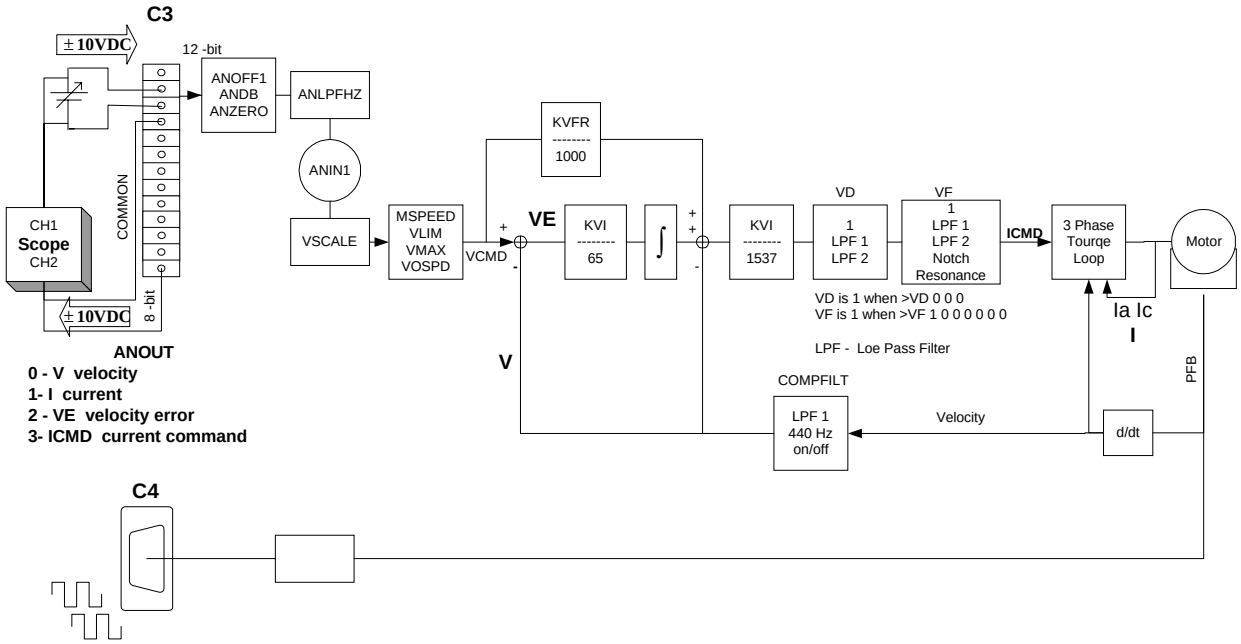
Example using ANOUT and scope.
Before tuning:
CH1 – PIN 2 and 3 of C3 ACMD +-350 rpm 200 ms
CH2 - PIN 13 and 4 of C3 ANOUT= 0 (V)



After tuning



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Digital Output

The digital output is a fix output where is ON during regular operation and of when the drive goes into Foldback mode in both operational mode velocity and torque.

Control Loops

This section describes the servo control loops, their characteristics, and how to configure them.

Core Processors

A 40 MHz embedded Controller and a 40 MHz DSP controller are the heart of the SERVO**STAR** CD-Lite. They use its internal operating system to monitor inputs, adjust outputs, communicate serially, maintain servo control, and monitor faults. The flash memory firmware that controls the core processor and gives the SERVO**STAR** CD-Lite its operating characteristics is saved in EPROM. The version number of the firmware can be read using the VER command.

When calling Danaher Motion Customer Support, be sure to have the firmware version number readily available. The most recent version of firmware is available for purchase and is easily field-upgradable through a PC. It can be obtained by contacting a Danaher Motion sales representative or by contacting the Danaher Motion Customer Support.

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Servo Loop Description

The SERVO**STAR** CD-Lite provides high-performance motor control by controlling up to three distinct closed loop systems within the DSP: the current, commutation, velocity.

Current Loop

Since current and torque are proportional in a Permanent Magnet (PM) motor, the current loop is often referred to as the torque loop. The function of the current loop is to regulate motor current as directed by a current command signal. The current command signal from the microprocessor can either come from a direct user input (OPMODE 3) or from the output of the velocity loop. There are actually three current loops, one for each motor phase. Each current loop receives its own command input from the commutation loop.

The SERVO**STAR** CD-Lite uses a fully digital, pole placement current loop with high bandwidth and a current loop sampling rate of 16 kHz (62.5 µs). All coefficients of the current loop are digitally calculated inside the drive for a given set of motor and drive characteristics. The current loop also includes adaptive gain terms to compensate for some non-linear effects.

The current loop incorporates electrical isolation for protection from the high-voltage BUS. These current loops also convert the output voltage to a Pulse Width Modulated (PWM) signal providing the highest efficiency possible. The PWM center frequency can be 8 or 16 kHz according to the drive size.

Commutation Loop

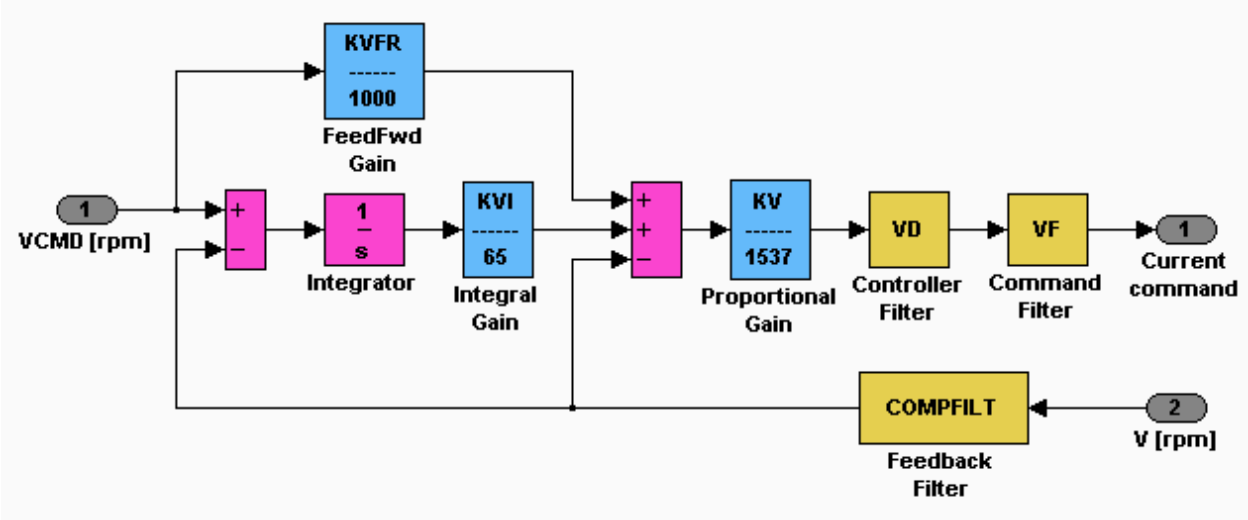
This loop converts a single-phase current command signal into a three-phase, position-modulated sine wave input to the current loops. The SERVO**STAR** CD-Lite has a patented sinusoidal wave form generator that uses a technique called Torque Angle Advance to get top performance out of its motors. The waveform generator is part of the microprocessor and is updated at a 16 kHz rate. This provides hi-fidelity sinewave commutation at both low and high velocities. The sinewave output must be aligned to the back EMF characteristics of the motor. This is why resolver or encoder alignment to the motor is critical.

