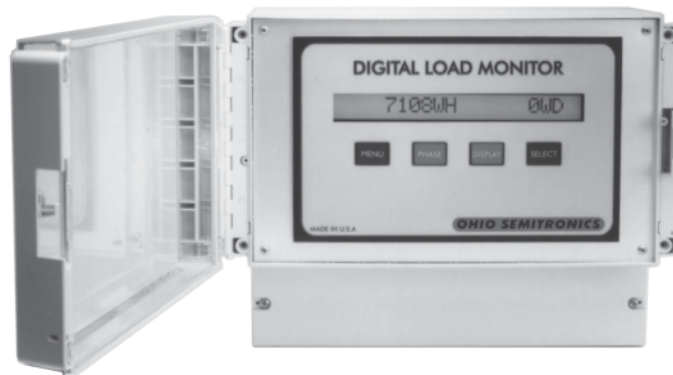


FEATURES

- Backlit LCD Display
- Multifunction Measurement
- Per-Phase and Total Values
- Pulse Outputs
- Dual Communication Ports

APPLICATIONS

- Demand Side Management
- Cost Allocation/ Submetering
- Process Control and Monitoring
- For use with SCR controls, chopped waveforms or where harmonic components exist.



DESCRIPTION

The Digital Load Monitor (DLM) is a real-time load monitor for use in stand-alone applications or as input into an energy management system. The DLM operates in a single phase or three phase system and provides a twenty character, backlit, LCD local display for per phase volts, amps and watts as well as total watts, apparent power, vars, power factor and frequency. The DLM also provides resettable registers for watt demand and either VA demand or VAR demand as well as watthour and either VARhour or VARhour consumption. Non-volatile memory retains consumption readings in the event of loss of instrument power. Four push buttons are used to select the phase and function displayed.

The Digital Load Monitor has two standard RS-422 serial communication connectors for daisy-chaining up to 32 load monitors to simplify communications with multiple DLM units. The real time power system parameters can be retrieved remotely via the communication port. Using the available MRS-4601 meter reading software, these real-time values can be retrieved, displayed and saved into a spreadsheet file for later analysis. The Digital Load Monitor has standard transformer rated current inputs. The DLM has several different voltage models to accommodate PT inputs as well as direct voltage connection. The programmable multiplier allows for direct primary readings for all measured values.

SPECIFICATIONS

INPUT

Voltage Ranges	120, 208, 240, 480 & 600Vac, $\pm 20\%$ 660Vac rms max.
Current	5A Standard 0.1, 1, 10A Available
Frequency	58 to 62 Hz. nominal 50, 400Hz. available
Dielectric Test ...	Input to Inst. Pwr./Output/Case 1500Vac Inst. Pwr. to Output/Case 1500Vac Output to Case 1000Vac
Temperature Range	0°C to +40°C
Accuracy	
Volts, Amps, Watts	$\pm 0.5\%$ F.S.
VA, VARS	$\pm 0.6\%$ F.S.
Watthours	$\pm 1\%$ F.S.
VAhours, VARhours	$\pm 1\%$ F.S.
Power Factor	$\pm 0.01\%$ PF
Frequency	$\pm 0.2\%$ Hz
Watt Demand	$\pm 1.0\%$ F.S.
VA Demand, VAR Demand	$\pm 1.0\%$ F.S.

Instrument Power. (std.)	115Vac, 50/60Hz, $\pm 10\%$ (opt.) .. 230Vac, 50/60Hz, $\pm 10\%$ available
Optional Self Powered Models	115,230Vac, $\pm 10\%$
Mounting	Panel mount standard Optional case
Mechanical	(Panel Mount) 5"H X 8"W X 2.75"D
Display	20 character, backlit LCD, 0.5"H
Freeze and Hold Mode	
Communications	RS-422, Standard
Panel Mount	2 ea., 9 Pin Connector
Optional Case	Screw Terminals
Weight	2.0 Lbs.

OPTIONS

- * CTY current transformers for 0.1A input models
 - * Solid-State relay output for watthours and either VAhours or VARhours
 - * RS-422/RS232 communications adaptor
 - * MRS-4601 Meter Reading Software
 - * LabVIEW™ Driver
- Consult factory for free application software.

DATA CONVERTER

MODEL IFC-4498

The IFC-4498(A) is a bi-directional, full duplex data converter for interfacing RS-422 and RS-232C communications ports. This will allow a computer with only an RS-232C port to connect to a DLM unit with an RS-422 port.

