Logosol Programmable Servo & Logic Controller LS-x12

Doc #712112001, Rev. 1.5, 08/19/2002

Features

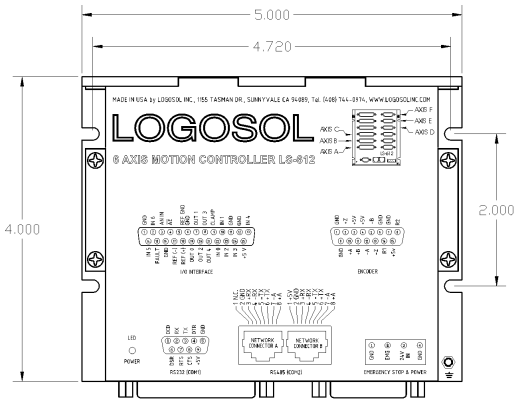
- **Single 24V power supply**
- **Up to 6 axis**
- **12 bit ±10V analog output**
- **PC/104 bus**
- **One RS-232C port**
- **One full duplex RS-485 port for networking with other Logosol devices**
- **512KB flash disk to store user programs**
- **7 general purpose inputs 5mA/24V**
- **Optional analog input with 8bit ADC**
- **5 general purpose open collector outputs 50mA/24V with short-circuit protection**
- **Emergency stop input**
- **Fault (error) input**
- **Bernstein-Bezier S-curve trajectory profile generator**
- **Windows 95/98/NT programming and diagnostic software**

General Description

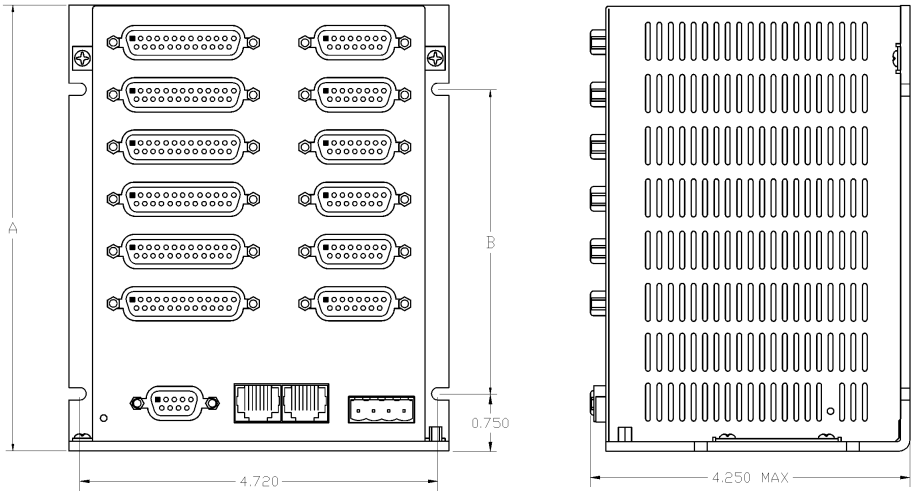
LS-x12 is a multi-axis, stand-alone servo controller with ±10V analog output. In addition to the motion control, LS-x12 offers general-purpose digital I/O lines. LS-x12 communicates with the host computer through RS-232C serial port. A second, full duplex RS-485 port is available, allowing LS-x12 to serve as a master for network of Logosol intelligent servo drives. The controller may run in stand-alone mode, or the host may control the target device using a simple but powerful set of commands. The built-in 386 CPU features enough computing power and memory to implement even most sophisticated motion control.

LS-x12 is equipped with various safety features like short circuit protection for the digital outputs, emergency stop input and encoder control. No special skills are required to program LS-x12 servo controller. Logosol Motion Control Center includes terminal emulation, sophisticated diagnostic and optimizing tools. Drag-and-drop style of Motion Composer utility offers a user-friendly environment for rapid application development, eliminating the need of low-level programming.

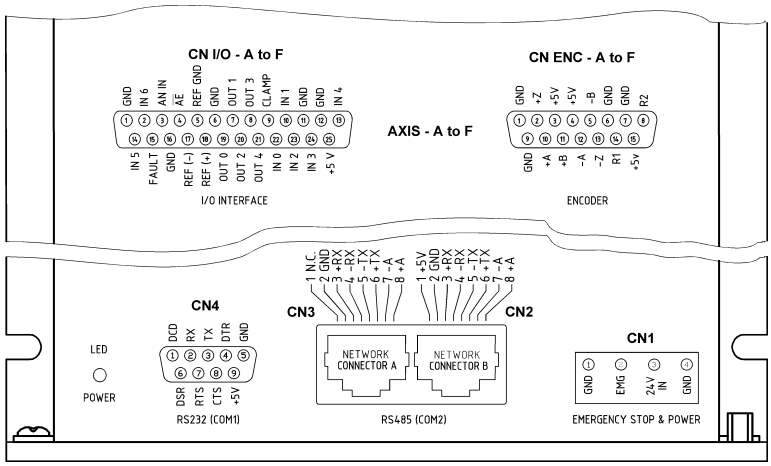
Outline Dimensions (in inches)



DEVICE	A	B
LS-112	3.800	2.000
LS-212	3.800	2.000
LS-312	3.800	2.000
LS-412	5.860	4.000
LS-512	5.860	4.000
LS-612	5.860	4.000



Connector Layout



TECHNICAL SPECIFICATIONS rated at 25°C ambient temperature

POWER SUPPLY VOLTAGE	
+24V IN	16 to 32 V DC, 35V Absolute Maximum
ANALOG OUTPUTS	
Voltage	±10V
Resolution	12bit
Output impedance	200 Ohm
DIGITAL OUTPUTS	
Type	Open Collector with protective diode to the power supply for inductive loads
Max voltage applied to output	+35V
Max current load	50mA per output
DIGITAL & ENCODER INPUTS	
Encoder	TTL level, 5mA, may be driven by open collector or line driver
Digital Inputs	Range –2V ÷ 35V DC, Low 1V, High 2.5 V
ENCODER	
Type	Quadrature incremental encoder with index
Max speed	720kHz
ANALOG INPUTS	
Resolution	8bit
Input impedance	more than 10K
Mode	asynchronous
Conversion time	10 to 30 µs
ADJUSTMENTS	
Analog input full scale	±800mV to ±12V
Analog output offset	±100mV
INDICATOR	
Yellow LED	Computer power supply is ON
PROTECTION	
Outputs	Short circuit between Digital output and positive power supply terminal
THERMAL REQUIREMENTS	
Storage temperature range	–30 to +85 °C
Operating temperature range	0 to 40 °C
MECHANICAL	
Size	L=5.00", D=4.00" H=3.800 for LS-112, LS-212, and LS-312 H=5.860 for LS-412, LS-512, and LS-612
Weight	1.5 lb. (LS-112) ÷ 3.1 lb. (LS-612)
MATING CONNECTORS	
Power	Magnum EM2565-04-VL or Phoenix MSTB 2.5/4-ST-5.08
I/O	D-sub 25 pin, female
Encoder	D-Sub 15 pin, female

ORDERING GUIDE

PART NUMBER	DESCRIPTION
912112001	One-axis Programmable Servo & Logic Controller LS-112
912212001	Two-axis Programmable Servo & Logic Controller LS-212
912312001	Three-axis Programmable Servo & Logic Controller LS-312
912412001	Four-axis Programmable Servo & Logic Controller LS-412
912512001	Five-axis Programmable Servo & Logic Controller LS-512
912612001	Six-axis Programmable Servo & Logic Controller LS-612
324010005	Mating power connector, female, 4pins