Velocity Loop

The purpose of the velocity loop is to regulate motor speed. Like the current and the commutation loops, the velocity loop is fully digital and uses the resolver or the encoder feedback signals to calculate actual motor velocity. The command for the velocity loop can come from a direct user input (OPMODE=1). The velocity loop is a digital sampling system operating at 4 kHz.

The difference between actual and desired velocity is filtered through a compensator algorithm and fed to the commutation loop. The SERVO**STAR** CD-Lite Pseudo-Derivative-Feedback with Feed-Forward (PDFF).

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Torque Loop

Most applications use the SERVO**STAR** CD-Lite in torque mode configuration. The SERVO**STAR** CD-Lite has many internal variables that can be used to examine and dictate system operation. Many of these variables and their locations in **MOTIONLINK** are presented graphically in the following discussions to help disclose meanings and relationships.

Analog Torque

The SERVO**STAR** CD-Lite is most often configured to operate as an analog torque loop controller (OPMODE=3). In this case, the current loop receives its input from the analog-to-digital (A/D) conversion system. After conversion, the input command signal is processed through an algorithm that adjusts the signal (ANOFF1, ANDB, ANZERO), filters it (ANLPFHZ) and scales it (ISCALE), before developing the current command. The current (or torque) command is checked against the peak (IMAX, ILIM) and continuous (FoldBack features, ICONT) current clamp limits. Sinusoidal commutation modulation is added to the command and fed to the three-phase current loop regulator, which calculates a current error. This error is fed through a digital pole-placement compensation algorithm. The output of the compensator is converted to a PWM signal and fed to the power transistor bridge. The power bridge uses the high voltage DC BUS Module (325 VDC bus typical) to supply the required current to the motor windings. The actual motor current is updated and the process begins again.

Current Sampling

The current loop receives corrective feedback from the current sampling circuitry. The current sensors use closed-loop hall sampling techniques in all units.

The current sample is used by the current loops to regulate the current in each of the three motor phases. Two phases (A and C) of the current signal are sampled by the microprocessor at a 16 kHz rate. The momentary A phase current and C phase current are monitored by examining the IA and IC variables, respectively. The microprocessor calculates the equivalent absolute current, which can be monitored as I. This value can be averaged for 2, 4, 8, 16, 32, or 64 samples.

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Foldback

The SERVO**STAR** CD-Lite offers two types of FoldBack protection for both the motor and the drive. The drive's microprocessor monitors the current feedback signal and develops a RMS value of this signal for the purpose of providing a value that represents the current in the motor. The system is similar to an "I-squared-T" accumulator.

Drive Foldback

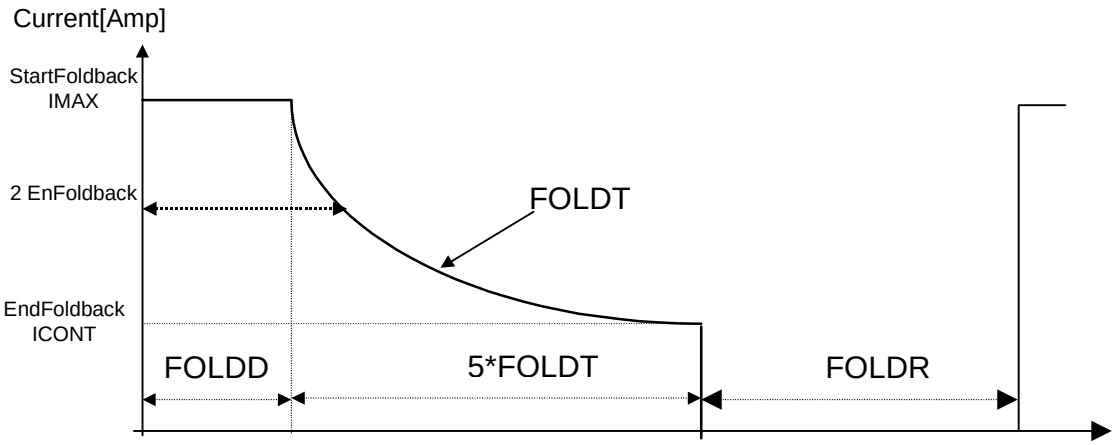
This Foldback algorithm monitors current feedback and, if the feedback exceeds the continuous current rating of the drive/motor combination (ICONT), decreases the system's current to the ICONT level. For example, under a step command input condition, the Foldback algorithm allows maximum peak current (IMAX) output from the drive for ½ second. After this, the drive enters "Foldback mode" (FOLD=1) and begins an exponentially Foldback to the system's continuous current. It takes approximately six seconds for the exponential decay to drop from the system's peak current to its continuous level.



For drive currents that exceed ICONT but are below IMAX, the system period before Foldback occurs is extended beyond two seconds. Two seconds is the shortest time period that will elapse before the drive enters Foldback and only occurs when maximum peak current (IMAX) is drawn.



This Foldback feature is designed to protect the drive electronics, not the motor. The Configurable Output, O1, (pin 12) can be configured to indicate a drive Foldback condition.



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Troubleshooting

The **MOTIONLINK** package comes with a comprehensive monitoring and troubleshooting help set. For troubleshooting the drive, it provides a Status screen (click on "Status" button in the upper right-hand corner of Main **MOTIONLINK** screen). The Status screen allows you to check the drive enable switches, the status display LED, fault status with complete error history, and mode settings for several of the drive's protection features. If using the terminal mode, you can simply check the contents stored in the FLTHIST variable.

An additional help provided by **MOTIONLINK** is the I/O screen (click on "I/O" button on the side of the Main **MOTIONLINK** screen). The I/O screen gives you the ability to check the status of the hardware position limit switches, the motor thermostat, and the encoder equivalent output. It also allows you to set up the I/O on the C3 connector for a variety of troubleshooting and monitoring approaches.