Model

- IFC-4498 For use with panel mount DLM (Option P)
- IFC-4498A For use with optional case DLM (Option S)

OHIO SEMITRONICS, INC.

4242 REYNOLDS DRIVE * HILLIARD, OHIO * 43026-1264
 PHONE: (614) 777-1005 * FAX: (614) 777-4511
WWW.OHIOSEMITRONICS.COM * 1-800-537-6732

STANDARD MODEL CHOICES (select one from each column)				OPTIONAL CHOICES (select one from each column)		
SYSTEM TYPE (PH)	*VOLTAGE INPUT (VVV)	CURRENT INPUT (AA)	MOUNTING (M)	INST. POWER (P)	FREQUENCY (F)	PULSE OUTPUT (R)
12 (1 phase, 2 wire)	120	.1	P (Panel)	() 115V Std.	() 60Hz Std.	() None Std.
13 (1 phase, 3 wire)	208	1	S (Case)	1 (230V)	4 (400Hz.)	R (WH Relay)
33 (3 phase, 3 wire)	240	5		2 (Self-powered, 120,208,240V models only)	5 (50Hz.)	and (VAH or VARH Relay)
34 (3 phase, 4 wire)	480	10				
	600					

The DLM model number designates the number of phases and wires (PH), input voltage (VVV), input current (AA) and mounting type (M). Optional choices include instrument power (P), operating frequency (F) and relay output (R).

Model number: DLM-PH-VVV-AA-M (-P-F-R)

*For 1 Phase Units - Specify L-N Voltage

*For 3 Phase Units - Specify L-L Voltage

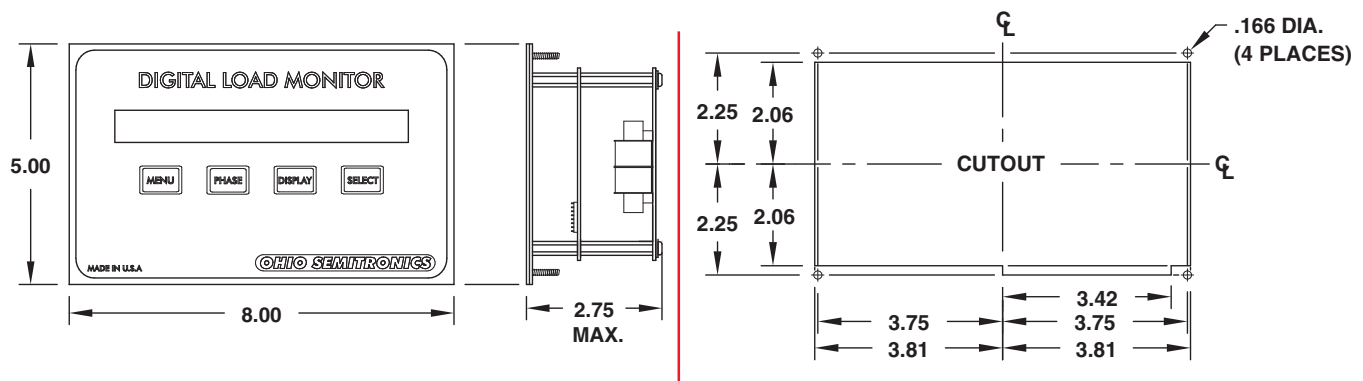
ORDERING INFORMATION

Example: 277/480V, 3 Phase, 4 Wire, 60Hz, 300:5 CT's with Relay Output. Unit to be placed in an existing panel.

DLM-34-480-5-P-R

(NOTE: CT's Supplied Separately)

PANEL DIMENSIONS



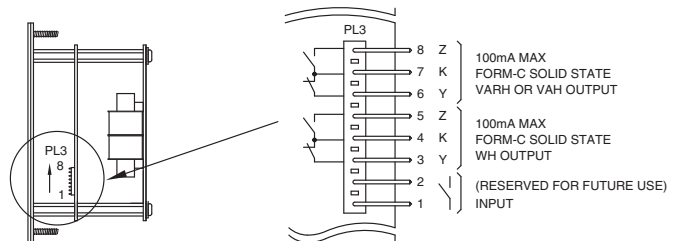
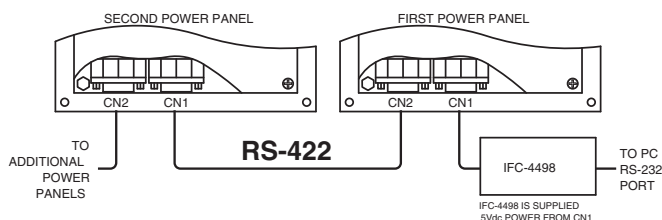
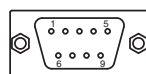
All Dimensions in Inches