CONNECTORS AND PINOUTS

CN1 – POWER CONNECTOR

PIN	SIGNAL	DESCRIPTION
1	GND*	Wired to pin #4
2	EMG	Emergency Stop input.
3	+24V IN	LS-x12 Power positive terminal
4	POW GND*	Power return terminal

CN2, CN3 – RS-485 (COM2) NETWORK CONNECTORS

PIN	SIGNAL CN2 (HOST)	SIGNAL CN5 (SLAVE)	DESCRIPTION
1	+5V	N.C.	Interface power supply - max 250 mA
2	GND*	GND*	Interface ground
3	+Rx	+Rx	Receive data (+)
4	-Rx	-Rx	Receive data (-)
5	-Tx	-Tx	Transmit data (-)
6	+Tx	+Tx	Transmit data (+)
7	-A line	-A line	Terminated with 2K2 resistor to +5V
8	+A line	+A line	Terminated with 2K2 resistor to GND*

CN4 – RS-232C (COM1) CONNECTOR

PIN	SIGNAL	DESCRIPTION
1	DCD	Data Carrier Detect
2	RX	Receive Data
3	TX	Transmit Data
4	DTR	Data Terminal Ready
5	GND*	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Start
9	+5V	Interface power supply - max 250 mA

AMPLIFIER INTERFACE AND I/O CONNECTOR

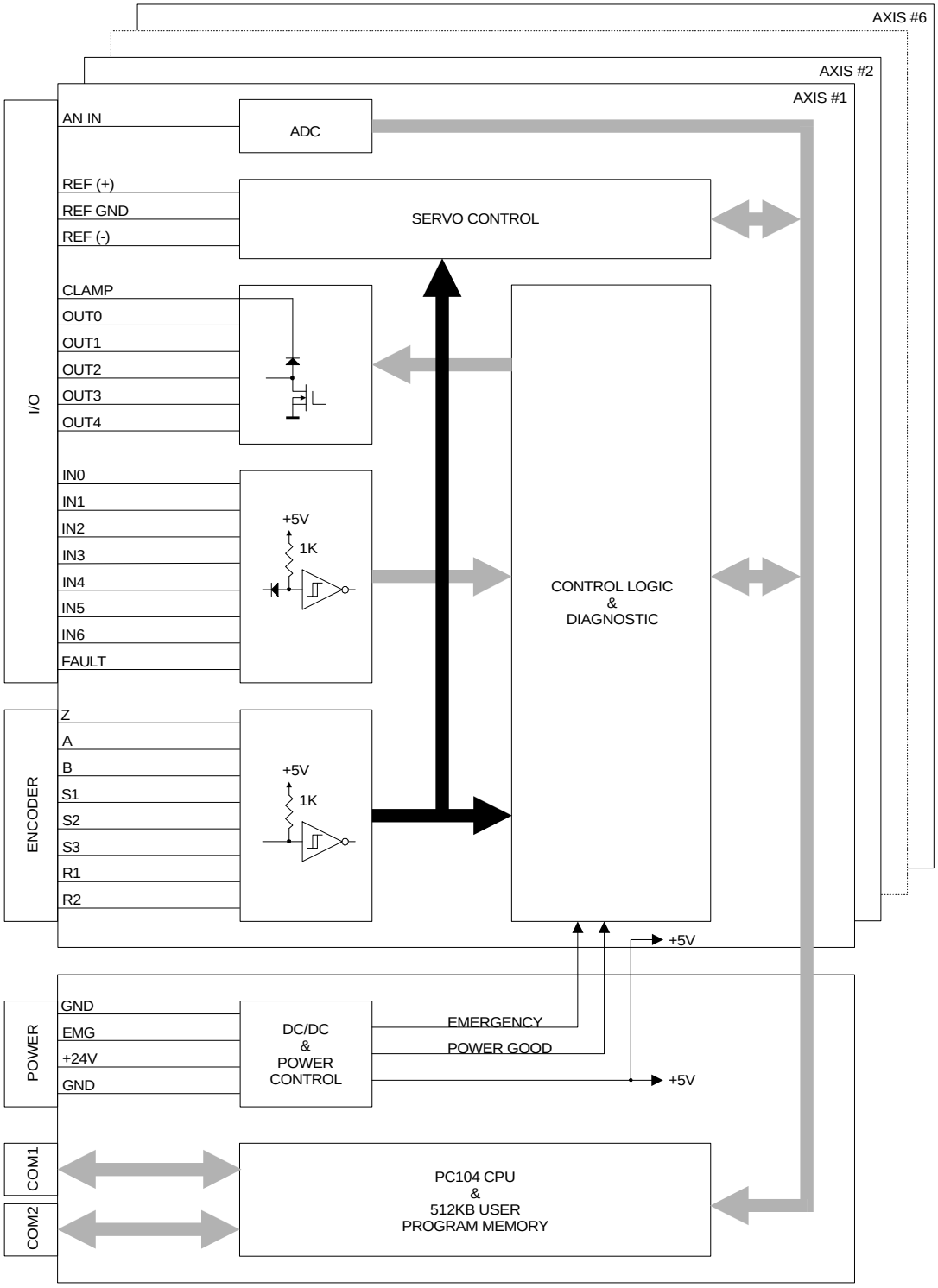
PIN	SIGNAL	DESCRIPTION
1, 6, 11, 12, 16	GND*	Signal ground
2	IN6	Input #6
3	AN IN	Analog input
4	AE	Amplifier enable
5	REF GND*	Analog output reference ground
7	OUT1	Output #1
8	OUT3	Output #3
9	CLAMP	Common point of output protective diodes cathodes
10	IN1	Input #1
13	IN4	Input #4
14	IN5	Input #5
15	FAULT	Fault (error) input
17	REF(-)	To amplifier (-) REF input
18	REF(+)	To amplifier (+) REF input
19	OUT0	Output #0
20	OUT2)	Output #2
21	OUT4	Output #4
22	IN0	Input #0
23	IN2	Input #2
24	IN3	Input #3
25	+5 V	Power supply for user sensors, relays

CN3 – ENCODER CONNECTOR

PIN	SIGNAL	DESCRIPTION
1, 6, 7, 9	GND*	Signal ground
2	+Z	Encoder index +Z input
3	+5V**	Encoder power supply
4	+5V**	Spare +5V power supply
5	-B	Encoder phase -B input
8	R2	Encoder type: For differential encoder leave R2 open For nondifferential encoder tie R2 to GND
10	+A	Encoder phase +A input
11	+B	Encoder phase +B input
12	-A	Encoder phase -A input
13	-Z	Encoder index -Z input
14	R1	Reserved
15	+5V**	Spare +5V power supply

* POW GND and GND are electrically connected. Controller case is isolated and may be grounded externally.
** The total current sunk from all +5V pins cannot exceed 200 mA per axis.

Functional Diagram



Overview

Logosol's LS-x12 is a family of modular multi-axis programmable servo and logic controllers. Letter "x" in the name represents the number of servo axes controlled by one device. LS-112, LS-212 to LS-612 are designed to control 1 to 6 axes respectively. All circuits necessary to control one axis, including connectors, servo, associated digital and analog I/O, are integrated on a separate servo board. Thus desired number of axes is obtained by stacking the necessary number of servo boards. Each LS-x12 contains a power supply board, CPU with RS-232/RS-485 interface and "x" number of servo boards. LS-x12 may be used with any external power amplifier featuring ±10V input.