For monitoring system performance, **MOTIONLINK** comes with a variety of monitoring tools. You can monitor a variety of variables from the Monitor screen (click "Monitor" button at the top of the Main **MOTIONLINK** screen) to compare up to three variables against themselves at one time. The Tune and Record screen allows you to evaluate the system's actual performance against a predefined command profile. Also from this screen, adjusting the gains until optimum following is achieved can vary the performance.

Error Codes

In most cases, the SERVO**STAR** CD-Lite communicates error codes with a text message via the serial port to the host. Some error codes are also transmitted to the status display. The same message is saved in the EEPROM under an error history log (FLTHIST, ERR) so that nothing is lost when power is removed. Not all errors reflect a message back to the host. In these cases, the no-message errors communicate only to the status display.

The response of the SERVO**STAR** CD-Lite to an error depends on the error's severity. There are three levels of severity:

1. Warnings, simply called errors, are not considered faults and do not disable operation
2. Non-fatal errors, or simply faults, that disable the drive and indicate a fault status
3. Fatal errors, or fatal faults, that disable almost all drive functions (including communications)



The drive is automatically disabled at the occurrence of a fault. Executing a drive disable command (DIS or K) followed by the EN command, or toggling the Remote Enable line (REMOTE) resets the fault latch. If the fault condition is no longer present, re-enables the system.

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FATAL FAULTS ERROR CODES

Status Display	Error Message	Possible Cause	Fatal	Non-Fatal	Error #
	No fault				0
t	Power stage over temperature	Overload, fan malfunction, power stage failure	*		1
o	Over voltage	Excessive _omm. rate	*		2
P	Over current **	Power stage surge current	*		3
r1	Resolver line break (resolver)	Break in resolver input lines detected	*		4.1
r2	RDC error (resolver)	Resolver to digital error	*		4.2
r4	A/B line break (encoder)	Break in encoder A/B input lines detected	*		4.4
r6	Illegal halls (encoder)	Illegal hall combination detected	*		4.6
u	Under voltage	Bus voltage is too low	*		5
H	Motor over temperature	Motor overload caused overheating	*		6
A1	Positive analog supply fail	Failure in +12V supply	*		7.1
A2	Negative analog supply fail	Failure in -12V supply	*		7.2
J	Over Speed	Velocity ≥ VOSPD	*		8
J1	Over Speed (1.8*VLIM)	Velocity ≥ 1.8 x VLIM	*		8.1
e	EEPROM checksum fail	EEPROM checksum invalid on power up	*		10
F	Foldback	System in FoldBack mode	*	*	12

**The Over Current fault can only be cleared by cycling power. The other faults can be cleared by toggling the Enable.

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NON-FATAL ERROR CODES

Status Display	Error Message	Possible Cause	Fatal	Non-Fatal	Error #
	NO_ERROR	No error was recorded		*	0
	UNKNOWN_COMMAND	Undefined command		*	20
	CHECKSUM_ERROR	Error on _omm.. Message checksum (ackmode 2)		*	22
	DRIVE_ACTIVE	Drive needs to be inactive for the requested command or variable		*	23
	VALUE_OUT_OF_RANGE	Variable value out of range		*	25
	SYNTAX_ERROR	Communication message syntax error		*	28
	NOT_PROGRAMMABLE	Variable is read-only		*	36
	CONFIG_FAIL_CURRENT	CONFIG failed due to current loop design failure		*	37.01
	CONFIG_FAIL_MENCOFF	CONFIG failed due to MENCOFF		*	37.03
	CONFIG_FAIL_MSPEED	CONFIG failed due to MSPEED		*	37.04
	VEL_CONFIG_FAILED	The velocity loop can't be con-figured with given parameters		*	41
	ARGUMENT_NOT_BINARY	Variable argument must be a power of 2		*	46
	BURNIN_ACTIVE	Requested function cannot be executed during Burnin (factory function)		*	47
	BURNIN_NOT_ACTIVE	Burnin (factory function) cannot be stopped if it is not active		*	48
	NOT_AVAILABLE	The requested variable value is not available; refer to the description of the variable in section 1 to determine why.		*	51

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NO MESSAGE FAULTS

Status Display	Fault Description	Fatal Error	Non-Fatal Error	Flashing Display	Steady Display
≡	Watchdog	*		*	
-1	No Compensation	*		*	
-2	Invalid Velocity Control	*		*	
-6	Failure while writing to the personality module		*	*	
-7	Failure while reading from the personality module		*	*	
L 1	Hardware CW limit switch open		*	*	
L 2	Hardware CCW limit switch open		*	*	
L 3	Hardware CW and CCW limit switches open		*	*	
A 3	Positive and negative analog supply fail	*		*	
I	RAM failure (during init)	*			*
c	EPROM checksum (during init)	*			*
8	Test LED			*	

Fault Monitoring System

The SERVO**STAR** CD-Lite's microprocessor is constantly monitoring the status of many different components. In general, all fault conditions are latched so you can readily determine the source of the problem. When a fault is detected, it is logged in the internal error log, indicated in the status display, enunciated over the serial port, and in most conditions causes a drive disable. Many faults can be reset by toggling the hardware remote enable (REMOTE input). The following is a list of the more frequent faults the drive detects in the unit hardware and operating system.

Motor OverTemperature: The Motor's External Thermostat input is monitored for an open circuit condition. The user can define (using THERMODE) what happens under this fault condition. The worst case event is a power stage disable when an 'H' appears in the status display, and the fault relay contacts (RELAY) are open.

Drive OverTemperature: The internal heatsink temperature is monitored for an unsafe condition. This condition causes a 't' to be displayed and disables the drive. The drive will eventually cool enough to allow reset of this condition.

RMS OverCurrent (FoldBack): The FoldBack detection system can 'clamp' the available output current. This is not a true fault condition, but may cause undesired performance, due to the command current being limited below what is required to achieve the desired performance. This condition is indicated with a flashing 'F' in the status display and can be detected by monitoring the FOLD switch variable.

Bus OverVoltage: An over-voltage condition shuts down the drive and displays a lower-case 'o' in the status display. This fault occurs mostly during regen operation where the BUS is raised to higher values than that produced by the power supply.

Bus UnderVoltage: An under-voltage condition shuts down the drive and displays an 'u' in the status display. This fault normally occurs when the incoming line voltage drops out or a fault occurs in the power supply.

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PowerStage Fault (OverCurrent): Hardware circuitry monitors load short-circuit, transistor failure, and instantaneous OverCurrent. In general, toggling the Remote Enable cannot reset a power stage fault. Power must be cycled. A flashing 'P' in the status display indicates this condition.

Low-voltage power supply faults: Out of tolerance values on the ± 12 VDC analog supplies will cause an 'A' to be displayed and disable the drive.

