DIGITAL AC POWER MONITOR — MODEL DSP-

DESCRIPTION

The DSP is a three-phase, three-element multifunction digital transducer with outputs for voltage, current, and power via serial communication. Applications include 4-wire and 3-wire circuits with external current transformers where needed. Voltage and current ratings are programmable to obtain primary scaling.

Measurements include: 3 line-to-line and 3 line-to-neutral voltages, 3 currents, 3 per-phase power, total power and frequency. All measurements are true RMS values. Data is available via a serial RS-422 port using a simple ASCII protocol. (See below for RS-232C option.)

A PC data system and LabVIEW™ driver are available for programming and reading the DSP. Consult factory for free application software.

5 YEAR WARRANTY

SPECIFICATIONS

INPUTS	MODEL DSP-007	MODEL DSP-008
Voltage (Line-Line/Line-Neutral)	300/175Vac	600/345Vac
Current (secondary)	0-5 Amps	0-5 Amps
Power measurement range	1-1000 W/element	2-2000 W/element
Frequency	48-62Hz	48-62Hz
Power Factor	1.0-0.1 Lag and Lead	1.0-0.1 Lag and Lead

SERIAL COMMUNICATION

Hardware..... RS-422, 9-Pin D connector
Parameters... 9600 Baud, 8 data bits, 1 stop bit, no parity

DIELECTRIC TEST

Input/Instrument Power to Output 1000Vac
Input/Instrument Power/Output to Case..... 1500Vac

INSTRUMENT POWER

Standard..... 115Vac, ±10%, 50/60Hz, 5VA
"-22" Option ..... 230Vac, 50/60Hz, ±10%

TEMPERATURE & PHYSICAL

Temperature Effect...(-10ºC to 60ºC).....±0.005%/ºC
Weight ..... 3.4 lbs.

ORDERING INFORMATION

Example: Three-Phase, Four-Wire, 480/277V, 5A, 60Hz with 230V Instrument Power.

DSP-008-22

ACCURACY

Volts, Amps ..... ±0.1% F.S.
Power ..(10%-100%) .....±0.1% Rdg., ±0.05% F.S.
Frequency ..... ±0.1%; ±0.1Hz
Power Factor..... ±0.01 PF

FUNCTION	RESOLUTION	UNIT OF MEASURE
Line-to-neutral RMS Volts, 3 phases	4 digits (XXX.X)	Volts
Line-to-line RMS Volts, 3 phases	4 digits (XXX.X)	Volts
Per-Phase Current, 3 phases	4 digits (XXXX)	mA or Amps *
Per-Phase Power	6 digits (XXXX.XX)	Watts or kW *
Total Power	6 digits (XXXX.XX)	Watts or kW *
Frequency (measured at L1-N)	4 digits (XXX.X)	Hz
Power Factor	3 digits (X.XX)	PF

*CT Rating is programmable by serial communication from 5 - 5000.
If current units are in Amps, then Watt reading is in kilowatts. If units are in milliamperes, Watt reading is in Watts

ANALOG OUTPUT OPTION

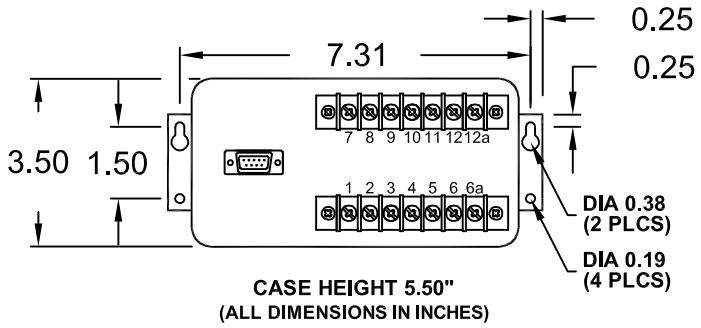
The model D/A-4653 is a 24Vdc-powered serial converter providing 8 channels of 4-20mAdc analog output. The converter connects to the serial port of a model DSP and converts the serial data to 4-20mAdc analog signals. Consult factory for details and pricing.

