

# Logosol Network Master Controller LS-990

Doc #712990001/ Rev. B, 02/17/2003

## Features

- ❑ 18.432 MHz Rabbit 2000™ CPU
- ❑ 256K FLASH Memory
- ❑ 128K RAM
- ❑ RAM Backup Battery
- ❑ Two Logosol Distributed Control Network (LDCN) ports, hosting of up to 62 network nodes
- ❑ One programming / RS-232 serial port
- ❑ One RS-232 / RS-485 (2 wire) serial port
- ❑ LCD Display 2 x 20 characters
- ❑ 7 Button Keyboard
- ❑ Rotary encoder
- ❑ 12VDC to 32VDC single power supply
- ❑ Real-time and multi-tasking capabilities
- ❑ Free Dynamic C® Library supporting Logosol product family for distributed servo, stepper and I/O control
- ❑ Small footprint (6.25"x2.36"x2")



## Description

LS-990 is a powerful, cost-effective, C-programmable CPU module with 2x20 characters LCD display, keyboard, and rotary encoder developed especially for hosting of Logosol devices as distributed servo, stepper and I/O control nodes. The programming is accomplished via a standard RS-232 port by using Z-World's Dynamic C® development environment featuring interactive editor, compiler and source level debugger. The high-performance Rabbit 2000™ microprocessor combined with Logosol's servo, stepper and I/O nodes offers a versatile platform for wide range of industrial control applications.

Dynamic C® is an enhanced version of the industry standard C programming language with real-time and multi-tasking capabilities, designed to compile a program with applicable library routines and download the code to a target system. Comprehensive Dynamic C® libraries are available free of charge to facilitate the integration of Logosol controllers with LS-990.

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## TECHNICAL SPECIFICATIONS rated at 25°C ambient, POWER(+) 12÷32V = 24VDC

POWER SUPPLY VOLTAGE	12÷32 VDC, (10÷40VDC Abs. Max range) Supply current <100 mA at 24VDC
CPU	Rabbit 2000™ – 18.432 MHz
FLASH Memory	256K
RAM	128K
SERIAL INTERFACES	COM A – RS-232 COM B – RS-485 full duplex (4 wire) LDCN compatible COM C – RS-485 full duplex (4 wire) LDCN compatible COM D – RS-232 or RS-485 half duplex (2 wire)
LCD Display	2 lines, 20 characters, 5x8 dots LCD display
Keyboard	7 buttons Rotary encoder 24 pulse / rev.
LED Red LED – PD7 controlled	PD7 = input = LOW light intensity PD7 = output set to “1” = light OFF PD7 = output set to “0” = HIGH light intensity
RAM BACKUP BATTERY	3V - CR2032
THERMAL REQUIREMENTS Storage temperature range Operating temperature range	–30 to +85 °C 0 to 45 °C
MECHANICAL Size Weight	6.25"x2.36"x2" 0.55lib. (250gr.)
MATING CONNECTORS CN1 – POWER CN2 – COM D CN3 – COM B (LDCN 1) CN4 – COM C (LDCN 2) CN5 – COM A	Magnum EM2565-02-VL or Phoenix MSTB 2.5/2-ST-5.08 6 pin RJ 11 8 pin RJ 45 8 pin RJ 45 6 pin RJ 11