LS-x12 may work in stand-alone mode or may be controlled online by a host computer using RS-232 interface. To program LS-x12 it has to be connected to a laptop or desktop computer, running Logosol Motion Control Center – an MS Windows based program. Programming LS-x12 is easy and user friendly. No special programming skills are required. There is no need even to learn the set of commands that is used to program LS-x12. Logosol Motion Control Center (MCC) features graphical user interface with drag-and-drop mechanism for generating the program. It also incorporates diagnostic tools and automatic PID-optimizer. Once created, the motion control program is loaded into LS-x12 internal flash disk and the controller is ready to operate completely stand-alone.

Servo Control

The servo control is based on National Semiconductor's precision motion processor LM-628. It features 32-bit position, velocity and acceleration registers and programmable PID-filter with 16-bit coefficients. Sophisticated software running inside LS-x12 enhances many of the LM628 functions and adds some new like Bernstein-Bezier S-profile trajectory generator.

Amplifier Enable

Amplifier enable ($\overline{AE}$) is a dedicated output used to enable/disable the external motor drive. It is designed as open collector and it is capable to sink 50mA. $\overline{AE}$ is an active low signal - the output can sink current, when it is enabled. Disable means the output is OFF.

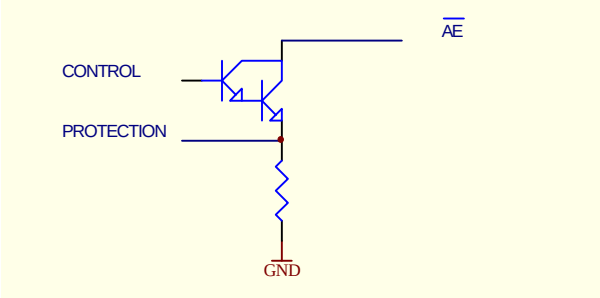


Figure 1: LS-x12 Amplifier Enable output schematic

$\overline{AE}$ may be set and reset using MCL software commands SERVO and NOSERVO. Once set it may be reset by LS-x12 protection circuits. It also may be reset by FAULT (ERROR) signal from the external drive.

Fault (Error) Input

Typical motor drive has a dedicated output to signal an abnormal condition (FAULT) – for instance overload, overheat, missing power. LS-x12 is equipped with special FAULT input, intended to handle such a signal. FAULT input shares the same schematic as all seven

general-purpose inputs, but has different function – it works like a trigger and when activated automatically disables the external amplifier.

Because the different motor drives have different FAULT signal polarity, LS-x12 is equipped with a dedicated output to select desired polarity. OUT5 is an internal (control) output and it is not wired to the interface connector. When OUT5 is OFF, FAULT input is activated on LOW-TO-HIGH transition. To activate FAULT input on HIGH-TO-LOW transition, OUT5 must be ON. The desired state of OUT5 may be assigned by the declaration in the LS-x12.INI file. Using OUT command, OUT5 may be accessed as any other output and its state can be changed on the fly. If OUT5 is not declared in LS-x12.INI file, its default state is OFF. FAULT input may be read at any time – MPF status bit represents its current state.

When FAULT is activated:

- $\overline{AE}$ (amplifier enable) signal will go HIGH (disable)
- MPFL status bit will go HIGH.

The digital outputs (except OUT4, which is servo-dependable) will not be affected. MCL command SERVO enables $\overline{AE}$ and clears MPFL. MPF and MPFL status bits are available to the software if declared in LS-x12.INI file.

Analog Output

The output from LS-x12 is ±10V analog voltage with 12-bit resolution. The offset may be zeroed using P2 potentiometer.

Encoder Interface

LS-x12 is designed to work with quadrature incremental encoder. Both differential and nondifferential encoder types may be used. Because of that LS-x12 encoder inputs are designed with two separate receivers for each phase instead with one differential. Input R2 located at the encoder connector selects encoder type. For nondifferential encoders R2 must be connected to ground. For differential encoder R2 must be left unconnected.

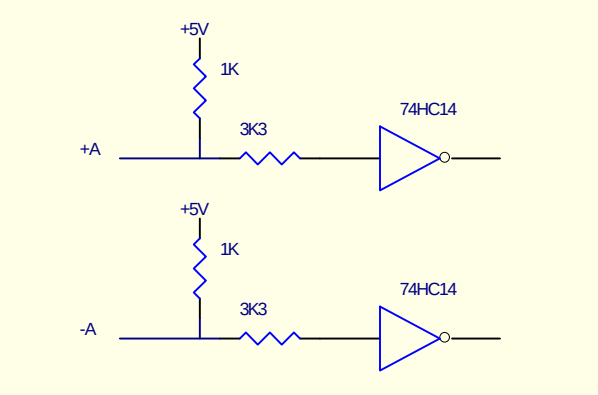


Figure 2: LS-x12 encoder interface

Using encoders with differential wiring is highly recommended because of the better noise immunity. In addition, with differential encoder LS-x12 provides protection against motor windup caused by missing or broken encoder wire. A dedicated logic controls the presence of all encoder signals. Detecting a missing signal is considered STOP condition:

- $\overline{AE}$ (amplifier enable) signal will go HIGH (disable)
- STPL status bit will go HIGH and will be latched at the rising edge of $\overline{AE}$. It will stay HIGH until $\overline{AE}$ is enabled again.

The digital outputs (except OUT4, which is servo-dependable) will not be affected. To recover after STOP condition, MCL command SERVO should be issued. It will enable $\overline{AE}$ and clear STPL. STPL status bits is available to the software if declared in LS-x12.INI file.
With nondifferential encoder LS-x12 will enter STOP condition only if the whole encoder connector is removed.

Digital Inputs

LS-x12 is equipped with 7 general-purpose digital inputs IN0 to IN6, designed with CMOS Schmitt-triggers and pull-up resistors. A serial Schottky diodes are added to the inputs, which makes possible to work with 24V sensors with active output connected directly to LS-x12. To activate any of the inputs, the corresponding sensor must be able to sink 5mA. All inputs are wired to LS-x12 I/O connector. The following diagram shows LS-x12 input configuration.

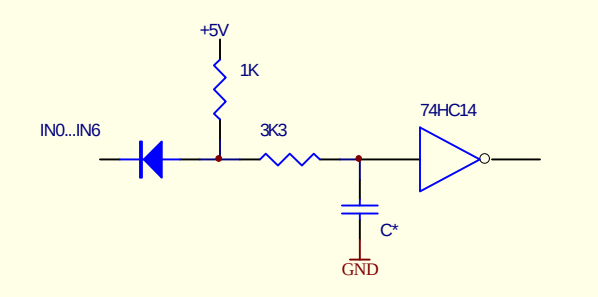


Figure 3: LS-x12 input schematic

All inputs are available to the software if they are declared in LS-x12.INI file. Their status may be read using IN command.

High-speed Position Capture

LS-x12 is capable to record the current motor position using the encoder index line as a strobe. Input IN4 may be configured to serve as an additional strobe source instead of encoder index. Either low (input is connected to the ground) or high (input is unconnected) level may be selected to trigger the capture. The parameter SELECT in the command STROBE axis=SELECT specifies source and polarity of the strobe signal.
Note: Both encoder phases A and B are required to be in LOW state in order position capture to take place. Because generally their state is unknown (the controller keeps track of encoder phases transition, not their state), the Position Capture should be performed only while the axis is in motion.

SELECT	Strobe Source	Strobe Polarity	A	B
0	IN4	LOW	LOW	LOW
1	IN4	HIGH	LOW	LOW
2 or 3	Encoder index line	HIGH	LOW	LOW

Table 1

The captured position may be read using INDEX command.