RS-232C DATA CONVERTER OPTION

The model IFC-4498 is a full-duplex RS-232C and RS-422 data converter. It connects to the serial RS-422 port of the DSP and the provides a standard 9-pin D connector for attaching to a PC. Consult factory for details and pricing.

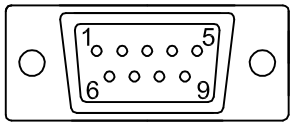
OHIO SEMITRONICS, INC.
4242 REYNOLDS DRIVE * HILLIARD, OHIO * 43026-1264
PHONE: (614) 777-1005 * FAX: (614) 777-4511
WWW.OHIOSEMITRONICS.COM * **1-800-537-6732**

CASE DIMENSIONS



CASE HEIGHT 5.50"
(ALL DIMENSIONS IN INCHES)

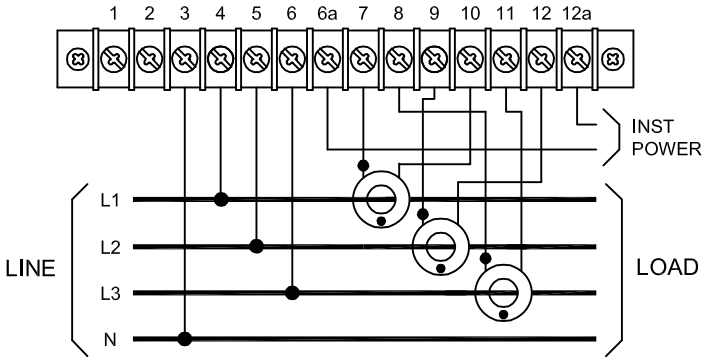
COMMUNICATIONS



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

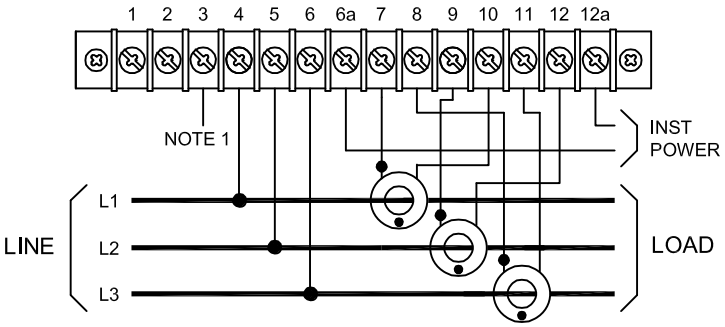
CONNECTION DIAGRAMS

THREE-PHASE, FOUR-WIRE SYSTEM



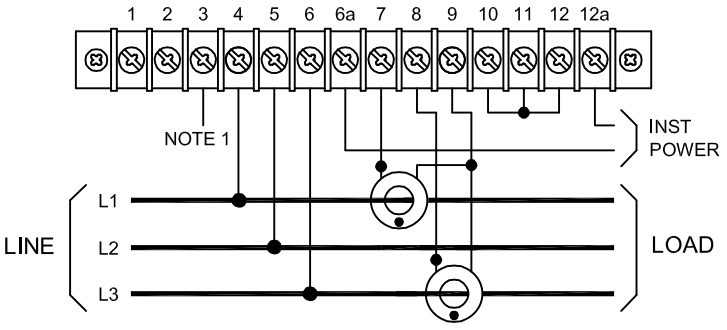
THREE-PHASE, THREE-WIRE SYSTEM
(THREE CURRENT TRANSFORMERS)

NOTE: Connection of device voltage neutral to system neutral is recommended but not required. In this configuration, all three phase currents are measured. Individual phase power is dependent on system voltage balance if neutral is not connected. Total power accuracy is not dependent on voltage balance.