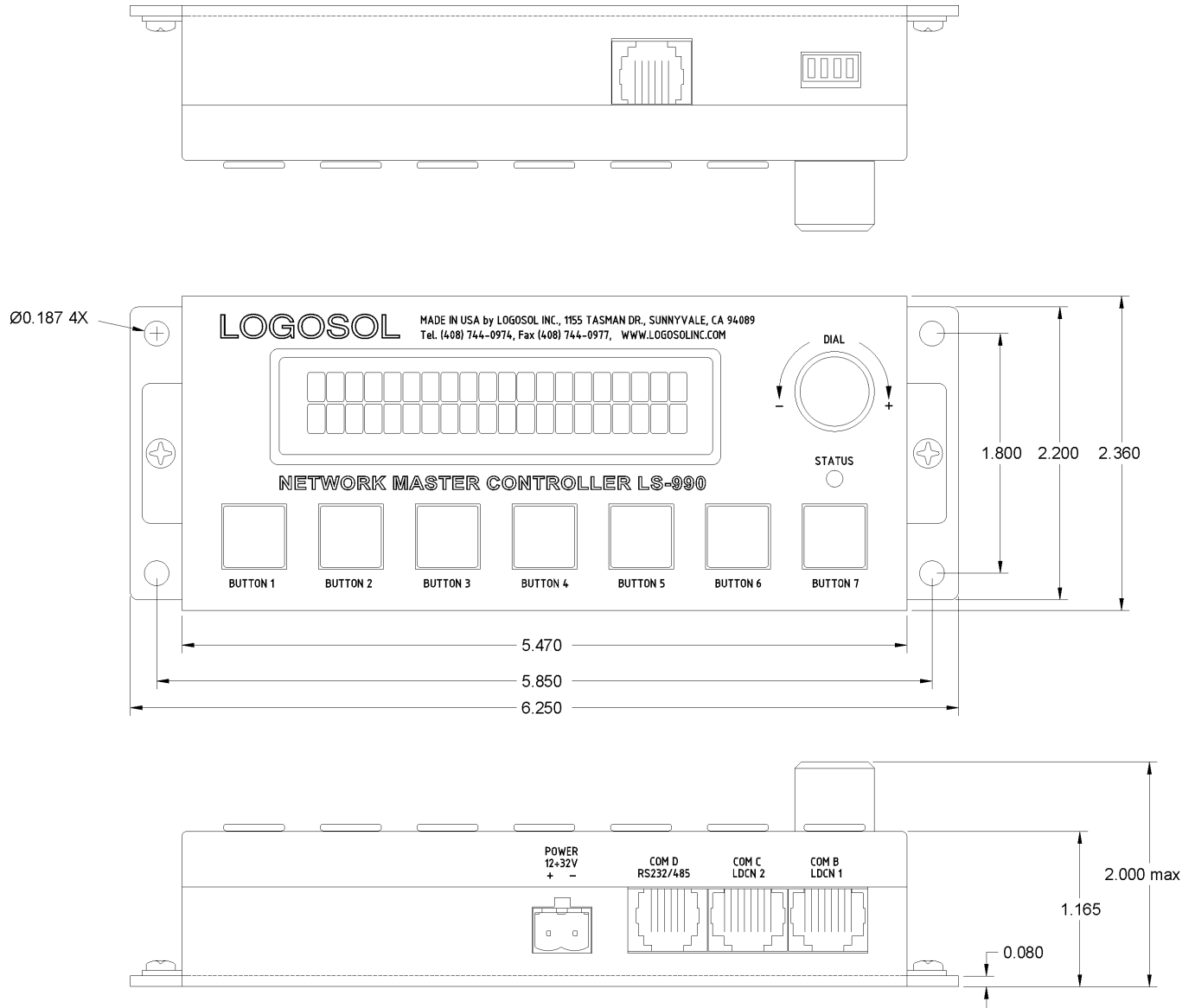
## ORDERING GUIDE

PART NUMBER	MODEL	DESCRIPTION
912990001	LS-990	Network master controller 2x20 LCD, Rabbit 2000™ CPU, 18.432MHz, 128K RAM, 256K FLASH
912801006	LS-884	RJ 11 6C to D-sub female 9 pin RS-232 adapter with RJ 11 L=7' cable.
324010036	EM2562-02-VL	Magnum EM2565-02-VL