Analog Input

LS-x12 has an optional analog input equipped with 8bit ADC intended for current monitoring. The analog input is designed for bipolar operation. Reading out the ADC will return 0x80 for

grounded input, 0xff for full-scale positive voltage and 0x00 for full-scale negative voltage. The full-scale range may be adjusted from ±800mV to ±12V using the calibrating potentiometer P1. The ADC is running in asynchronous mode with 20ìs typical conversion rate. The analog input AN IN is located at LS-x12 I/O connector.

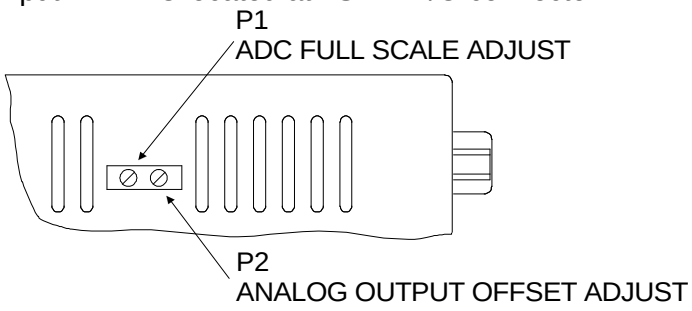


Figure 4

To access ADC it has to be declared in [ADC] section of LS-x12.INI file (see typical LS-x12.INI file shown at the end of this manual). Data may be read using MCL command IN. For instance, if axis A ADC is defined as ADC_A, command IN ADC_A will return a number between 0 and 255 representing the current voltage at axis A analog input.

Digital Outputs

LS-x12 features 5 general-purpose digital outputs OUT0 to OUT4 designed with open collector transistors. The outputs are equipped with protective diodes for inductive loads. Each output is capable to sink 50mA.

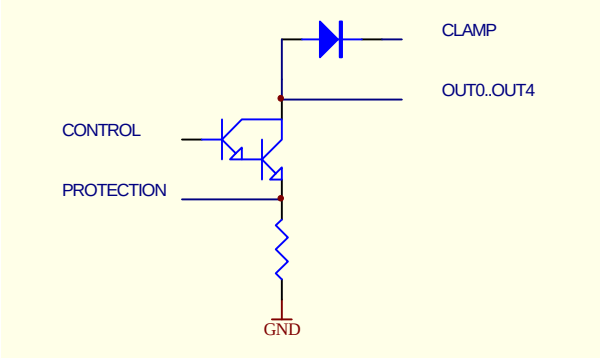


Figure 5: LS-x12 outputs schematic

All outputs are protected against short to the power source. In case of short:

- $\overline{AE}$ (amplifier enable) signal will go HIGH (disable)
- All outputs will be automatically disabled
- OPFL status bit will go HIGH and will be latched at the rising edge of $\overline{AE}$. It will stay HIGH until $\overline{AE}$ is enabled again.

OPFL is available to the software if declared in LS-x12.INI file. Once disabled the outputs will remain in this state. They may be written and read back, but their actual state will be OFF. To restore the normal operation, MCL command SERVO should be executed. It will close the servo loop again and enable $\overline{AE}$ (amplifier enable).

The output OUT4 has slightly different control than the rest of outputs. OUT4 is designed to be servo-dependant. To activate OUT4, the software must turn it ON and $\overline{AE}$ (amplifier enable) must be ON as well. This way it is guaranteed that if the external amplifier is disabled due to overcurrent, overheating or other reason, OUT4 automatically goes off. That function may be useful, for instance, to control motor brake circuitry.
All outputs are wired to I/O connector.

Emergency Stop Input

LS-x12 is equipped with dedicated Emergency Stop Input. It is supposed to be connected to the main Emergency Stop Button associated with the to controlled machine. The purpose of that input is to inform the host that an emergency situation is taking place. In addition it also disables the output to the external amplifiers. In order to operate LS-x12, EMG input should be closed to the ground (GND). When the Emergency Stop Button is pressed, i.e. EMG is disconnected from the ground:

- $\overline{AE}$ (amplifier enable) signal will go HIGH (disable)
- All outputs will be automatically disabled
- EMG and EMGL status bits will go HIGH. EMGL will be latched at the rising edge of $\overline{AE}$ and will stay HIGH until $\overline{AE}$ is enabled again. EMG represents the current state of the Emergency Stop Input.

To recover after Emergency Stop, a sequence of two MCL commands – POWER and SERVO should be executed. If for some reasons Emergency Stop Input is not used, it must be tied to the ground (GND).
If Emergency Stop Input is declared in LS-x12.INI file, it may be accessed using IN command as any other general-purpose input.

Power Supply

LS-x12 is powered by single external 24V source. It is used both for the computer and analog circuits. If the power supply drops under certain limit this may affect the proper work of the controller. To prevent that LS-x12 is equipped with a dedicated control of the internal power supply voltages. If the input voltage drops under 15V and as a result the internal power drops too, LS-x12 will disable the motor driver:

- $\overline{AE}$ (amplifier enable) signal will go HIGH (disable)
- OPF and OPFL status bits will go HIGH. OPFL will be latched at the rising edge of $\overline{AE}$ and will stay HIGH until $\overline{AE}$ is enabled again. OPF status bit continuously monitors the input voltage.

To restore the normal operation after detecting an undervoltage, the MCL command SERVO should be executed. Both the undervoltage and the output short condition affect OPF/OPFL status bits. To distinguish between them, all outputs should be turned off and the servo loop closed again using SERVO command. In that case only undervoltage may set OPFL status bit HIGH.
If the input voltage drops under 9V, the LS-x12 computer will be reset and the controller will be completely shut down.

Connecting to the Host

A simple serial cable with crossed data wires and no handshaking signals (Null modem) is required to connect LS-x12 to the Host computer