THREE-PHASE, THREE-WIRE SYSTEM
(TWO CURRENT TRANSFORMERS)

NOTE: Connection of device voltage neutral to system neutral is recommended but not required. In this configuration, all three phase currents are measured. Individual phase power is dependent on system voltage balance if neutral is not connected. Total power accuracy is not dependent on voltage balance. L2 current is derived for this connection as L2 = -(L1+L3)



Dwg # 0902-00833-B Rev --

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

Communication with the DSP is a simple ASCII protocol with defined commands and responses. Communication parameters are: 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.
DATA	Information associated with the command, where required.
ETX	An ASCII end-of-text control character, 03 Hex, control C, (^C).
CR	An ASCII carriage return character, 0D Hex.
LF	An ASCII line feed character, 0A Hex.

A "broadcast address" of 0000 can be used in the ADDR field of certain commands. Refer to the specific command description for exact details on usage.

Leading zeroes are not required in the DATA field except for the "W" command (change of unit address).

Spaces that appear in the examples are only for the purpose of readability. Actual input strings and output response strings will not contain spaces.

COMMANDS AND RESPONSES

COMMAND: R "Read Data"

INPUT: STX ADDR R ETX

RESPONSE: Returns a string of characters with the values of the requested measured parameter.

Response example: STX 0001, 600.3, 598.9, 599.2, 099.5, 100.0, 100.8, 3001.90, ETX
Data fields in this example are: Address, VA-B, VB-C, VC-A, IA, IB, IC, KW
The data fields returned are dependent on the defined read response setup (see U command & Table 1 on page 6).
Will not respond if the broadcast address is used.

Response example: STX 0001, 600.3, 598.9, 599.2, 099.5, 100.0, 100.8, 3001.90, F, ETX
The "F" is added at the end of the string to indicate frozen readings.

COMMAND: V "Verify Settings"

INPUT: STX ADDR V ETX

RESPONSE: Returns a string of characters with the active values of all configurable parameters.

Response example: STX 0001, 01.01, 0400, 2000, 02, F8, ETX
Data fields in this example are: Address, Firmware version, VT rating, CT rating, Averaging, Read Setup byte.
Instruments containing firmware version 4.02 or later will respond if the broadcast address is used.

COMMAND: F "Freeze Readings"

INPUT: STX ADDR F ETX

RESPONSE: STX F ETX (No response if broadcast address is used.)
Upon receiving the next read command, the frozen readings are transmitted out with an "F" added at the end of the string to indicate frozen readings. Subsequent reads are not frozen until a new "Freeze" command is received.

COMMANDS AND RESPONSES, CONT.

All of the remaining commands, unless otherwise noted, are disabled by a hardware lockout.

Program parameters are stored in EEPROM non-volatile memory.
To enable programming, connect a short length of wire (jumper) between terminal numbers 2 and 3. After setting needed parameters with the following commands, remove the jumper to "lock out" any further program changes.

COMMAND: W "Change Unit Address"
INPUT: STX ADDROLD W NEW ADDRNEW ETX
RESPONSE: STX W ETX (No response if broadcast address is used).
Input example: STX 0001 W 0002 ETX (Changes unit address from 0001 to 0002.)

Broadcast address can always be used to change the address setting. Any future communication must use either the new address or the broadcast address.

COMMAND: K **"**Change Averaging Cycles"
INPUT: STX ADDR K XX ETX
RESPONSE: STX K ETX (No response if broadcast address is used.)
Input example: STX ADDR K 4 ETX (Defines the number of measurements averaged to be 4.)

Broadcast address can be used to change the averaging cycles.

COMMAND: 2 **"**Change CT Rating"
INPUT: STX ADDR 2 XXXX ETX
RESPONSE: STX 2 ETX (No response if broadcast address is used.)
Input example: STX ADDR 2 1000 ETX (Current range scale based on new value of 1000.)

Broadcast address can be used to change the CT rating.

COMMAND: J **"**Change VT Rating"
INPUT: STX ADDR J XXXX ETX
RESPONSE: STX J ETX (No response if broadcast address is used.)
Input example: STX ADDR J 600 ETX (Voltage range scale based on new value of 600.)

Broadcast address can be used to change the VT rating.