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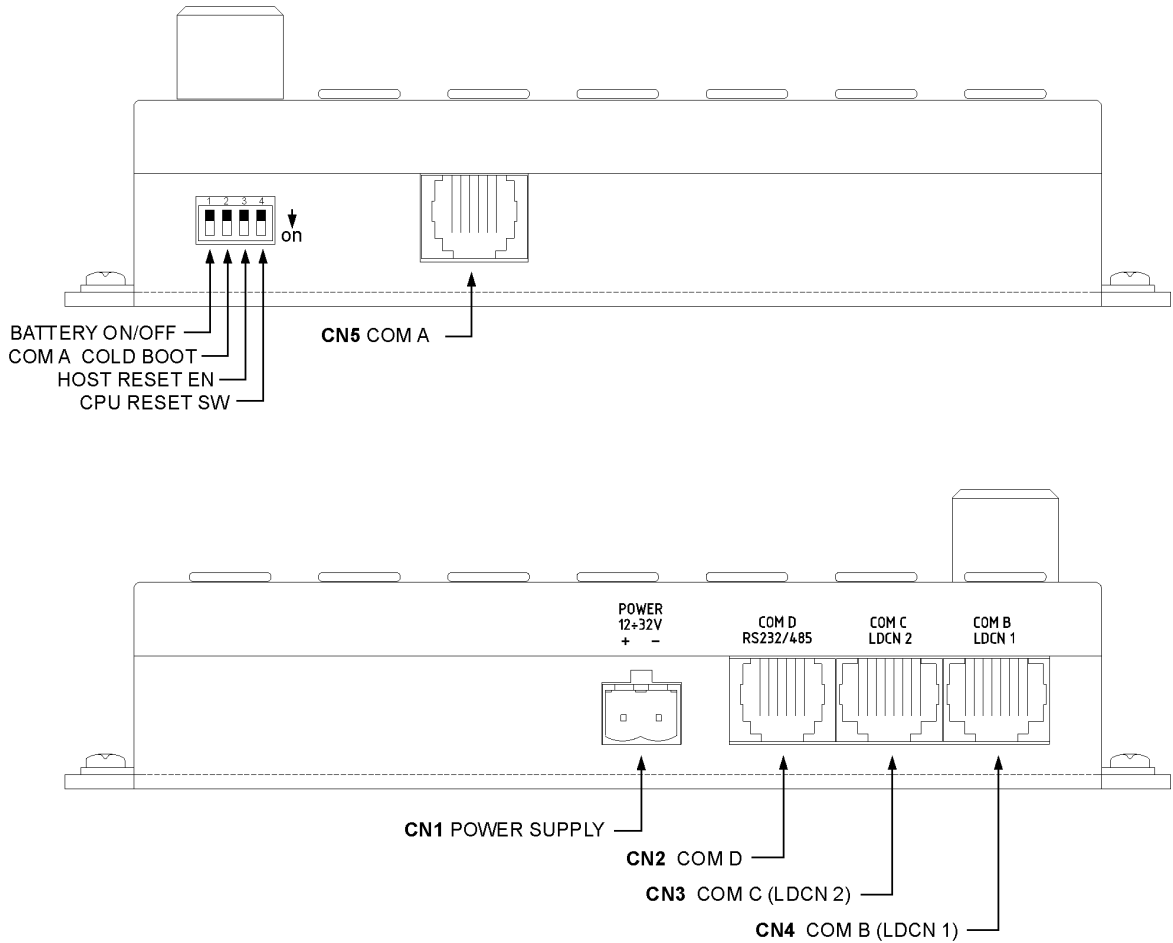
## DIMENSIONAL DRAWING



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## CONNECTOR LAYOUT



## DIP SWITCHES

SW	FUNCTION	DESCRIPTION
1	BATTERY ON/OFF	RAM Backup battery ON/OFF
2	COM A COLD BOOT	ON = COM A COLD BOOT ENABLED
3	HOST RESET EN	ON = HOST RESET ENABLED
4	CPU RESET SW	ON = CPU RESET

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## CN1 – POWER

PIN	SIGNAL	DESCRIPTION
1	POWER (+) 12 to 32VDC	12-32VDC power supply, positive terminal
2	POWER GND*	Power supply ground

## CN2 – COM D

PIN	SIGNAL	DESCRIPTION
1	RXD	RS-232 Receive data
2	TXD	RS-232 Transmit data
3	-D	RS-485 (-) Data terminal
4	+D	RS-485 (+) Data terminal
5	GND*	Interface ground
6	+5V**	+5V Power output

## CN3 – COM C (LDCN 2)

PIN	SIGNAL	DESCRIPTION
1	N.C.	Not Connected
2	GND*	Interface ground
3	+RX	(+) Receive data
4	-RX	(-) Receive data
5	-TX	(-) Transmit data
6	+TX	(+) Transmit data
7	+5V**	+5V Power output
8	GND*	Interface ground

## CN4 – COM B (LDCN 1)

PIN	SIGNAL	DESCRIPTION
1	N.C.	Not Connected
2	GND*	Interface ground
3	+RX	(+) Receive data
4	-RX	(-) Receive data
5	-TX	(-) Transmit data
6	+TX	(+) Transmit data
7	+5V**	+5V Power output
8	GND*	Interface ground