OverSpeed fault: Software continuously monitors the actual (feedback) speed. If the motor speed exceeds the VOSPD limit, a 'J' is displayed and the drive is disabled. This normally occurs when there is an improperly-tuned system and the load overshoots its commanded speed.

No compensator: In case the SERVO**STAR** cannot design a compensator (after a RSTVAR command, CLREEPROM, or any change in the motor or drive parameters), a flashing minus sign (-) is displayed and causes the drive to disable. This display normally indicates the drive does not have a compensation file loaded.

Memory reliability: During the initialization process upon power up, the runtime, variables memory (RAM - Random Access Memory), and the program memory (EPROM - Electrically Programmable Read Only Memory) are tested.

> If a RAM fault is detected, an 'I' is displayed and the drive is halted. If an EPROM fault is detected, a 'c' is displayed and the drive is halted.
>
> The user configuration non-volatile memory (EEPROM - Electrically Erasable Programmable Read Only Memory) is also checked for integrity upon power-up. Any discrepancy in this data is noted with an 'e' in the status display. After power-up is successfully completed, any subsequent fault in the operation of the EEPROM is noted with an 'E' in the status display.

WatchDogs: The SERVO**STAR** incorporates a watchdog system to maintain software operation integrity. Failure of the watchdog mechanism displays three bars on the status display and causes the drive to halt. This normally indicates serious problems. Please contact Danaher Motion Customer Support.

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Firmware Upgrades

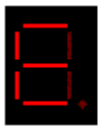
From time to time, Danaher Motion adds features to its products that expand their overall capabilities. Features added to the SERVO**STAR** CD-Lite can be easily implemented at the customer's site. This is accomplished by downloading new firmware via the drive's serial port directly from a host computer.

When ordering a firmware upgrade, you receive the following files:
Lccd_xxx.emb - firmware code (xxx describe the firm ware version).
Ember.txt - firmware upgrade utility
Cdlignit.exe - windows application to download the firmware code
Ig.bat – for user how want to ember in DOS Mode
Ignite.exe - for user how want to ember in DOS Mode

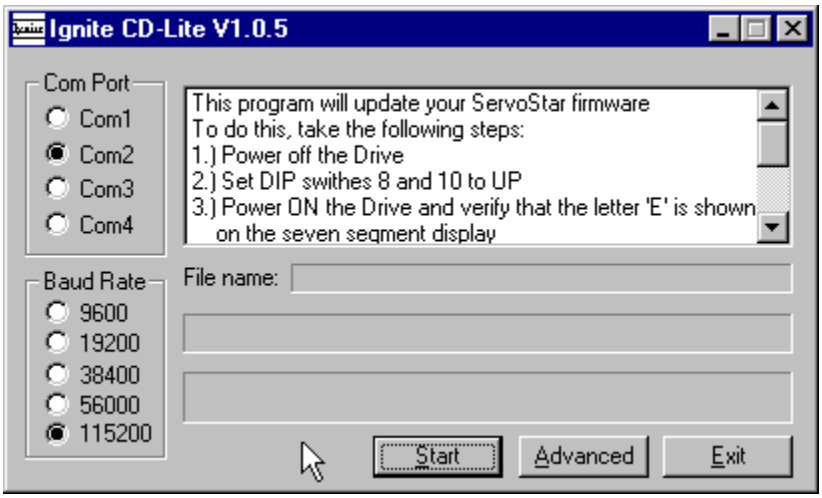
Upgrade Procedure

(in windows operation system)

1. Turn off the CD-LITE.
2. Change the DIP switches 8 and 10 to 1 (you can find them on top of the CD-LITE).
3. Turn ON the CD-LITE, Make sure that the seven segment Led on the CD-LITE changes to E.

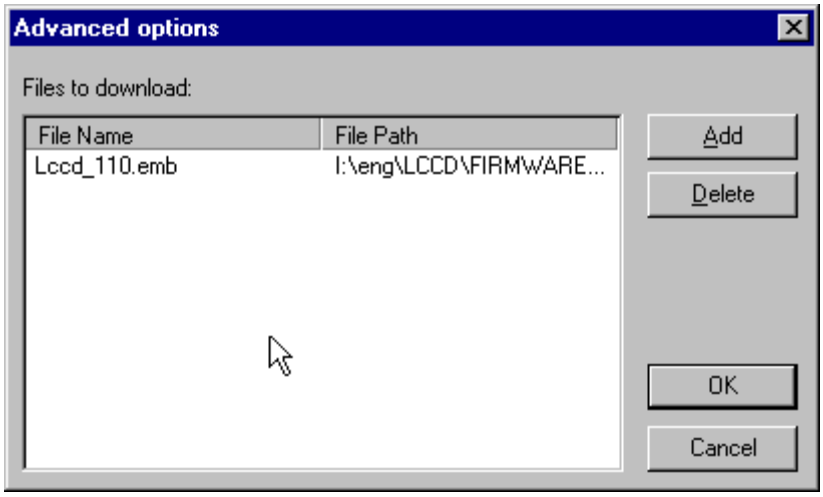

- Ember.

4. With explorer activate Cdlignit.exe the following dialog box appears:

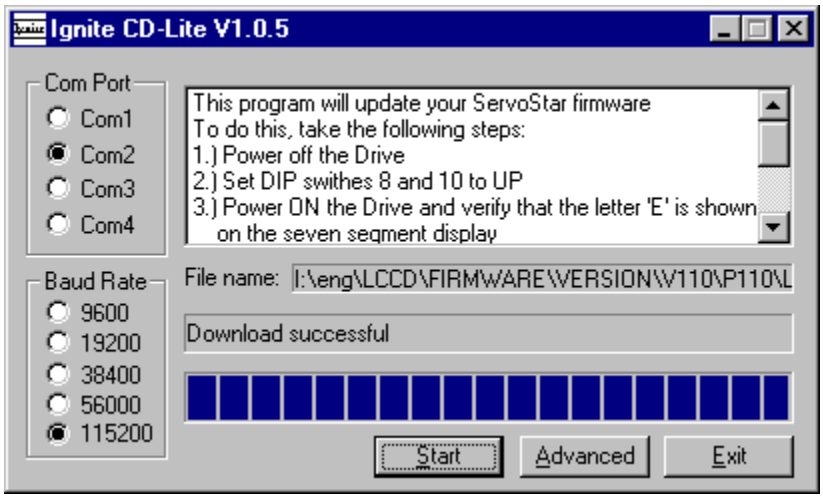


5. Select the Com Port.
6. Select Baud Rate (default 115200).
7. Select Advanced the dialog box "Advanced options" appears.