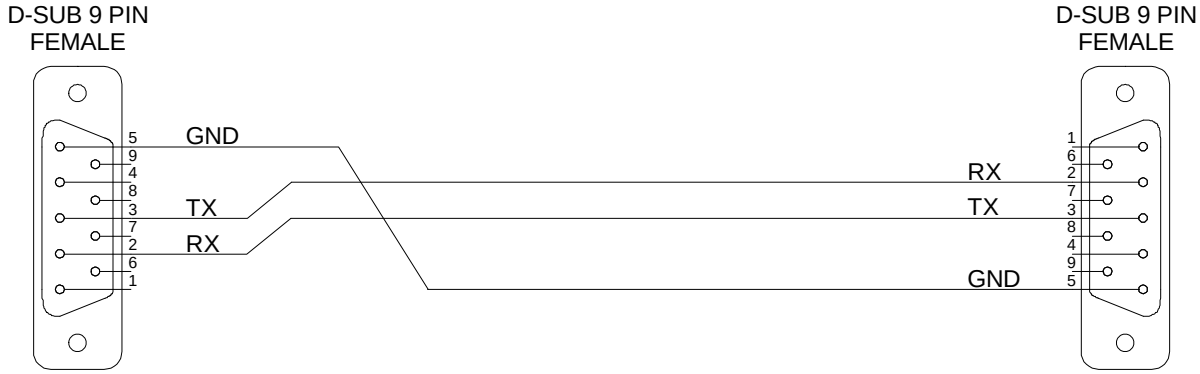


Figure 6: Connecting LS-x12 to Host RS-232C port using 9-pin connector

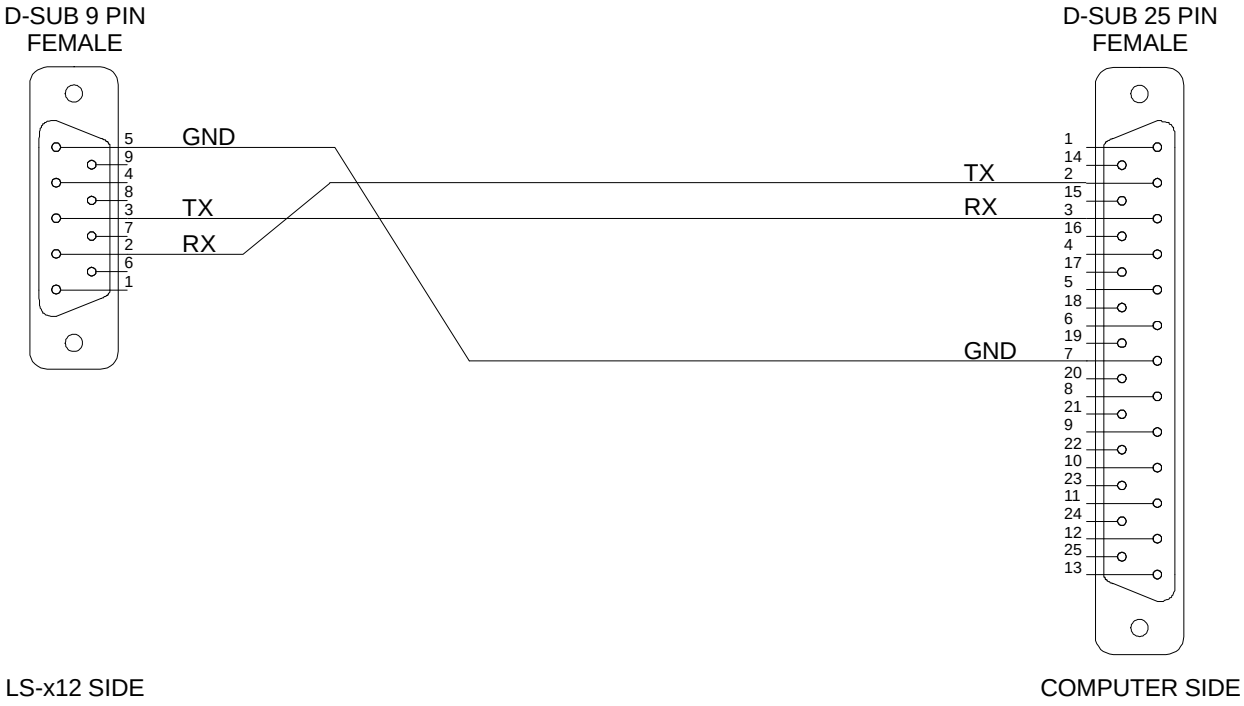
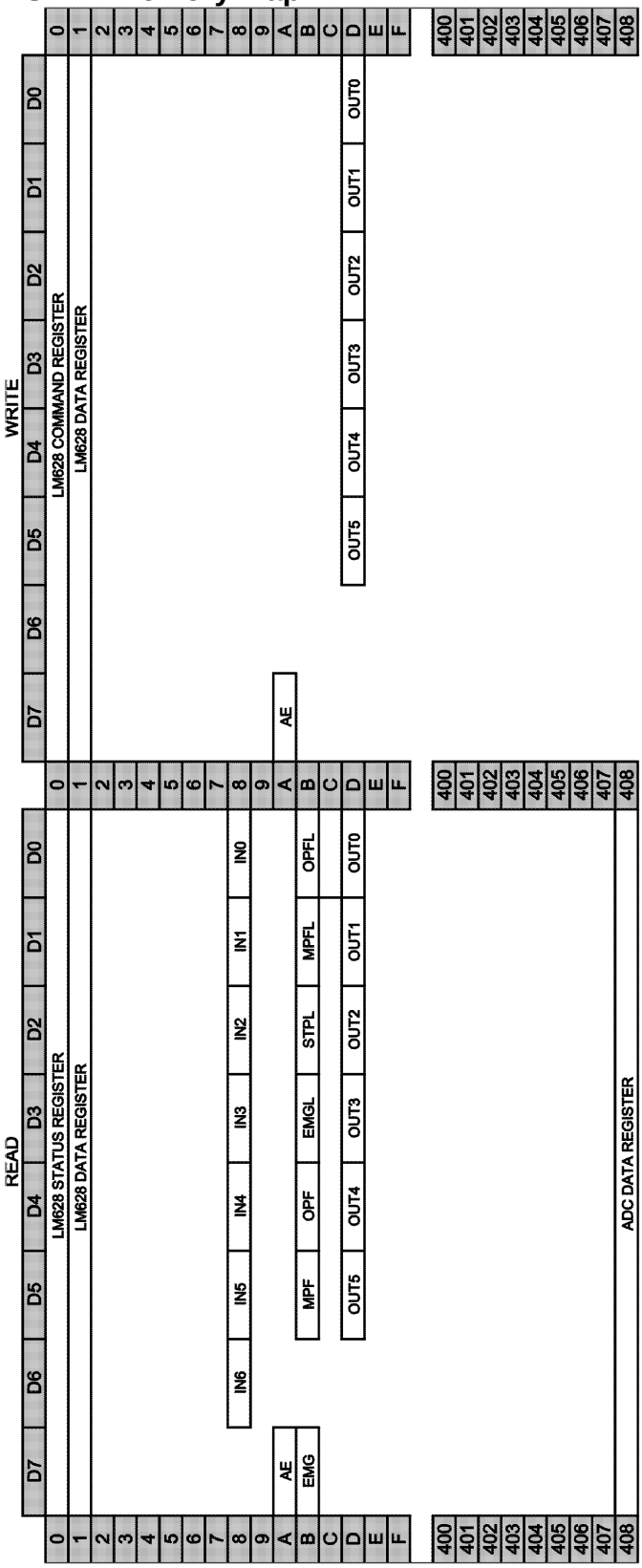