COMMUNICATION CONNECTIONS

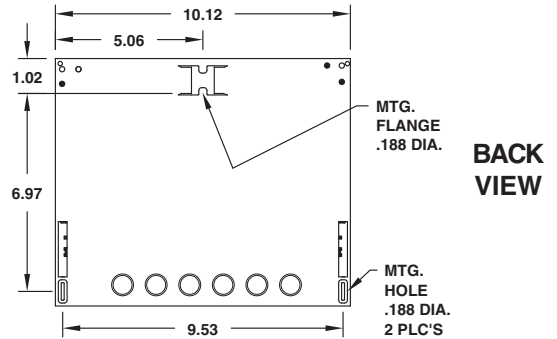
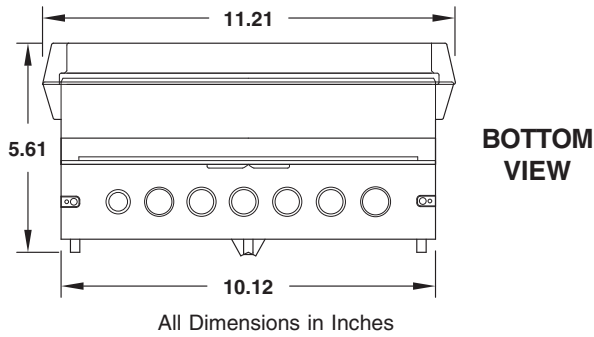
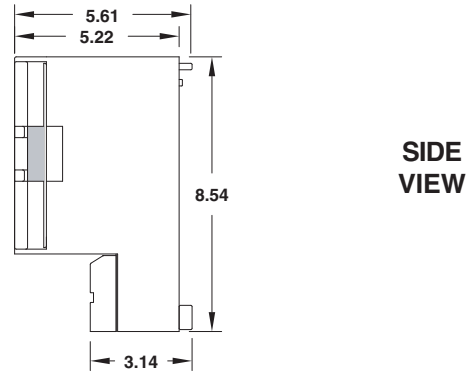
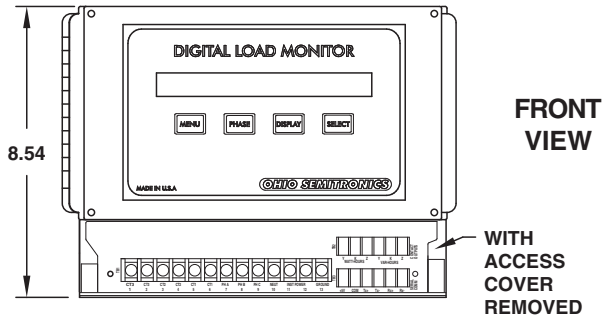
PULSE OUTPUT CONNECTION

RS-422

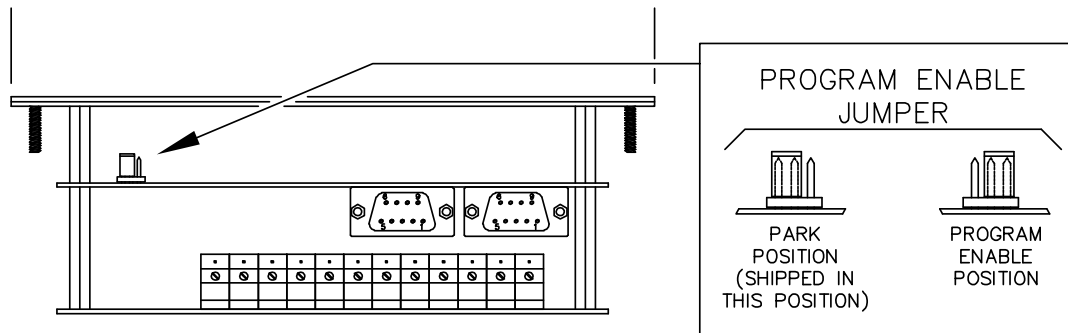
SIG	CN1	CN2
+5V	2	-
COM	1	-
TX+	4	4
TX-	5	5
RX-	9	9
RX+	8	8