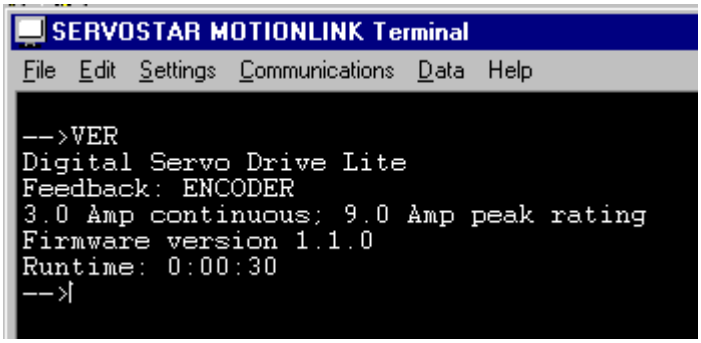
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8. Select Lccd_xxx.emb and select OK
9. From the window “Ignite CD-Lite” Select the Start Button to start download the new firmware from PC to the CD-LITE, wait until you get the message download successful.



10. Select Exit, and turn Off the CD-Lite
11. Change the DIP switches 8 and 10 to 0 (back to normal operating mode).
12. Make sure you have the correct firmware. From terminal, type the “VER” command.

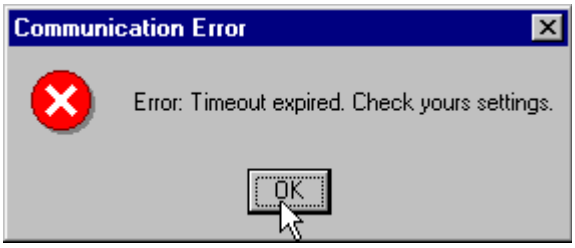


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or From **MOTIONLINK** Basic Drive Setup:



To obtain the latest firmware version or receive additional help, contact the Danaher Motion Customer Support.



If you get and your setting is correct , Please recycle the Power of the Drive and Restart the Ignite Application.

Customer Support

Danaher Motion is committed to quality customer service. Our goal is to provide the customer with information and resources as soon as they are needed. In order to serve in the most effective way, please contact your local sales representative to answer all your product needs. If you are unaware of your local sales representative, please contact Danaher Motion Customer Support. Visit our website often for **MOTIONLINK** software upgrades, application notes, and technical publications.

Danaher Motion Customer Support
Continental US Customers: 1-800-777-3786
International Customers: (815) 226-2222
Email: customer .service@danahermotion.com
Website: www.danahermotion.com

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Personality Module for CD-LITE

The Personality Module is used to easily configure multiple CD-Lite servo drives. After one servo drive has been configured and tuned, the parameters of that drive are uploaded into the module. In order to configure additonal servo drives with the same parameters, the module is plugged into those drives and the parameters downloaded into the drives.

The same parameters that are stored in an SSV file, are stored in the Personality Module. In addition, when downloading the parameters, CONFIG and SAVE commands are included.

Preparation

The CD-LITE should have firmware version 0.1.3 or higher.

Description and Operation

The Personality Module has a female D-9 connector to plug into the serial connector (C1) on the front panel of the CD-Lite. The Personality Module has two switches and one green LED on it:

A recessed switch is used for UPLOADING parameters from the drive into the Personality Module. The tip of a pen or some similar instrument is needed to access the switch. The switch needs to be pressed for a minimum of 2 seconds in order to activate the upload procedure. During the upload, the display will show 3 bars flashing, first the lower, then the middle, and then the upper.

An easy access switch is used for DOWNLOADING parameters from the Personality Module to the drive. Pushing this button downloads the values from the Personality Module to the drive. During the download, the CD-Lite display shows 3 bars flashing, first the upper, then the middle, and then the lower. This action takes a few seconds.

The Green LED is lit to indicate that the system is powered on.

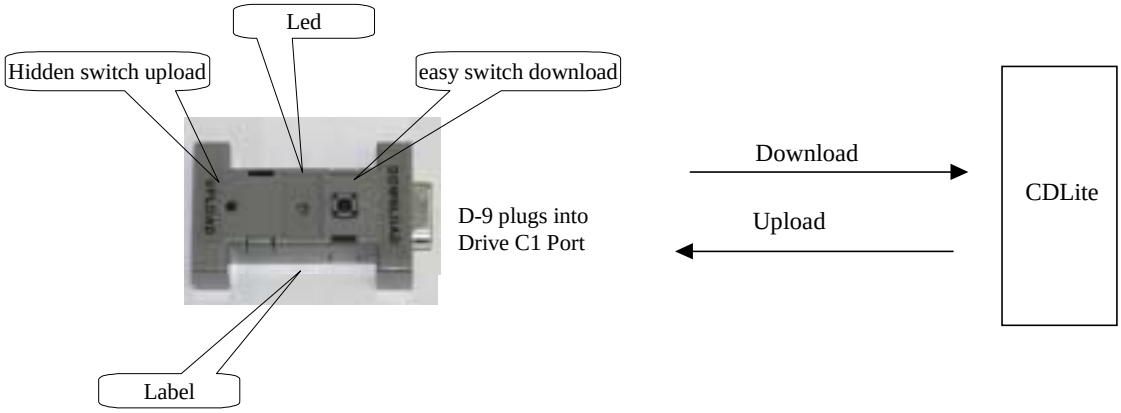
Error Display

- If an error occurs during DOWNLOAD from the Personality Module, the display on the 7-segment flashes “–7”.
- If an error occurs during UPLOAD to the Personality Module, the display on the 7-segment flashes –6.

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Schematic

The following diagram describes the PRMDL schematically





How To Order

The Personality Module may be ordered by specifying its part number, **LE-PRMDL**

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Appendix A

The SERVO**STAR** product family can be mated with a variety of motors. Cable sets (motor and feedback) can be purchased directly from Kollmorgen; which gives you a complete plug-n-play system. However, some users may find it necessary to manufacture their own cable sets. This Appendix provides pinout information between the drive's power and feedback connections and the motor receptacles for most of Kollmorgen's motor products.