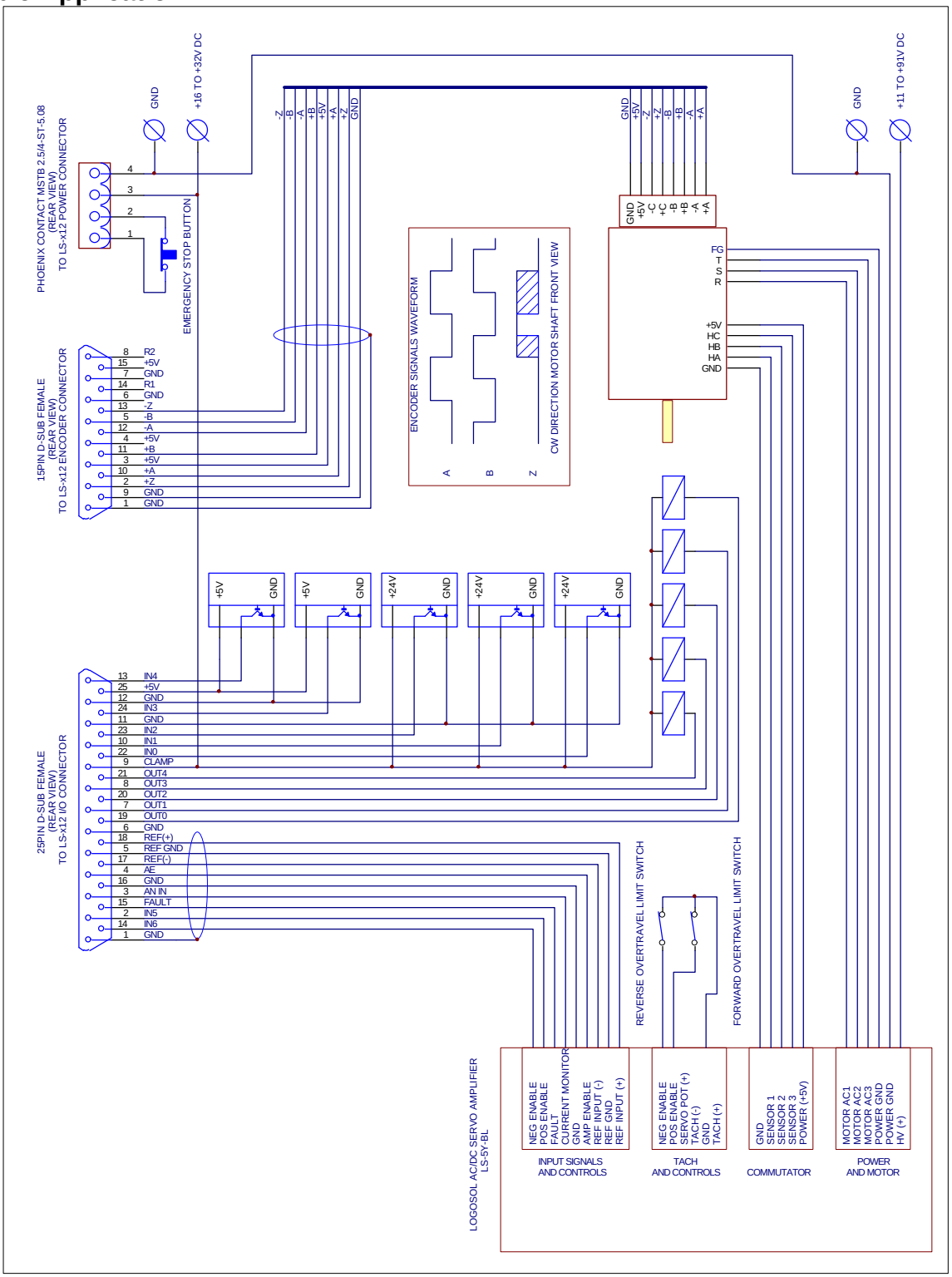
Figure 7: Connecting LS-x12 to Host RS-232C port using 25-pin connector

LS-x12 Memory Map



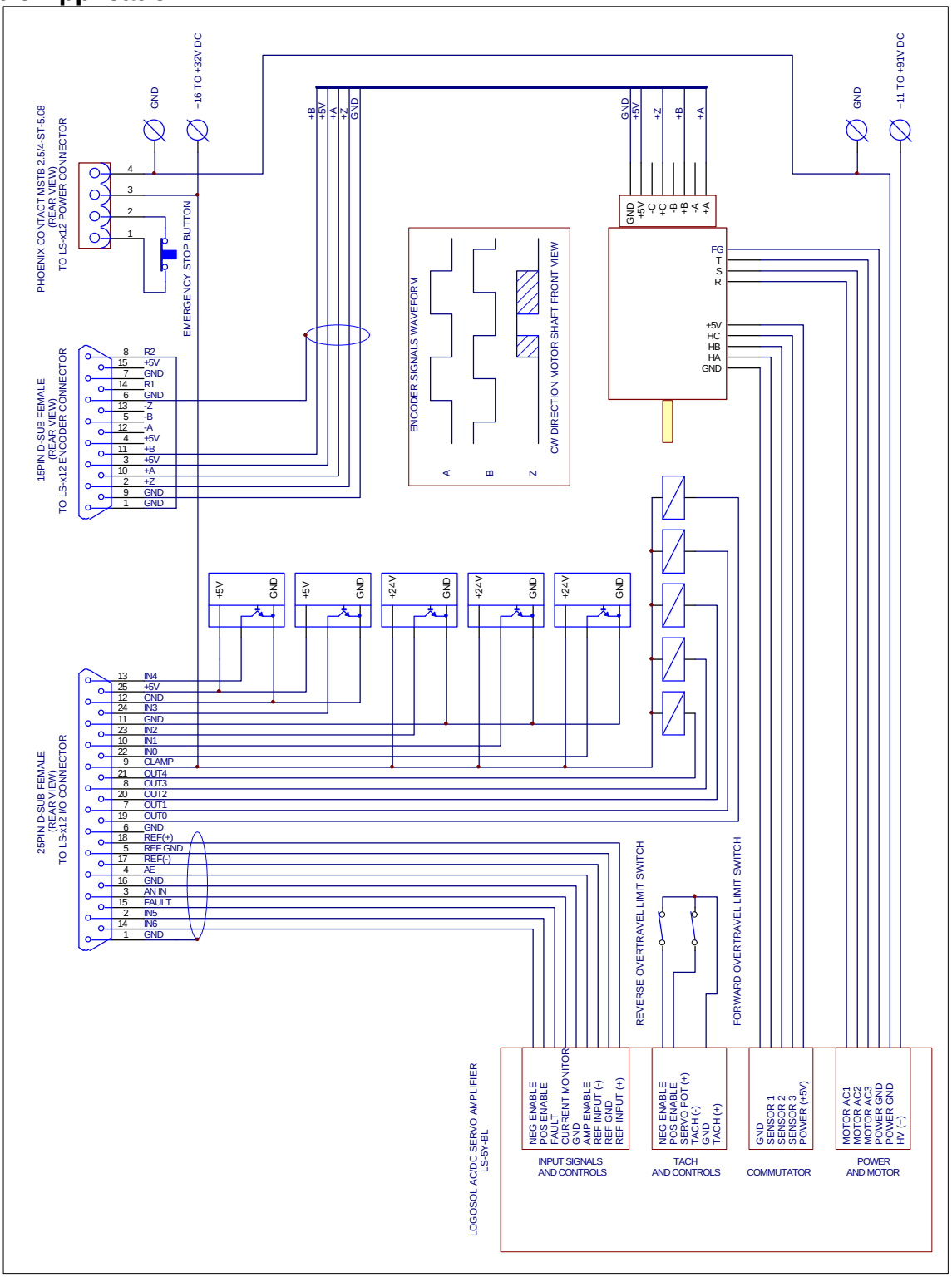
L.S.-x12 registers, I/O and status bits shown with their offset from controller base address

