*Process Control Display with PLC & communications interfaces*

Features

- **LCD backlit** 20 character x 2 line (82mm x 18mm)
- **IP56** rated **outdoor** DIN metal enclosure – dust & water-jet protected
- **8..28VDC** switchmode operation
- **MODBUS** RTU and ASCII protocols standard (Active or Passive)
- Independent **RS-232** and **RS-485** interfaces or PLC pulse input
- Programmable OC **alarm** output
- **Bargraph** mode display
- **EEPROM** message memory
- **MicroSD** memory option
- Built-in **VGA** or **TV** video output up to 128 characters x 64 lines
- Video **giant character** mode for distance viewing
- P8X32A eight core 32-bit CPU
- CE0039/LV100 backward compatible

Optional Video Display
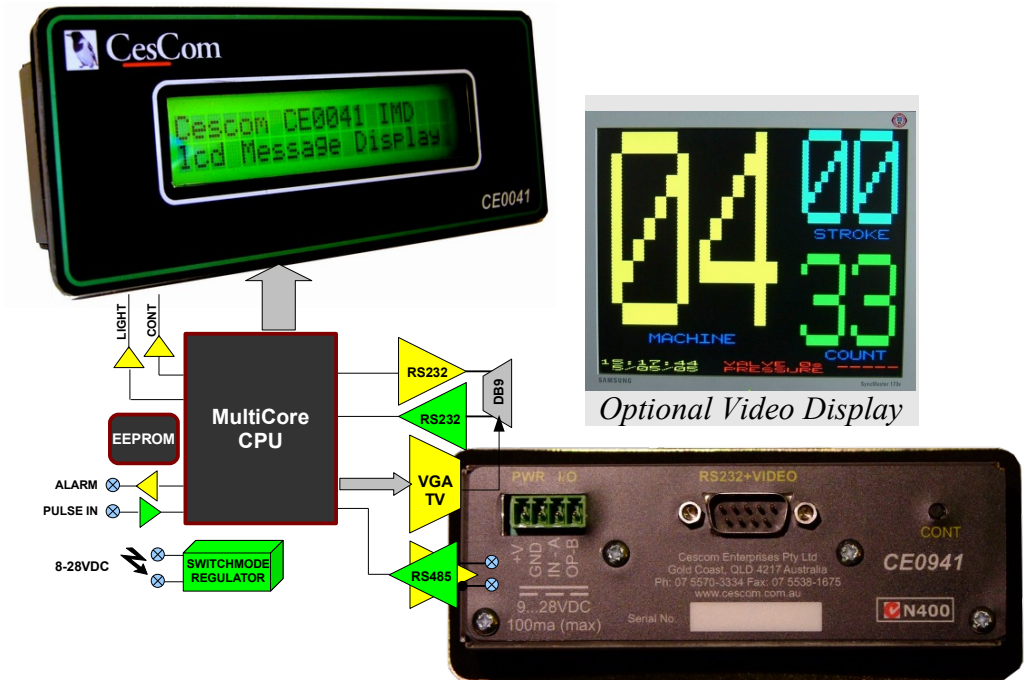
Overview

This is a character LCD display that is designed for industrial environments for use with PLC using MODBUS or other protocols. The unit is DIN mounted along with a neprene gasket through the front of the facia and clamped from behind with the supplied bracket. The front is fully sealed and can be used where powerful water jets are employed to clean equipment facias. This also makes it suitable for outdoor use as well with the LCD clearly readable in direct sunlight.

Muliple communications methods are possible using the RS232 and RS485 ports for direct connection to PLCs and PCs etc. The serial communications ports are fully programmable in standard and non-standard formats and baud-rates (0..2Mbit, 1..32 data bits etc).

A typical connection scheme would be to run a 4-core cable from the PLC carrying the 2-wire RS485 signal plus 24 volts for power which can be run hundreds of metres without requiring a local PSU.

The PLC can communcate directly with the display using the default MODBUS or customer specified protocol. Alternatively the display can passively monitor the bus and interpret and display appropriate messages. The monitor mode is useful for alarm and diagnostic messaging and includes a programmable high-current output that can be set to trip on user specified conditions.

VGA and TV outputs are built-in and are capable of 64 colors with a mix of hires text and lores graphics.

Options include a programmable alarm output may be set to operate when the inputs reach a preset match condition. Various parameters governing the input range, brightness, alarm conditions etc. can be set via the RS-232 input.