Motor Power Connections

SERVO**STAR**	**GOLDLINE B, M, EB & XT**			**DDR**		**SILVERLINE**		**RBHR/ RBE(H)**
DRIVE CONNECTIONS	B/M/EB Motor Receptacle	XT Motor Receptacle	WIRE Color (Winding to Receptacle)	Motor Receptacle	Wire Color (Winding to Receptacle)	Motor Receptacle	Wire Color (Winding to Receptacle)	Wire Color
MA	Pin A	3	Brown	Pin 3	Black	Pin 1	Red	Red
MB	Pin B	4	Red	Pin 4	Red	Pin 2	White	White
MC	Pin C	1	White	Pin 1	White	Pin 6	Black	Black
GND	Pin D	2	Green/Yellow	Pin 2	Green	Pin 7	Green	

LR RESOLVER Connection

SERVO**STAR**	**GOLDLINE B, M, EB, XT**				**DDR**		**RBHR**
C2	**B/M/EB**	**XT 50X & 70X**	**XT 30X**	**Wire Color (from resolver to motor receptacle)**	**Resolver Connector**	**Wire Color (from resolver to motor receptacle)**	**Wire Color**
Pin 1	Pin A	Pin A	Pin 3	Black	Pin 3	Black	Yellow
Pin 2	Pin B	Pin B	Pin 7	Red	Pin 7	Red	Blue
Pin 3 (shield)							
Pin 4	Pin D	Pin D	Pin 8	Yellow	Pin 8	Yellow	Red
Pin 5	Pin C	Pin C	Pin 4	Blue	Pin 4	Blue	Black
Pin 6 (Shield)							
Pin 14 (Shield)							
Pin 15	Pin F	Pin F	Pin 5	Yellow/White	Pin 5	Yellow/White	Red / White
Pin 16	Pin E	Pin E	Pin 9	Red/White	Pin 9	Red/White	Yellow / White
Pin 13	Pin T	Pin R	Pin 2	Yellow	Pin 2	Blue	
Pin 25	Pin U	Pin S	Pin 6	Yellow	Pin 6	Red	
Pin 12 (Shield)							

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LE Encoder Connection

SERVO**STAR**	GOLDLINE B, M, EB & XT				SILVERLINE		**RBE(H)**
C2	**Encoder Receptacle**			**Wire Color** (at Motor Receptacle)	**0802 Encoder Receptacle**	**0802 Wire Color**	**Encoder Receptacle**
	B, M, EB Series MS threaded	XT Series MS Threaded	XT Series Euro Style				
Pin 1	Pin A	Pin A	Pin 1	Blue	Pin 3	Blue	Pin 6
Pin 2	Pin M	Pin M	Pin 2	Blue / Black	Pin 6	Blue / Black	Pin 5
Pin 3 (shield)							
Pin 4	Pin B	Pin B	Pin 3	Green	Pin 4	Green	Pin 8
Pin 5	Pin C	Pin C	Pin 4	Green / Black	Pin 7	Green / Black	pin 7
Pin 6 (Shield)							
Pin 7 & 8	Pin S	Pin S	Pin 7	Red	Pin 10	Red	Pin 2
Pin 9	Pin F	Pin F	Pin 17	Brown	Pin 12	Brown	
Pin 10	Pin H	Pin H	Pin 16	Gray	Pin 13	Gray	
Pin 11	Pin K	Pin K	Pin 15	White	Pin 14	White	
Pin 12 (Shield)							
Pin 13	Pin T	Pin T	Pin 8	Yellow	Pin 1	Yellow	
Pin 14 (Shield)							
Pin 15	Pin D	Pin D	Pin 5	Violet	Pin 5	Violet	Pin 10
Pin 16	Pin E	Pin E	Pin 6	Violet / Black	Pin 8	Violet / Black	Pin 9
Pin 18,19 & 20	Pin R	Pin R	Pin 10	Black	Pin 9	Black	Pin 3
Pin 22	Pin G	*	*	*	*	*	*
Pin 23	Pin J	*	*	*	*	*	*
Pin 24	Pin L	*	*	*	*	*	*
Pin 25	Pin U	Pin U	Pin 9	Yellow	Pin 2	Yellow	

*Must be shorted to C 2 pin 18 for proper operation

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Appendix B

Setup Example

The following example shows how to configure the CD-LITE 3 AMP with GOLDLINE XT MTX 502A1. Once configured, we will run it from **MOTIONLINK** in Torque Mode.

Remember Torque Mode doesn't need tuning, Where in velocity mode you have to tune the PDFF VF VD and COMPFILTparameters (not cover in this example).

Configure the CD-Lite to a Motor

1. Start **MOTIONLINK** by clicking on the icon:

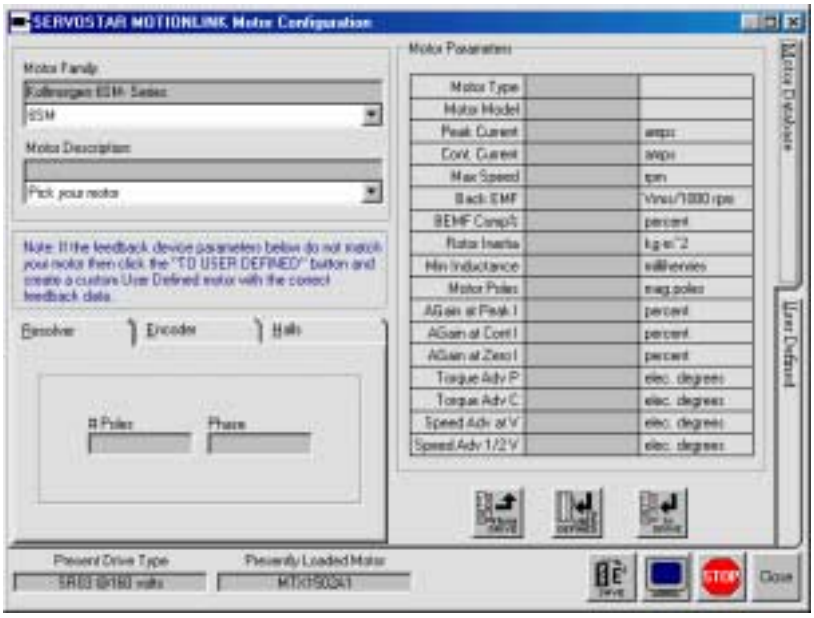


You will see the Startup screen below:

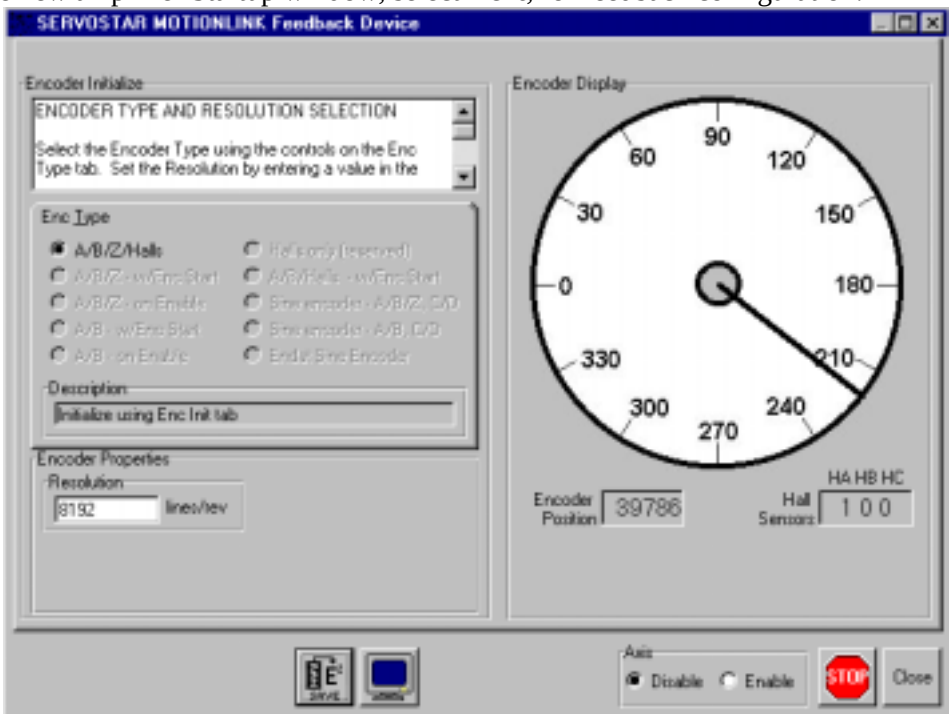


2. Select **Start**.
3. Verify that the drive information is correct.
4. Select **OK**.
5. Select **Close**.
6. From the new amplifier Startup window, select **Next**, For motor configuration.

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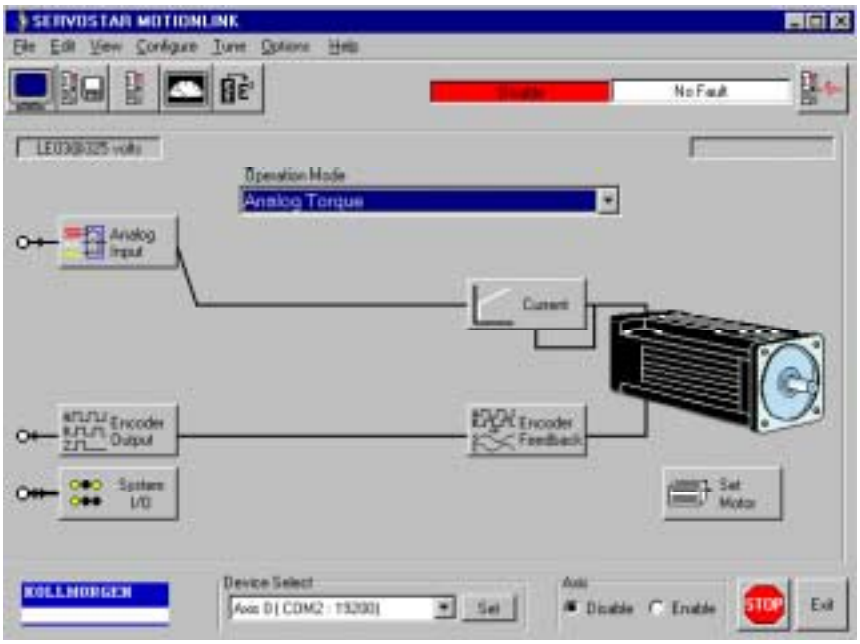
7. Select **GOLDLINE XT MTX502A1**.
8. Select the "TO Drive" button to download the motor parameter to the Drive.
9. Select **Yes**.
10. Select **Close** to close the motor configuration window
11. From the new amplifier Startup window, select **Next**, for feedback configuration.



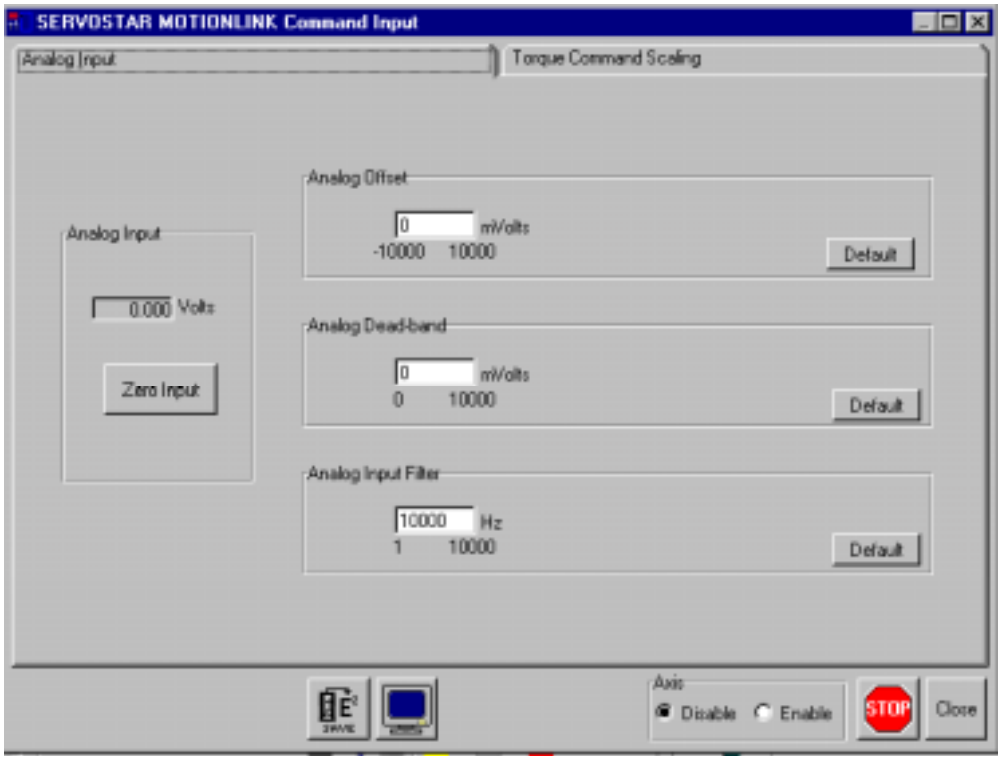
12. Select the encoder type and type the motor resolution in the resolution field (you can manually rotate the shaft for confirmation).
13. Select **Close**.
14. From the new amplifier Startup window, select **Next**, For OPMODE configuration.

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15. For Operation mode, select **Analog Torque**.
16. Select **Close**.
17. From the new amplifier Startup window, select **Next** for backup motor parameter to a file.
18. When the Next button changes to **Finish**, select **Go**.
19. The main window of **MOTIONLINK** appears.



20. Select **Analog Input**.



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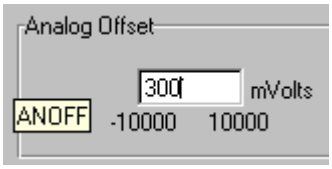
21. Select **Zero Input**.
22. Select **OK** for ANZERO procedure.
23. Change the Hardware enable input so pin 8 in C3 connector is 24 Return where pin 7 is the +24 source. If you are not sure, go to the terminal window and type "REMOTE." REMOTE should be 1.



