

Software Specification

To: Mark Pierce

Reference: 2003111101

Date: 11 November 2003

Description:

Control and acquisition unit for use with EMCYCLE software

Hardware Specification:

1. 8 bit MCU with A/D converters, PWM outputs and serial port
2. RS232 serial comms port (default), up to 58KBd
3. RS485 serial comms port (jumper selectable), up to 58KBd
4. 2 isolated analogue inputs, 10 bit A/D resolution, up to 400V with external attenuators
5. 2 analogue inputs, 10 bit A/D resolution, +5V max
6. 1 analogue converter, 16 bit A/D resolution, software switch selectable to one of the four analogue inputs
7. 4 digital inputs, 5-24V logic
8. 2 analogue outputs, +/-10V peak
9. 2 SPCO relay outputs, 240V ac at 5A max
10. 2 open collector outputs, 24V DC at 1A max

Software Specification:

To run under EMCYCLE control and be integrated within that package

Overview:

The computer will communicate to the control via a serial comms link using the regular computer ports. Standard baud rates up to 58K will be supported.

The display in EMCYCLE will reflect the data from and instructions to the control unit. Analogue signal data (ACQD command) will be displayed graphically, measured values (STAT command) will be displayed as a digital readout. Digital inputs and outputs will be displayed as "LEDs"

A check box is required in order to select control unit operation. If the control unit is deselected then no communications are made to it and data will not be displayed.

A direct command line interface input to the control unit is needed in order to adjust parameters and for diagnostic work.

Batch files can be activated during the dwell time to run sophisticated exercising sequences.

CPU Command set:

Input commands to the CPU shall consist of a four letter mnemonic. All commands shall consist only of upper case alphanumeric ASCII characters, which will be echoed back to the host. Only one character shall be sent from the host at a time and it shall wait for receipt of echo. A carriage return <LFCR> will be sent back to the host when the CPU is ready for further input, either data or a new command. Some commands require additional data input, which should be supplied when the <LFCR> has been sent to the host. A space (0x20), <LFCR>, lower case character, or any other non alphanumeric character at any time during the first four characters of the command will terminate that command.

Where a command requires the input or receipt of additional data, the data bytes shall be sent as ASCII character pairs in hexadecimal format (eg. 3F 0C 89 DB) followed by spaces. Additional spaces in the transmission are ignored. The data string shall be terminated with a <LFCR>. Sending an escape key <ESC> will abort the current command. Error codes are returned by the status command and are cleared after sending. Data bytes sent from the CPU to the host shall not wait for echo and will not expect to see it.

When a command has been processed, an additional <LFCR> will be sent to the host. Failure to process the command will usually generate an error code.

The command list is as follows:

ACQD	Acquires a stream of analogue data at 8 bit resolution from the isolated analogue input ports. Needs to be followed by the number 00 or 01 to denote which port is to be accessed.
ANIN	Analogue input on. Turns on measurement for specified port. Needs to be followed by 00, 01, 02, 03 or 04 to identify the port.
ANIF	Analogue input off. Turns off the specified analogue input port. Needs to be followed by 00, 01, 02, 03 or 04 to identify the port.
ANON	Analogue output on. A stored waveshape is transmitted repeatedly to the output port. Needs to be followed by 01 or 02 to identify the port.
ANOF	Analogue output off. Turns off the analogue output port. Needs to be followed by 01 or 02 to identify the port.
BAUD	Baud rate. To be followed by 00 (9K6), 01 (19K2), 02 (38K4) or 03 (57K6). Will change baud rate for all subsequent communications. A reset will default back to 9600 baud.
DIGO	Digital output, followed by a hex ascii byte to denote the status of the outputs.
LMEM	Load CPU memory (RAM). Used to load parameters into memory locations. Command sequence consists of "LMEM A1 D1 A2 D2.....<CR>", where A1 is the first address and D1 is the first data byte. Single spaces between pairs of characters will be ignored in the conversion process. A carriage return will be sent to the host after the last letter of the command mnemonic, to signify the start of data input.
LDOP	Load output sweep. Accepts an input data stream of 81 bytes as hex ascii input character pairs separated by spaces terminated with <LFCR> (total 245 bytes). The first byte is 00 or 01 to denote which of the two outputs is being addressed. This data stream becomes an 8 bit output wave shape from the appropriate port..
MEMD	Memory dump. Used only for diagnostic purposes
RSET	Reset. Resets the unit and restores default values.

SCNT	Scan time for analogue input data stream. Needs to be followed by a number from 00 to FF. Larger numbers correspond to longer scan times. Once issued, this value is retained by the control unit until it is reset.
SELI	Select input, selects which one of the four analogue inputs is to be allocated to the 16 bit A/D converter. Requires additional numbers 00, 01, 02, 03 or 04 to identify the port. If 00 is used, then the 16 bit A/D converter is disconnected and disabled.
STAT	Status request, returns current values and status as 18 information bytes in a hexadecimal ascii string (57 bytes total).
SWPT	Sweep time for analogue output. Determines the loop cycle time for the waveshape pattern. Needs to be followed by a number from 00 to FF. Larger numbers correspond to longer sweep times. Once issued, this value is retained by the control unit until it is reset or overridden.

Notes:

The status string values represent an almost instantaneous snapshot of the equipment under test (EUT) when the status command is issued. Analogue values are unipolar, so a zero level measurement needs to be made before testing begins.

The control unit can operate a timed sequence of events during the dwell period. This feature allows the EUT to be exercised whilst under duress. A sequencer is needed with variable time delays between each step and an instruction or state change associated with that step. A simple batch command executor would be perfectly adequate. The batch command would be executed during the dwell period at each frequency step. The batch commands could be stored as text files in a separate directory.

Output waveshapes to be downloaded, will be stored as text files in their own directory. A file menu will allow selection of the waveshape file. The destination port will need to be selected and individual control of the outputs.

Format for the status string is as follows:

Select input status	1 byte	(00-04)
Digital inputs	1 byte	D4,D3,D2,D1,X,X,X,X (1 = on or high level)
Analogue inputs	1 byte	AN4,AN3,AN2,AN1,AN0,X,X,X (1 = active)
Input scan rate	1 byte	
Analogue IP0 (16 bit)	2 bytes	MSB first
Analogue IP1 (iso)	2 bytes	MSB first
Analogue IP2 (iso)	2 bytes	MSB first
Analogue IP3	2 bytes	MSB first
Analogue IP4	2 bytes	MSB first
Outputs	1 byte	ANA1,ANA2,RLY1,RLY2,OC1,OC2,X,X (1 = active)
Output sweep time	1 byte	
Error code	1 byte	
Checksum	2 bytes	

Data returned by the ACQD command is unipolar and can be directly displayed in a graph format. This command is intended for monitoring waveshapes, not making voltage measurements. The graphs should be displayed only if the inputs are activated. Only one acquisition need be made per frequency step and should be acquired at the end of the dwell period before turning off the modulation.

Both status and data should be updated continuously at a period equivalent to the dwell interval, even when the test is not running and the RF is not applied. This requirement is essential for initial setting up and diagnostic work.

Baud rate default is determined by a link in the external connector. When the link is present, the baud rate is 57K6 on the RS485 circuit and when the link is not present the baud rate is 9600 on the RS232 circuit.

In the batch file command language, a command "DLAY n", where n is an integer adds a delay of "n" seconds to the batch file execution

David G. Cass
Director