## CN5 – COM A

PIN	SIGNAL	DESCRIPTION
1	RXA	RS-232 Receive data
2	TXA	RS-232 Transmit data
3	STAT	STATUS output from Rabbit 2000™ CPU (used by software development tools)
4	HRST	HOST RESET input (used by software development tools) Enabled by HOST RESET EN switch
5	GND*	Interface ground
6	+5V**	+5V Power output

\* POWER GND and GND are electrically connected. Drive's case is isolated from the controller circuitry and can be grounded externally.

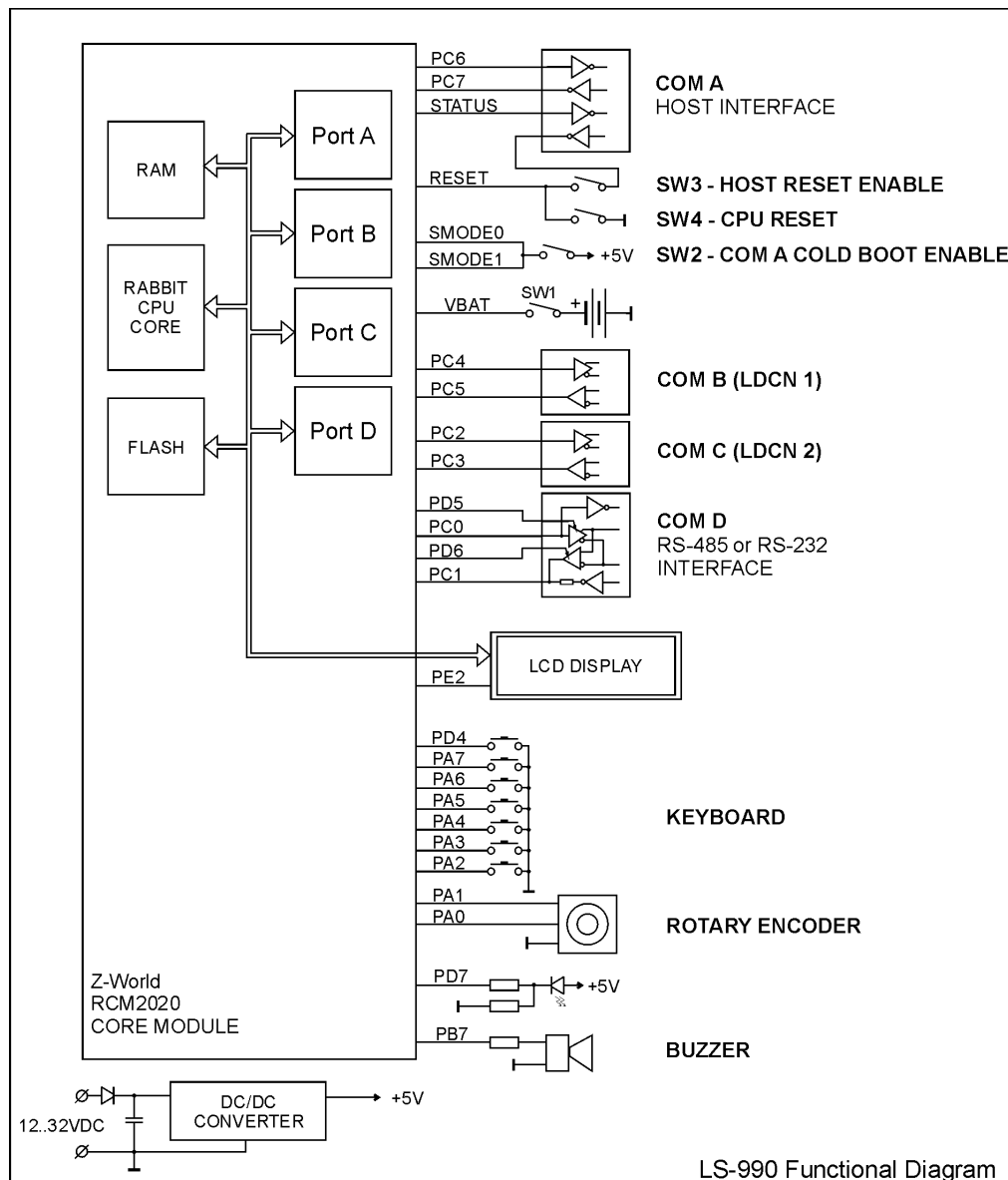
\*\* 250mA MAX for all outputs combined.