24. Change axis state from **Disable** to **Enable**.



25. You can see that the seven segment of the CD-Lite is now **3**. Now you are about to move the motor shaft. Type **300** in the Analog Offset.



26. To stop the motor, select **Zero Input**.

Now you can operate the system with your analog input (300 mVolts = 0.3 Volts).

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Appendix C

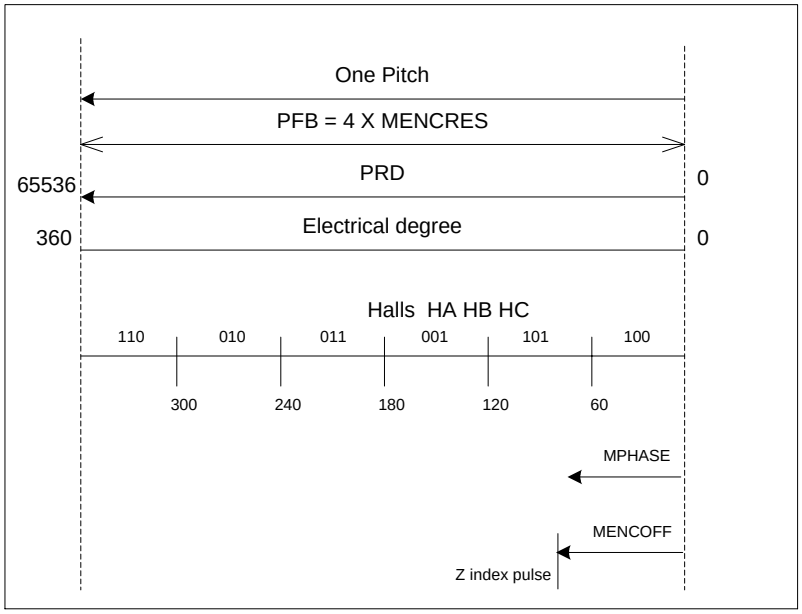
Linear Motor with CD-LITE

The CD-LITE maintains only rotary variables. To use a linear motor, you should convert the linear parameters to rotary values from the motor data sheet:

PolePitch [mm]
Vmaxl (Max linear Speed) [mm/sec]
BEMFl (Linear Back EMF) [Vpeak/m/sec L-L]
Motor poles usually it is 2
Resolution [uM] micron **before quad**

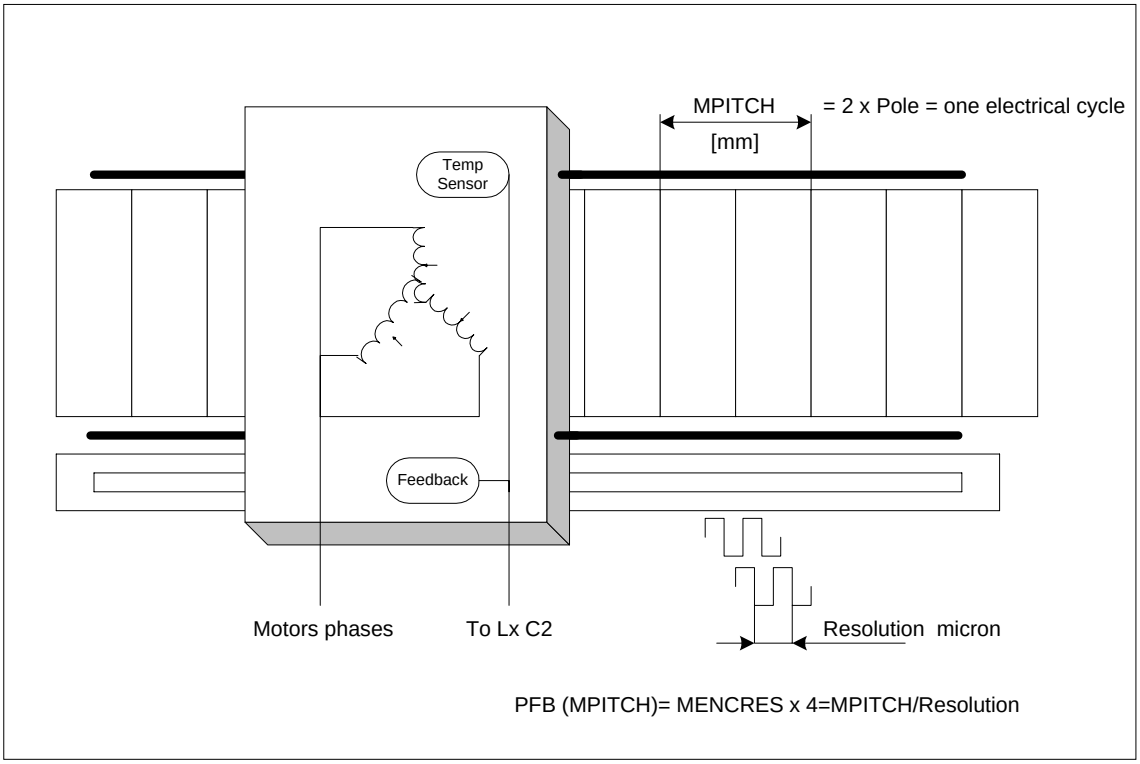
Calculate CD-Lite parameters

- MENCTYPE according to the feedback type
- MSPEED = Vmaxl x 60 / PolePitch [RPM]
- MKT = BEMFl x PolePitch / 60 x 16.54 = [10-3Nm/RMS AMP]
- MENCRES = PolePitch / Resolution [Motor Rev]
- MENCOFF = 0 (if MENTYPE =6)
- MPHASE please check hall table and compare halls phasing.
- VLIM = Vllim x 60 / PolePitch [RPM]
- VOSPD = Vlospd x 60 / PolePitch [RPM]
- VSCALE = Vlscale x 60 / PolePitch [RPM]
- VMAX is automatically calculated after execute the command CONFIG (for further information see *CD-Lite Variable and Command Reference*) [RPM]



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0 to 60 Degree HA=1 HB=0 and HC=0



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Appendix D

Motor Thermostat with CD-LITE

From version 0.1.8, CD-Lite supports motor thermostat types PTC and NTC.

PIN	C2 Feedback Connector	Electrical drawing
13	Thermostat High	MOT_TMP+
25	Thermostat Low	MOT_TMP-

THERMTYPE = 0 for PTC. When the PTC is more then 12.4 kΩ, the drive is in motor overtemperature fault state (you will see “H” flashing in the seven segment display).

THERMTYPE = 1 for NTC. When the NTC is less then 0.5 kΩ, the drive is in motor overtemperature fault state.

Default **THERMTYPE = 0**.

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