OPTIONAL CASE DIMENSIONS

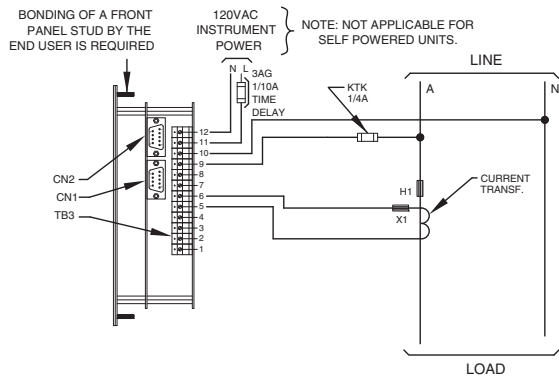


PROGRAM ENABLE JUMPER

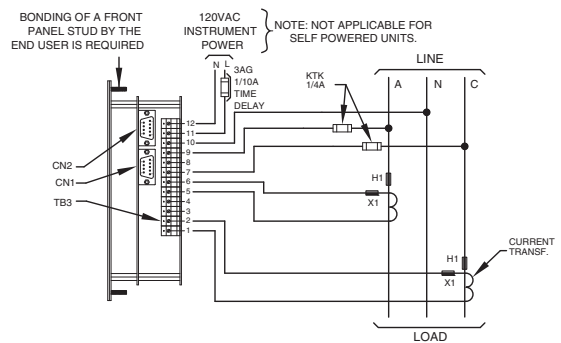


CONNECTION DIAGRAMS

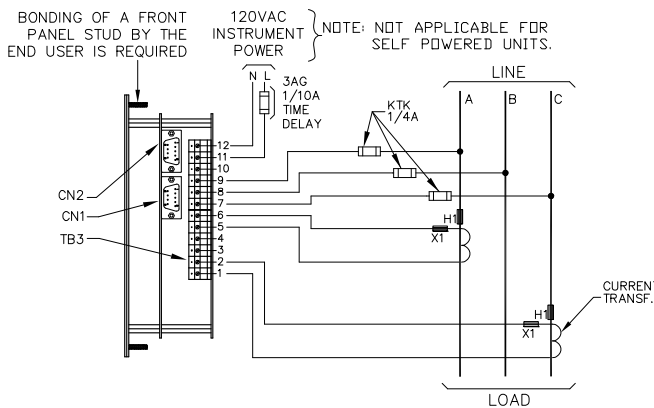
SINGLE-PHASE, TWO-WIRE



SINGLE-PHASE, THREE-WIRE

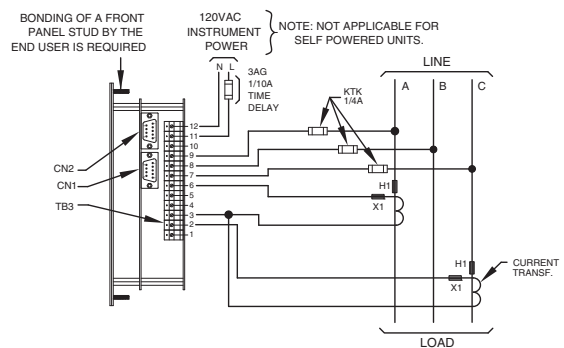


STANDARD

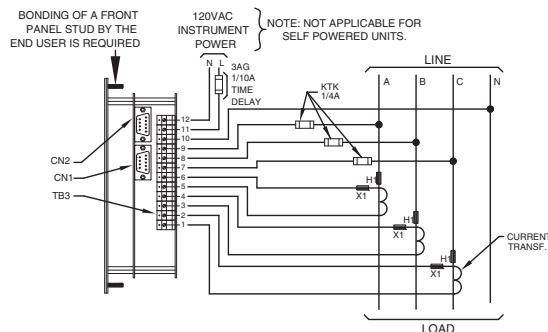


THREE-PHASE, THREE-WIRE

w/CTY-XXX.1L CTs



THREE-PHASE, FOUR-WIRE



DISPLAY SEQUENCE DEFINITION, EXAMPLE DISPLAYS

ENERGY AND MAXIMUM DEMAND

	1	2	3	4	5	6	7	K	W	H			5	1	7	5	K	W	
--	---	---	---	---	---	---	---	---	---	---	--	--	---	---	---	---	---	---	--

REACTIVE ENERGY

	1	2	3	4	5	6	7	K	V	R	H		6	3	0	4	K	V	R
--	---	---	---	---	---	---	---	---	---	---	---	--	---	---	---	---	---	---	---

FREQUENCY AND POWER FACTOR

	6	0	.1	H	Z				1	.0	0	P	F						
--	---	---	----	---	---	--	--	--	---	----	---	---	---	--	--	--	--	--	--

LINE-TO-NEUTRAL VOLTS, AMPS, PER PHASE POWER

AN	2	7	7	.0	V		2	5	0	0	A		6	9	2	.5	K	W	
BN	2	7	7	.0	V		2	5	0	0	A		6	9	2	.5	K	W	
CN	2	7	7	.0	V		2	5	0	0	A		6	9	2	.5	K	W	

LINE-TO-LINE VOLTS, AMPS AND TOTAL POWER/APARENT POWER/REACTIVE POWER

AB	4	8	0	.7	V		2	4	9	9	A		2	0	7	7	K	W	T
BC	4	7	9	.9	V		2	5	0	0	A		2	0	7	7	K	V	A
CA	4	8	0	.0	V		2	5	0	0	A					0	K	V	R

VOLTS LINE-TO-NEUTRAL A/B/C

VOLTS LINE-TO-LINE AB/BC/CA

AMPS A/B/C

L	L		2	7	7	.0	V		2	7	7	.1	V		2	7	7	.1	V
L	N		4	8	0	.7	V												
A	M	P	S		2	5	0	0		2	5	0	0		2	5	0	0	

FRONT PANEL PUSHBUTTON OPERATIONS

The sequence of displays is as shown. The initial display shown is arbitrary since the meter will return to any previously selected display after a power loss.

The DISPLAY pushbutton is used to step between display groups. The PHASE pushbutton is used to step between phases or other displays grouped as shown above .

To reset Maximum Demand, depress the MENU pushbutton then repeat until the display shows “Reset demand? SELECT” then push the SELECT button. To reset Energy, depress the MENU pushbutton then repeat until the display shows “Reset energy? SELECT” then push the SELECT button.

To enter programming mode, to change a CT ratio for example, depress the MENU pushbutton repeatedly until “Program mode? SELECT” is displayed then press the SELECT pushbutton. To change a quantity after entering programming mode, press the MENU pushbutton repeatedly until the quantity is displayed, then press the SELECT pushbutton. At this point, a digit should be flashing. Pressing the PHASE pushbutton will increment the flashing digit, and pressing the DISPLAY pushbutton will cause the next digit to flash. Once the desired value has been entered, press the SELECT pushbutton to save the new value. If during this process the MENU pushbutton is depressed, the changes will be aborted and the previous value restored.