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## LS-990 ARCHITECTURE OVERVIEW

- CPU - Rabbit 2000™
- CPU clock – 18.432 MHz
- 256K FLASH memory
- 128K SRAM with battery backup
- Two full-duplex (4 wire) RS-485 port for hosting of up to 62 LDCN nodes
- One RS-232 for software development and general purpose applications
- One configurable RS-232 or RS-485 (2 wire) serial port
- LCD Display 2 lines, 20 characters
- 7 button keyboard
- Rotary encoder
- Buzzer
- LED indicator with two intensity levels

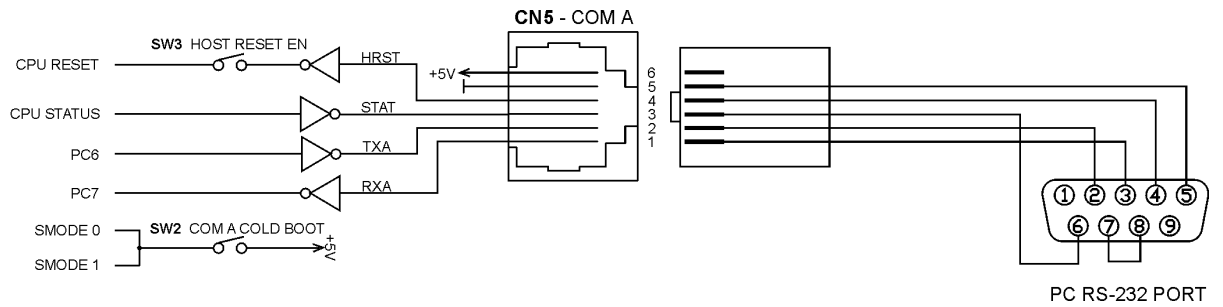


# Logosol Network Master Controller LS-990

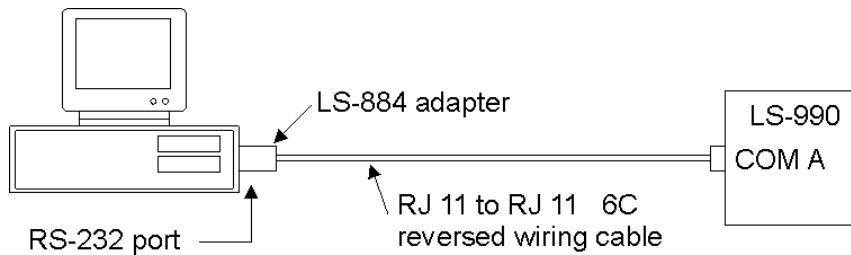
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## SERIAL INTERFACE (COM A)

- COM A corresponds to Rabbit 2000™ Serial port A.
- COM A schematics:



- SOFTWARE DEVELOPMENT mode:  
SW 2 = ON  
SW 3 = ON



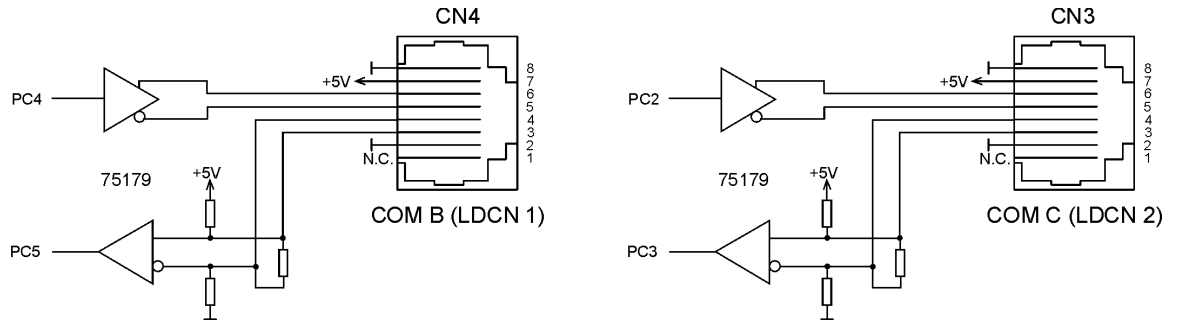
In this mode, LS-990 can be controlled by Z-World development tools.