Sample Application #1



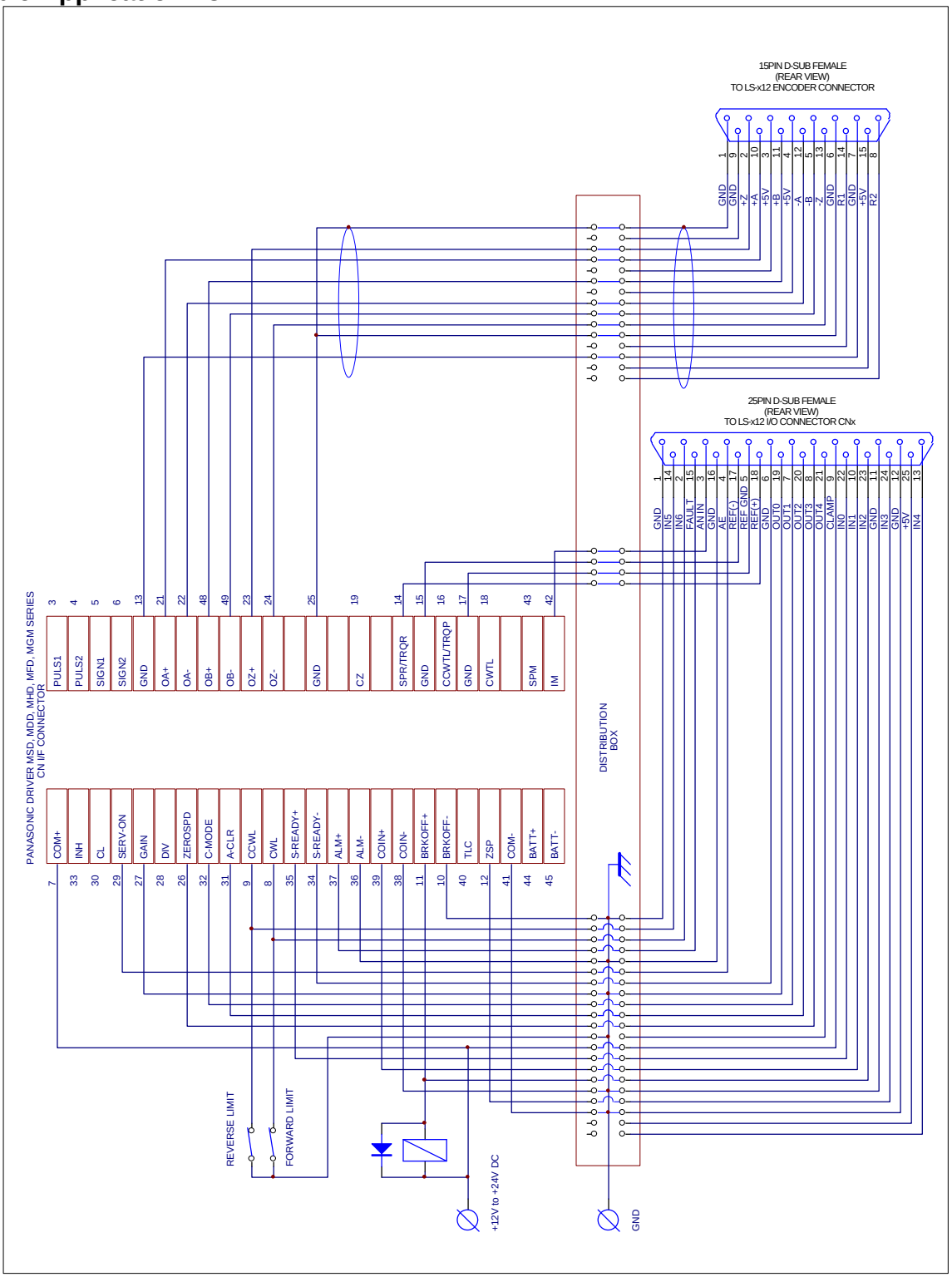
Interfacing LS-x12 to Logosol LS-5Y-BL servo amplifier and brushless motor with differential encoder

Sample Application #2



Interfacing LS-x12 to Logosol LS-5Y-BL servo amplifier and brushless motor with nondifferential encoder

Sample Application #3



Interfacing LS-x12 to Panasonic MSD, MDD, MHD, MFD, MQD, MGM series motor driver

*Note: The tin line connections shown in the distribution box are optional. The simplest (minimum) configuration requires only these connections shown with tick line.

Typical LS-x12.INI file

```
; Logosol Programmable Servo & Logic Controller LS-x12
; System configuration file
; Copyright 1999 Logosol, Inc.

; For technical support contact support@logosolinc.com

; Created November 30, 1999

[BOARDS]
Axis_A      0x280      ; available for LS-112 to LS-612
Axis_B      0x290      ; available for LS-212 to LS-612
Axis_C      0x2a0      ; available for LS-312 to LS-612
Axis_D      0x2b0      ; available for LS-412 to LS-612
Axis_E      0x220      ; available for LS-512 and LS-612
Axis_F      0x230      ; available for LS-612


[ADC]

; ADC definition

ADC_A       Axis_A  0x408  8   0   HIGH  ; available for LS-112 to LS-612
ADC_B       Axis_B  0x408  8   0   HIGH  ; available for LS-212 to LS-612
ADC_C       Axis_C  0x408  8   0   HIGH  ; available for LS-312 to LS-612
ADC_D       Axis_D  0x408  8   0   HIGH  ; available for LS-412 to LS-612
ADC_E       Axis_E  0x408  8   0   HIGH  ; available for LS-512 and LS-612
ADC_F       Axis_F  0x408  8   0   HIGH  ; available for LS-612

[INPUTS]

; The following group of inputs is available for LS-112 to LS-612

IN0_A       Axis_A      IN0     LOW
IN1_A       Axis_A      IN1     LOW
IN2_A       Axis_A      IN2     LOW
IN3_A       Axis_A      IN3     LOW
IN4_A       Axis_A      IN4     LOW
IN5_A       Axis_A      IN5     LOW
IN6_A       Axis_A      IN6     LOW
STPLflag_A  Axis_A      STPL    HIGH
EMGflag_A   Axis_A      EMG     HIGH
EMGLflag_A  Axis_A      EMGL    HIGH
OPFflag_A   Axis_A      OPF     HIGH
OPFLflag_A  Axis_A      OPFL    HIGH
MPFflag_A   Axis_A      MPF     HIGH
MPFLflag_A  Axis_A      MPFL    HIGH
AE_A        Axis_A      AE      HIGH
```

; The following group of inputs is available for LS-212 to LS-612

IN0_B	Axis_B	IN0	LOW
IN1_B	Axis_B	IN1	LOW
IN2_B	Axis_B	IN2	LOW
IN3_B	Axis_B	IN3	LOW
IN4_B	Axis_B	IN4	LOW
IN5_B	Axis_B	IN5	LOW
IN6_B	Axis_B	IN6	LOW
STPLflag_B	Axis_B	STPL	HIGH
EMGflag_B	Axis_B	EMG	HIGH
EMGLflag_B	Axis_B	EMGL	HIGH
OPFflag_B	Axis_B	OPF	HIGH
OPFLflag_B	Axis_B	OPFL	HIGH
MPFflag_B	Axis_B	MPF	HIGH
MPFLflag_B	Axis_B	MPFL	HIGH
AE_B	Axis_B	AE	HIGH

; The following group of inputs is available for LS-312 to LS-612

IN0_C	Axis_C	IN0	LOW
IN1_C	Axis_C	IN1	LOW
IN2_C	Axis_C	IN2	LOW
IN3_C	Axis_C	IN3	LOW
IN4_C	Axis_C	IN4	LOW
IN5_C	Axis_C	IN5	LOW
IN6_C	Axis_C	IN6	LOW
STPLflag_C	Axis_C	STPL	HIGH
EMGflag_C	Axis_C	EMG	HIGH
EMGLflag_C	Axis_C	EMGL	HIGH
OPFflag_C	Axis_C	OPF	HIGH
OPFLflag_C	Axis_C	OPFL	HIGH
MPFflag_C	Axis_C	MPF	HIGH
MPFLflag_C	Axis_C	MPFL	HIGH
AE_C	Axis_C	AE	HIGH

; The following group of inputs is available for LS-412 to LS-612

IN0_D	Axis_D	IN0	LOW
IN1_D	Axis_D	IN1	LOW
IN2_D	Axis_D	IN2	LOW
IN3_D	Axis_D	IN3	LOW
IN4_D	Axis_D	IN4	LOW
IN5_D	Axis_D	IN5	LOW
IN6_D	Axis_D	IN6	LOW
STPLflag_D	Axis_D	STPL	HIGH
EMGflag_D	Axis_D	EMG	HIGH
EMGLflag_D	Axis_D	EMGL	HIGH
OPFflag_D	Axis_D	OPF	HIGH
OPFLflag_B	Axis_D	OPFL	HIGH
MPFflag_D	Axis_D	MPF	HIGH
MPFLflag_D	Axis_D	MPFL	HIGH
AE_D	Axis_D	AE	HIGH