To freeze the readings on the display, press the SELECT pushbutton. To make the readings update “live” again, press any pushbutton.

PULSE OUTPUTS FOR WH AND EITHER VARH OR VAH

Pulse outputs have a pulse constant corresponding to the least significant digit of the energy, reactive energy or apparent energy display. This value will depend on the voltage and current ranges programmed into the instrument and is automatically selected to obtain optimum resolution for the programmed ranges. The energy output units will be in watthours, kilowatthours or megawatthours as appropriate for the selected ranges. An output pulse is defined as a form C transition, that is, the open contact closes and the closed contact opens for each unit of energy measured.

Communication with the DLM is a simple ASCII protocol with defined commands and responses.

Communication Parameters: 9600 Baud, 8 Bits, No Parity, 1 Stop Bit

Message Format:

All commands and responses have the same general format .: STX ADDR CMD [DATA] ETX

- STX An ASCII start of text control character, 02 Hex, control B, (^B).
- ADDR A meter's unique 4 character identification (address), most significant character first. Only hexadecimal characters (0-9,A-F) are allowed.
- CMD A single character command for which there is a defined response. Information associated with the command, where required.
- ETX An ASCII end of text control character, 03 Hex, control C, (^C).

COMMANDS AND RESPONSES

COMMAND R: READ DATA

STX ADDR R ETX

Example data field identification V1-2, V2-3, V3-1, I1, I2, I3, kW

The comma delimited data fields returned are dependent on the defined read response setup (see U command and table).

COMMAND V VERIFY SETTINGS STX ADDR V ETX

RESPONSE: Returns a string of characters with the active values of all configurable parameters
E.G. STX 0001,01.01,0345,020,05,0400,F8,ETX. Addr, F.W. Ver, VT rtg, VT ratio, CT rtg, CT ratio, Read Setup byte

COMMAND C Clear consumptions (WH, VARH) STX ADDR C ETX

RESPONSE: None, consumption readings are reset to zero.