For more information, see the related documents at <http://www.zworld.com/> and <http://www.rabbitsemiconductor.com/>.

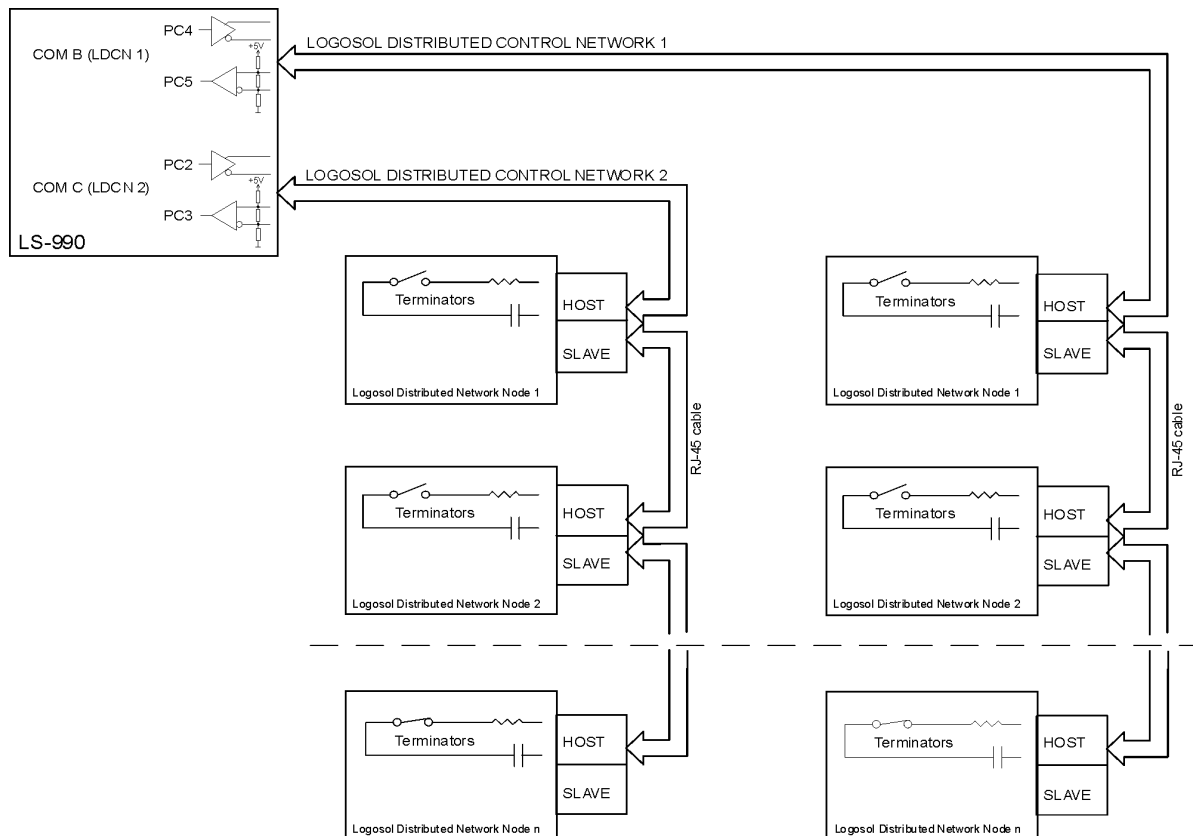
- RS-232 interface mode:  
SW 2 = OFF  
SW 3 = OFF

## SERIAL INTERFACE COM B (LDCN 1) and COM C (LDCN 2)

- COM B corresponds to Rabbit 2000™ Serial port B.
- COM C corresponds to Rabbit 2000™ Serial port C.
- Interface schematics:



- LDCN 1 and LDCN 2 are especially designed for interfacing with Logosol Distributed Control Network, hosting up to 31 distributed servo, stepper, I/O and other devices per network.
- Typical LDCN application schematics:

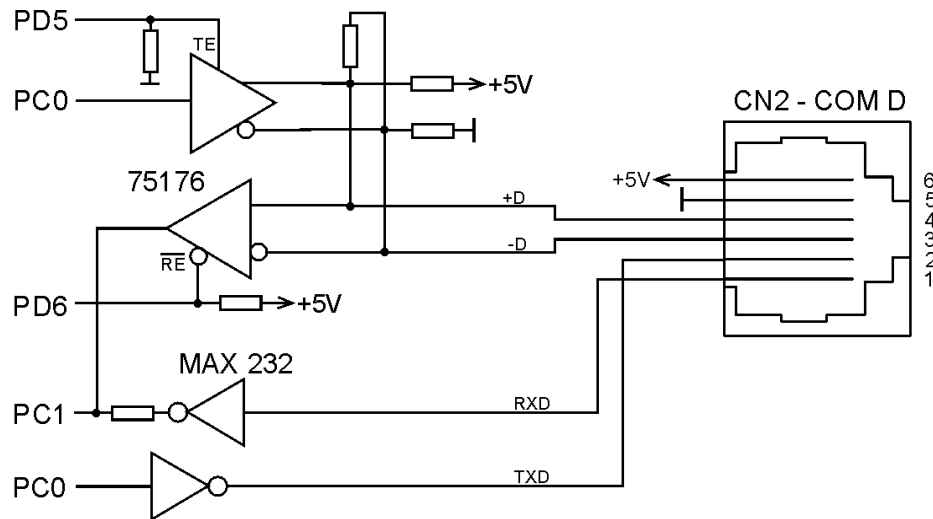


For a full description of LDCN, refer to the manuals and software library, available for download at <http://www.logosolinc.com/>.



## SERIAL INTERFACE (COM D)

- COM D corresponds to Rabbit 2000™ Serial port D.
- Interface schematics:



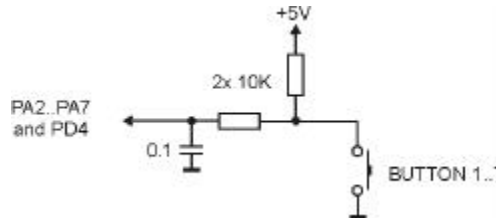
- RS-232 mode:  
Program PD5 and PD6 as standard outputs. Set PD5 = 0 and PD6 = 1.
- RS-485 mode:  
To control the direction PD5 and PD6 should be programmed as a standard outputs.  
PD5 = 1 and PD6 = 1 – transmit mode  
PD5 = 0 and PD6 = 0 – receive mode

## LCD DISPLAY

- The 2 line 20 characters LCD display is compatible with L2032 series LCD display's from SEIKO Instruments. For more information, see the related documents at: <http://www.seiko-usa-ecd.com/>
- LCD data bus (DB7..DB0) is connected to Rabbit 2000™ data bus (D7..D0).
- LCD enable (E) is connected to the inverted Rabbit 2000™ Parallel port E bit 2 (PE2).
- LCD register select (RS) input is connected to Rabbit 2000™ address line A0.
- Rabbit 2000™ Parallel port E bit 2 (PE2) should be initialized in I/O strobe mode.  
For detailed information, see the software library or visit: <http://www.logosolinc.com/>.

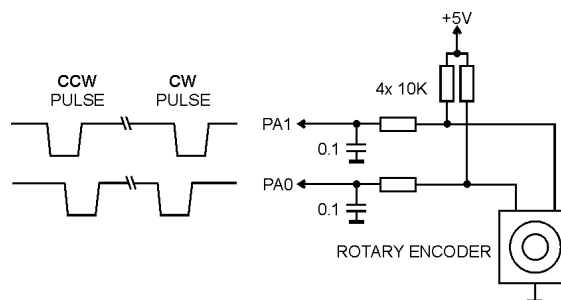
## KEYBOARD

- The keyboard features seven push buttons.  
When button is pressed the corresponding Rabbit 2000™ Parallel port bit is read as "0"  
See Rabbit 2000™ port assignments table for details.



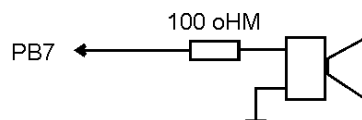
## ROTARY ENCODER

- The rotary encoder phases are connected to Rabbit 2000™ Parallel port A bit 0 and bit 1 (PA0 and PA1). Rotary encoder resolution - 24 pulses / revolution.