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Specifications

Supply Voltage	8...28VDC
Current	60ma @24VDC, 100ma @12VDC
Physical	132 width x54 height x 40mm depth 1mm steel
Environment	-40'C to +85'C operating, IP56 rated
Connections	4 way 5.04mm screw terminal block + DB9M
Standards	IEC 1010; AS/NZS 3548 EMI/EMC; C Tick compliant
Switch Output	2A MOSFET switch to common

RS-232	110 – 460.8K baud, all formats supported
RS-485	110 – 2M baud, all formats supported
MODBUS	RTU or ASCII via RS485 or RS232
CPU + MEMORY	32-bit 8 core CPU, 48KB RAM, 64KB EEPROM, MicroSD (option)
LCD	20 Character x 2 line (83mm x 18.6mm)
VGA + TV	Up to128x64, 64 colors, mixed text and graphics, NTSC/PAL mod/base
Pulse Input	5...28VDC pulse, 10us minimum (10ms default)

OPERATION

PLC PULSE MODE

This mode is suitable for simpler systems as the display will measure the width of an input pulse and display a preset message based upon the pulse-width. The default for the pulse-width unit is normally 50ms but may be user modified from 1ms to 100ms.

COMMUNICATIONS PORTS

Both the RS232 and RS485 ports are available independantly and concurrently and may be configured to suit the application. It is possible to use the RS232 port for configuration and diagnostics etc while the RS485 port is active.

RS-232 MODE

Arbitrary messages and effects can be displayed through the RS232 port. Messages longer than the display capacity are automatically scrolled repeatedly with full user control over these modes. The latest messages are logged in the optional SD card and also displayed on the optional VGA monitor or TV.

MODBUS

The IMD can be programmed with a MODBUS address and accept ASCII or formatted data from hosts either through the RS485 or RS232 port. Alternatively the IMD can passively monitor the bus for certain traffic and display an appropriate message such as detecting high-pressure limits. The MODBUS address and other parameters are set by configuring the unit in program mode through a menu screen presented via the RS232 port using Hyperterminal or similar.

CONNECTIONS

POWER   PULSE MODE

1	GND	Power common
2	+VIN	8...28VDC Input
3	PLC	5...28VDC signal
4	-OUT	Switched sink output

POWER   RS485 MODE

1	GND	Power common
2	+VIN	8...28VDC Input
3	A	RS-485 A (+)
4	B	RS-485 B (-)

DB9 COMS

1	VSYN	VGA VSYNCH
2	RXD	RS-232 Receive
3	TXD	RS-232 Transmit
4	HSYN	VGA HSYNCH
5	GND	Common
6	RED	VGA RED
7	GRN	VGA GREEN
8	BLU	VGA BLUE
9	TV	Composite video

FACTORY OPTIONS:
R: RS485 – The RS485 lines are connected to pins 3&4 of the screw terminal.
P: Pulse – Pins 3&4 are configured as pulse input and alarm outputs.

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MENU OPERATION

At start-up the CE0941 will display a message via the RS232 port. Connect to a terminal emulator such as Hyperterminal to view this. Default settings are 9600,8,N,1 and no handshake.

```
 HARDWARE: CE0941 Industrial Message Display
 FIRMWARE: CE0941.spin
 V1.1 100312-00:00


Hit Esc to enter setup menu .......................
```

You have 3 seconds from the time after the menu appears to hit the escape key to enter the menu otherwise the unit reverts to display mode. The menu appears after a quick listing of features and connections and is listed below.

```
Cescom CE0941 IMD
Commands             Usage     Description
****************************************************************
B Set baud rate     - 19200B    sets to 19200 BAUD
R Set RS485 baud rate 115200B   set RS485 port to 115200K baud
W Set Pulse Width   - 10W       sets 10ms pulses
H Set Holdoff       - 50H       holdoffs anymore pulses for 50ms
F Set Feature codes - 10F       turns on display blanking during pulse
                                use 1s and 0s to turn on/off virtual DIP switch
Q Reboot
? Show message      - 42?       Display message 42
? List all messages - ?         Copy the text from this listing to clone others
: Enter message     - 12:<text> Enter up to 64 characters total or two lines
                    - :         Enter all messages from the start
                                Hit escape to terminate
! Backup messages   - !         Backup messages to EEPROM

Controls
****************************************************************
Esc  Escape         -           Cancel the current entry and reprompt
sp   space          - 12 34     Enter multiple numbers
.    comma          - 115,200   Dummy control for clarity
bs   Backspace      - .........Clear last digit in current number

CMD>
```

The usage field demonstrates an example of how to use that command. Many commands can be used without parameters just to query the value, so B by itself will display the baud rate.