; The following group of inputs is available for LS-512 and LS-612

IN0_E	Axis_E	IN0	LOW
IN1_E	Axis_E	IN1	LOW
IN2_E	Axis_E	IN2	LOW
IN3_E	Axis_E	IN3	LOW
IN4_E	Axis_E	IN4	LOW
IN5_E	Axis_E	IN5	LOW
IN6_E	Axis_E	IN6	LOW
STPLflag_E	Axis_E	STPL	HIGH
EMGflag_E	Axis_E	EMG	HIGH
EMGLflag_E	Axis_E	EMGL	HIGH
OPFflag_E	Axis_E	OPF	HIGH
OPFLflag_E	Axis_E	OPFL	HIGH
MPFflag_E	Axis_E	MPF	HIGH
MPFLflag_E	Axis_E	MPFL	HIGH
AE_E	Axis_E	AE	HIGH

; The following group of inputs is available for LS-612

IN0_F	Axis_F	IN0	LOW
IN1_F	Axis_F	IN1	LOW
IN2_F	Axis_F	IN2	LOW
IN3_F	Axis_F	IN3	LOW
IN4_F	Axis_F	IN4	LOW
IN5_F	Axis_F	IN5	LOW
IN6_F	Axis_F	IN6	LOW
STPLflag_F	Axis_F	STPL	HIGH
EMGflag_F	Axis_F	EMG	HIGH
EMGLflag_F	Axis_F	EMGL	HIGH
OPFflag_F	Axis_F	OPF	HIGH
OPFLflag_F	Axis_F	OPFL	HIGH
MPFflag_F	Axis_F	MPF	HIGH
MPFLflag_F	Axis_F	MPFL	HIGH
AE_F	Axis_F	AE	HIGH

[OUTPUTS]

; The following group of outputs is available for LS-112 to LS-612

OUT0_A	Axis_A	OUT0	HIGH	OFF
OUT1_A	Axis_A	OUT1	HIGH	OFF
OUT2_A	Axis_A	OUT2	HIGH	OFF
OUT3_A	Axis_A	OUT3	HIGH	OFF
OUT4_A	Axis_A	OUT4	HIGH	OFF
FAULTpolarity_A	Axis_A	OUT5	HIGH	OFF

; The following group of outputs is available for LS-212 to LS-612

OUT0_B	Axis_B	OUT0	HIGH	OFF
OUT1_B	Axis_B	OUT1	HIGH	OFF

```
OUT2_B              Axis_B      OUT2   HIGH   OFF
OUT3_B              Axis_B      OUT3   HIGH   OFF
OUT4_B              Axis_B      OUT4   HIGH   OFF
FAULTpolarity_B     Axis_B      OUT5   HIGH   OFF

; The following group of outputs is available for LS-312 to LS-612

OUT0_C              Axis_C      OUT0   HIGH   OFF
OUT1_C              Axis_C      OUT1   HIGH   OFF
OUT2_C              Axis_C      OUT2   HIGH   OFF
OUT3_C              Axis_C      OUT3   HIGH   OFF
OUT4_C              Axis_C      OUT4   HIGH   OFF
FAULTpolarity_C     Axis_C      OUT5   HIGH   OFF

; The following group of outputs is available for LS-412 to LS-612

OUT0_D              Axis_D      OUT0   HIGH   OFF
OUT1_D              Axis_D      OUT1   HIGH   OFF
OUT2_D              Axis_D      OUT2   HIGH   OFF
OUT3_D              Axis_D      OUT3   HIGH   OFF
OUT4_D              Axis_D      OUT4   HIGH   OFF
FAULTpolarity_D     Axis_D      OUT5   HIGH   OFF

; The following group of outputs is available for LS-512 and LS-612

OUT0_E              Axis_E      OUT0   HIGH   OFF
OUT1_E              Axis_E      OUT1   HIGH   OFF
OUT2_E              Axis_E      OUT2   HIGH   OFF
OUT3_E              Axis_E      OUT3   HIGH   OFF
OUT4_E              Axis_E      OUT4   HIGH   OFF
FAULTpolarity_E     Axis_E      OUT5   HIGH   OFF
;
; The following group of outputs is available for LS-612
;
OUT0_F              Axis_F      OUT0   HIGH   OFF
OUT1_F              Axis_F      OUT1   HIGH   OFF
OUT2_F              Axis_F      OUT2   HIGH   OFF
OUT3_F              Axis_F      OUT3   HIGH   OFF
OUT4_F              Axis_F      OUT4   HIGH   OFF
FAULTpolarity_F     Axis_F      OUT5   HIGH   OFF
```

[AXES]

```
; The following axis definitions are available for LS-112 to LS-612

Name                A           rotary
Master              Axis_A      0
Encoder             1000
```

; The following axis definitions are available for LS-212 to LS-612

Name	B	rotary
Master	Axis_B	0
Encoder	1000	

; The following axis definitions are available for LS-312 to LS-612

Name	C	rotary
Master	Axis_C	0
Encoder	1000	

; The following axis definitions are available for LS-412 to LS-612

Name	D	rotary
Master	Axis_D	0
Encoder	1000	

; The following axis definitions are available for LS-512 and LS-612

Name	E	rotary
Master	Axis_E	0
Encoder	1000	

; The following axis definitions are available for LS-612

Name	F	rotary
Master	Axis_F	0
Encoder	1000	

[PARAMETERS]

; The following axis parameters are available for LS-112 to LS-612

VEL	A = 10000
ACC	A = 20000
MAX	A = 1000
KP	A = 20
KD	A = 1000
KI	A = 20
IL	A = 80
DS	A = 256
FLIMIT	A = NOLIMIT
RLIMIT	A = NOLIMIT
PRO	A = 0

; The following axis parameters are available for LS-212 to LS-612

```
VEL             B = 10000
ACC             B = 20000
MAX             B = 1000
KP              B = 20
KD              B = 1000
KI              B = 20
IL              B = 80
DS              B = 256
FLIMIT          B = NOLIMIT
RLIMIT          B = NOLIMIT
PRO             B = 0
```

; The following axis parameters are available for LS-312 to LS-612

```
VEL             C = 10000
ACC             C = 20000
MAX             C = 1000
KP              C = 20
KD              C = 1000
KI              C = 20
IL              C = 80
DS              C = 256
FLIMIT          C = NOLIMIT
RLIMIT          C = NOLIMIT
PRO             C = 0
```

; The following axis parameters are available for LS-412 to LS-612

```
VEL             D = 10000
ACC             D = 20000
MAX             D = 1000
KP              D = 20
KD              D = 1000
KI              D = 20
IL              D = 80
DS              D = 256
FLIMIT          D = NOLIMIT
RLIMIT          D = NOLIMIT
PRO             D = 0
```

; The following axis parameters are available for LS-512 and LS-612

```
VEL             E = 10000
ACC             E = 20000
MAX             E = 10000
KP              E = 20
KD              E = 1000
KI              E = 20
IL              E = 80
```

DS	E = 256
FLIMIT	E = NOLIMIT
RLIMIT	E = NOLIMIT
PRO	E = 0

; The following axis parameters are available for LS-612

VEL	F = 10000
ACC	F = 20000
MAX	F = 10000
KP	F = 20
KD	F = 1000
KI	F = 20
IL	F = 80
DS	F = 256
FLIMIT	F = NOLIMIT
RLIMIT	F = NOLIMIT
PRO	F = 0

[SYSTEM]

TimeSlice	5
Info	Text
Report	0x0
Kernel	ON
MaxSamples	1000
MaxArrays	5000
MaxVars	220
MaxLines	6000
MaxMacros	240
MaxProc	120
Upload	transfer /s
Download	transfer /r