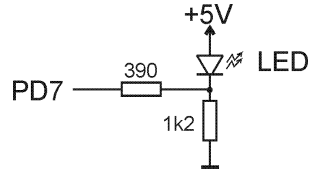
## BUZZER

- The Buzzer can be controlled by Rabbit 2000™ Parallel port B bit 7 (PB7).  
To activate Buzzer set PB7 = 1 for at least 1mS.  
The Buzzer control is available for the user software.



## LED

- LED intensity can be controlled by Rabbit 2000™ Parallel port D bit 7 (PD7).
- LED control schematics:



- LED intensity table:

PD7 MODE	STATE	LED INTENSITY
INPUT	X	LOW
OPEN-DRAIN OUTPUT	1	LOW
OPEN-DRAIN OUTPUT	0	HIGH
STANDARD OUTPUT	1	NONE
STANDARD OUTPUT	0	HIGH

The LED intensity control is available for the user software.

## DIP SWITCHES

- SW 1 (BATTERY ON/OFF) switch turns on and off RAM backup battery.  
SW 1 = ON – RAM keeps the information during power off.  
SW 1 = OFF – The information in RAM is destroyed during power off.
- SW 2 (COM A COLD BOOT) switch – see Serial interface COM A
- SW 3 (HOST RESET EN) switch – see Serial interface COM A
- SW 4 (CPU RESET SW) switch corresponds to Rabbit 2000™ CPU master reset.  
SW 4 = ON – Rabbit 2000™ CPU in reset condition.  
SW 4 = OFF – Rabbit 2000™ CPU is running.

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## RABBIT 2000™ PORTS ASSIGNMENT AND INITIALIZATION

### PORT A

	INITIALIZED AFTER RESET		REMARKS
	DIRECTION	DATA	
PA7	Input	none	Button 2 – read as logic “0” when pressed
PA6	Input	none	Button 3 – read as logic “0” when pressed
PA5	Input	none	Button 4 – read as logic “0” when pressed
PA4	Input	none	Button 5 – read as logic “0” when pressed
PA3	Input	none	Button 6 – read as logic “0” when pressed
PA2	Input	none	Button 7 – read as logic “0” when pressed
PA1	Input	none	Rotary encoder
PA0	Input	none	Rotary encoder

### PORT B

	INITIALIZED AFTER RESET		REMARKS
	DIRECTION	DATA	
PB7	Output	0	Buzzer
PB6	Output	0	Reserved
PB5	Input	none	Identification – read as logic “1”
PB4	Input	none	Identification – read as logic “1”
PB3	Input	none	Identification – read as logic “1”
PB2	Input	none	Identification – read as logic “0”
PB1	Input	none	Reserved
PB0	Input	none	Reserved

### PORT C

	INITIALIZED AFTER RESET		REMARKS
	DIRECTION	DATA	
PC7	Input	none	Serial Port A RX
PC6	Output	1	Serial Port A TX
PC5	Input	none	Serial Port B RX
PC4	Output	1	Serial Port B TX
PC3	Input	none	Serial Port C RX
PC2	Output	1	Serial Port C TX
PC1	Input	none	Serial Port D RX
PC0	Output	1	Serial Port D TX

### PORT D

	INITIALIZED AFTER RESET		REMARKS
	DIRECTION	DATA	
PD7	O.D. Output	1	LED intensity control
PD6	Output	1	Serial port D RS-485 mode receive enable
PD5	Output	0	Serial port D RS-485 mode transmit enable
PD4	Input	none	Button 1 – read as logic “0” when pressed
PD3	Output	0	Reserved
PD2	Output	0	Reserved
PD1	Output	0	Reserved
PD0	Output	0	Reserved

### PORT E

	INITIALIZED AFTER RESET		REMARKS
	DIRECTION	DATA	
PE7	Output	0	Reserved
PE6	Output	0	Reserved
PE5	Output	0	Reserved
PE4	Output	0	Reserved
PE3	Output	0	Reserved
PE2	Output	1	LCD Display enable
PE1	Output	0	Reserved
PE0	Output	0	Reserved