COMMAND: U **"**Change Read Setup" (Refer to Table 1, Read Control Setup Values)
INPUT: STX ADDR U XX ETX
RESPONSE: STX U ETX (No response if broadcast address is used.)
Input example: STX ADDR U F8 ETX

The data in the "U" command example (F8) 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 Table 1 on page 6. Broadcast address can be used to change the read setup.

COMMANDS AND RESPONSES, CONT.

The remaining commands are intended for use by factory technicians to implement calibration of the instrument. If recalibrated by the user, then the factory calibration will be changed.

Calibration of measurements is accomplished by applying a fixed, stable source of Volts and Amps of required accuracy (such as a Rotek Model 800A, or equivalent). The DSP instrument is sent a command string which causes the applied inputs to be established as reference values for calculation of RMS Volts, Amps and Watts.

Voltage measurements are referenced to line-to-neutral inputs. Generally the line-to-neutral input voltage applied for calibration is chosen to be the line-to-line voltage rating multiplied by 0.575.
Example: If Vrating = 600 use 345, if 240 use 138, if 120 use 69, etc.

COMMAND: C1 Sets calibration to present value of input of phase "A" volts, amps and watts.
INPUT: STX ADDR C1 ETX
RESPONSE: STX C ETX (No response if broadcast address is used.)

Broadcast address can be used to calibrate.

COMMAND: C2 Sets calibration to present value of input for phase "B" volts, amps and watts.
INPUT: STX ADDR C2 ETX
RESPONSE: STX C ETX (No response if broadcast address is used.)

Broadcast address can be used to calibrate.

COMMAND: C3 Sets calibration to present value of input of phase "C" volts, amps and watts.
INPUT: STX ADDR C3 ETX
RESPONSE: STX C ETX (No response if broadcast address is used.)

Broadcast address can be used to calibrate.

COMMAND: CA Sets calibration to present value of input for all three phases of volts, amps, and watts.
INPUT: STX ADDR CA ETX
RESPONSE: STX C ETX (No response if broadcast address is used.)

Broadcast address can be used to calibrate.

COMMAND: Q "Read Calibration Constants"
INPUT: STX ADDR Q ETX
RESPONSE: STX ADDR LF CR NNNNN LF CR NNNNN LF CR NNNNN LF CR NNNNN LF CR NNNNN LF CR NNNNN LF CR NNNNN LF CR NNNNN LF CR NNNNN LF CR NNNNN LF CR NNNNN ETX

The data fields represented by "NNNNN" are numerical values set by the calibration procedure. The broadcast address can not be used to read the calibration constants. Hardware lockout does not apply to this command.

READ CONTROL SETUP VALUES (U COMMAND)

FIRST CHARACTER					
BINARY	HEX	V_{L-L} (3)	V_{L-N} (3)	IΦ (3)	WΦ (3)
0000	0				
0001	1				X
0010	2			X	
0011	3			X	X
0100	4		X		
0101	5		X		X
0110	6		X	X	
0111	7		X	X	X
1000	8	X			
1001	9	X			X
1010	A	X		X	
1011	B	X		X	X
1100	C	X	X		
1101	D	X	X		X
1110	E	X	X	X	
1111	F	X	X	X	X

SECOND CHARACTER				
BINARY	HEX	W_{TOT}	Freq (Hz)	PF
0000	0			
0001	1			
0010	2			X
0011	3			X
0100	4		X	
0101	5		X	
0110	6		X	X
0111	7		X	X
1000	8	X		
1001	9	X		
1010	A	X		X
1011	B	X		X
1100	C	X	X	
1101	D	X	X	
1110	E	X	X	X
1111	F	X	X	X

TABLE 1

Select the hexadecimal (“hex”) digit for each of the two characters that represents the desired data string.

An “**X**” in the field means that the parameter will be included in the data string.

Example: To put V_{L-L}, IΦ, WΦ, Frequency and Power Factor in the data string, the binary sequence would be 10110110. The hexadecimal digits for the “U” command would therefore be **B6**.