COMMAND D Reset Demand (W demand and either VA demand or Var demand) STX ADDR D ETX

RESPONSE: None, demand readings are reset to zero.

HARDWARE LOCKOUT All the following commands are disabled by a hardware lockout. A jumper must be supplied at the program enable header to enable change of any operating parameter by serial communication or front panel operation.

COMMAND W CHANGE UNIT ADDRESS STX ADDR W NEW ADDR ETX

RESPONSE: Not Acknowledged, Any future communication must use new address.

E.G. STX 0001 W 0002 ETX CHANGES UNIT ADDRESS FROM 0001 TO 0002

Address 0000 can always be used to change the address setting.

***COMMAND 1 Change current rating** STX ADDR 1 0005 ETX

RESPONSE Current rating (internal), normally set at calibration current value. E.G. (05 is a 5 amp secondary rating).

COMMAND 2 Change CT ratio STX ADDR 2 0400 ETX

RESPONSE Current transformer ratio multiplier based on new value (example 400).

E.G. With 5 amp secondary rating and 400/1 external ratio gives a 2000 Amp primary rating.

***COMMAND 3 Change VT rating** STX ADDR 3 0345 ETX

RESPONSE Voltage range (line-to-neutral volts) based on new value.

COMMAND J Change VT ratio STX ADDR J 0020 ETX

RESPONSE External voltage ratio multiplier, example sets new value to 20. With internal voltage rating of 345 I-n volts and external 20/1 T the primary voltage range would be 6900V line-to-neutral.

****These commands (1,3) are normally only used for factory calibration settings. The external ratio settings are also selectable from the front panel controls.***

COMMAND U CHANGE READ SETUP STX ADDR U 7901 ETX SEE TABLE

RESPONSE: The data byte in the "U" command (example 7901) selects new read quantities.

The most significant 6 bits (b7 b6 b5 b4 b3, b2) each correspond to a measured parameter; set bit to a value of 1 to enable or 0 to disable. Bit selections are as shown in the following table.

DLM Serial Output Quantities

There are 15 possible readings that can be individually enabled to the serial output .

Per phase values consist of 3 data values each, for a total of 21 possible data values if all are enabled.

VII (3), VIn (3), Iq (3), Wq(3) , WTot, Freq, P.F., VA ,VAR, W demand, VA demand or VAR demand, WH, VARH or VAH.

The output string can be formatted with serial commands to select the desired quantities.

The command follows our standard ASCII communications using a "U" command with 4 characters. Each bit corresponds to a value as listed above.

"U" COMMAND FORMAT FOR DLM PRODUCT

^B0001UXXXX^C

^B is an STX (02) character.

0001 is a typical unit serial address.

U is the command character.

XXXX ASCII characters (hex values 0-F) which represent the selected bit pattern.

^C is an ETX (03) character.

CHARACTER FIELD OF U COMMAND (XXXX)

VALUE		FIRST CHARACTER				SECOND CHARACTER				THIRD CHARACTER				FOURTH CHARACTER				
Bin	Hex	VII	VIn	I _o	W _o	WT	Freq	P.F., VA, VAR	W demand, VA demand or Var demand, WH, VARH or VAH									VAR or VA
0000	0																	*
0001	1				X				X									*
0010	2			X				X										*
0011	3			X	X			X	X									*
0100	4		X				X											*
0101	5		X		X		X		X									*
0110	6		X	X			X	X										*
0111	7		X	X	X		X	X	X									*
1000	8	X				X												*
1001	9	X			X	X			X									*
1010	A	X		X		X		X										*
1011	B	X		X	X	X		X	X									*
1100	C	X	X			X	X											*
1101	D	X	X		X	X	X		X									*
1110	E	X	X	X		X	X	X										*
1111	F	X	X	X	X	X	X	X	X									*
EXAMPLE																		
		0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0
		7				9				0				0				

* Lack of an X means VAR while an X means VA.

TABLE OF READ CONTROL SETUP VALUES

X MARKS DATA FIELD TO BE ENABLED.

Assume we want to select VIn (3), I_o (3), W_o (3), WTot, W demand, WH, VARH as the output data.

From the table above (bold X shows desired quantities), character values are 7, 9, 0 and 0 so the command data field is then 7900 (ASCII CHARACTERS 7, 9, 0 and 0). Send command string ^B0001U7900^C.