MENU COMMANDS

BAUD RATE
Any rate from 110 to 115200 can be entered. The software does not check to see if it is a standard baud rate so it is possible to use 31,250 if desired. The baud rate will take affect on a restart. In case the current baud rate is not known and the menu does not appear it is possible to send a break during the 3 second menu timeout in which case the baud rate will temporarily revert to 9600 so that it can be checked and set if needed.

RS-232 DISPLAY MODE
Normally the CE0941 will be in display mode unless the menu has been invoked. An inactivity timer of 60 seconds will cause the unit to be restarted and fall back to display mode so it can't be inadvertently left in the menu state.

All characters received will be displayed and control characters have special operations (refer to the control function listing). Also, non-standard ASCII characters from $80 to $FF will invoke stored messages 0 to 127 with a single character.

STORED MESSAGE MODE
Up to 128 messages of 20 characters by 2 lines can be entered and stored on the CE0941. Using a positive timed and variable width pulse on the pulse input will result in a message being displayed corresponding to the length of the pulse received. The default for the length of the pulse is in 50ms increments so that a pulse of 500ms will select message #10, 50ms selects message #1.

A discriminator automatically rounds off the timing of the pulse received so that it only needs to be in the +/-50% vicinity for that increment. Therefore a 50ms pulse can be from 25 to 75ms and be discriminated as a nominal 50ms pulse. Since 50% is the limit then pulse should therefore be well within those margins for reliable operation. Pulses less than 50% of the minimum pulse (default 50ms) are rejected. Also a hold-off period can be specified where no more pulses are read in case of noise or chatter.

ENTERING and CLONING MESSAGES
Follow the example in the menu to enter a message interactively. Empty lines will be ignored and partial lines will be padded to fill the 20 characters. To clone all the messages from the unit use the show message command "?" by itself which will list all messages to the terminal. Copy and paste these into another display when connected by first entering the ":" command by itself on the new display. After pasting an ESC can be entered which causes the unit to terminate at the end of the paste and backup the messages to EEPROM.

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DISPLAY CONTROL CODES

In display mode control characters are interpreted according to the table below:

```
$00 : '^@   Null
$01 : '^A   Home
$02 : '^B
$03 : '^C
$04 : '^D   Hide cursor
$05 : '^E   Underline cursor
$06 : '^F   Blinking block cursor
$07 : '^G   Pulse bell output
$08 : '^H   backspace
$09 : '^I   Tab
$0A : '^J   Line Feed
$0B : '^K   Cursor up
$0C : '^L   Clear screen and return home
$0D : '^M   Carriage return
$0E : '^N   Backlight on
$0F : '^O   Backlight off
$10 : '^P   Accept cursor-position entry
$11 : '^Q
$12 : '^R
$13 : '^S
$14 : '^T   Set backlight brightness
$15 : '^U   Display on
$16 : '^V   Display off
$17 : '^W   Set contrast (00..1F)
$18 : '^X   Set bell duration (00..FF)
$19 : '^Y
$1A : '^Z   RESET
$1B : '^[
$1C : '^\   Write next byte direct to lcd as a character
$1D : '^]   Write next byte direct to lcd as a control
$1E : '^^
$1F : '^_
```

CONTROLS

HOME
Move the cursor (visible or not) to the top left hand corner of the display.

CLEAR
Clear the display and move the cursor home.

CURSOR MODES
Hide or display the cursor.

BELL
Currently the CE0941 is configured to quick flash the backlight and operate the MOSFET output when a bell character is received. This operation can be factory configured to suit.

BACKLIGHT
Normally the backlight will be on but it can be controlled to suit.

DISPLAY ON/OFF
The display may be blanked without actually clearing it. Once the display on command is received again any text reappears.

CONTRAST
The default settings for contrast will most usually not need to be adjusted but if required a control sequence of $17 followed by a character value from $00 to $FF may be sent to vary the contrast and viewing angle (within limits).

CURSOR MODES
Hide or display the cursor.

RESET
Affects only the LCD display mode and resets everything back to a power-up default.

WRITE DIRECT
Useful for accessing the standard LCD functions directly from RS232 such as custom characters etc.