

**ICP PANEL-TEC  
MICROGATE II**

**BACNET TO  
SIEMENS SED2 DRIVE  
APPLICATION**

**INSTALLATION  
AND  
OPERATION  
GUIDE**

## REVISION HISTORY

Revision	Date	Author	Comments
000	7 Oct 2008	David Walker	Initial release.
001	10 Oct 2008	David Walker	Added BV 40 – KWH RESET Changed text for MV 11-14 from alarm to warning
002	21 Oct 2008	David Walker	Removed BV06 and BV10
003	30 Oct 2008	David Walker	Changed MV 01-08 and MV 11-14 to show 1000 states, pass fault/warning value directly as state value
004	6 Nov 2009	David Walker	Corrected reference to Local port for configuration (pg. 9)
005	12 Apr 2010	David Walker	Updated part numbers. Updated cable diagrams. Added dimensions. Added mechanical drawing.
006	14 Apr 2010	David Walker	Updated Ordering Information Added Technical Support information

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## INTRODUCTION

The BACnet to USS version of the MicroGate II connects one Siemens SED2 drive to a BACnet MS/TP Network. A pre-defined set of BACnet objects are provided that allow access to the most common drive parameters, monitor values, setpoint values, and control points for the SED2 drive.

## Ordering Information

The MicroGate II product is sold with several different applications. To ensure that the correct version of the MicroGate II is procured, please include the correct part number when ordering. Part numbers for the BACnet to SED2 MicroGate II are shown below. Part numbers for included components are shown in parentheses, where applicable.

**Table 1 - Part Numbers**

<u>Description</u>	<u>Part Number</u>
<ul style="list-style-type: none"> <li>■ <b>MicroGate II BACnet to SED2</b> <span style="float: right;"><b>5005-202-102</b></span>  includes the following: <ul style="list-style-type: none"> <li>□ MicroGate II with BACnet to SED2 application</li> <li>□ MicroGate II Local Port Siemens Drive Cable (RS485 DB9-M to stripped wires for connection to SED2 terminal block) <span style="float: right;">(6000-0003-A)</span></li> <li>□ MicroGate II Network Port RS485 Cable (RS485 DB9-F to stripped wires) <span style="float: right;">(6000-0006)</span></li> <li>□ MicroGate II BACnet to SED2 application note (printed manual)</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>■ <b>Configuration Kit</b> <span style="float: right;"><b>7001-202-102</b></span>  includes the following: <ul style="list-style-type: none"> <li>□ MicroGate II Power Supply <span style="float: right;">(4000-0205)</span></li> <li>□ MicroGate II Network Port Configuration Cable (RS232 DB9-F to DB9-F, null-modem) <span style="float: right;">(6000-0010)</span></li> <li>□ MicroGate II Configuration Instructions for Siemens USS Applications (CD)</li> </ul> </li> </ul>	

## Technical Support

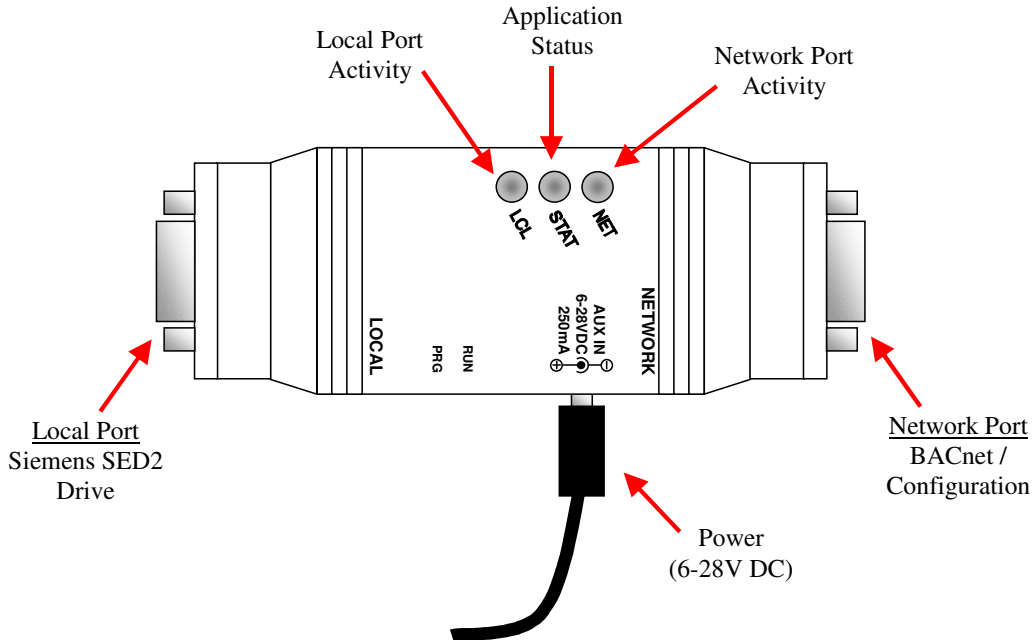
For technical support on the MicroGate II, contact:

ICP Panel-Tec, Inc.  
(256) 534-8132  
techsupport@panel-tec.com

## HARDWARE

### Dimensions

The MicroGate II is packaged in a 11cm x 4cm x 2cm plastic box. The serial ports are located on either end of the unit; the leds are located on the top of the unit; and the power connector is on the side of the unit.



### Power Supply

The MicroGate II requires a 6-28 Volts DC power source, capable of supplying a minimum of 250mA. Power may be supplied to the MicroGate II by either connecting the MicroGate II Power Supply to the Input Power jack on the side of the unit, or by providing 6-28 Volts DC power to pin 9 of the Local serial port.

### Programming Switch

The Programming Switch on the MicroGate II should always be in the RUN position for normal operations and configuration. The PRG position is used strictly for loading firmware at the factory.

### Serial Ports

The MicroGate II comes with two serial ports. The pinouts for the serial ports are shown in the table below.

The Local port is for connection to a local device (in this case, an SED2 Drive), and supports both RS232 and RS485 (2-wire) communications. The Local port is also used for programming the MicroGate II at the factory.

The Network port is for connection to a network (in this case, a BACnet network), and also supports both RS232 and RS485 (2-wire) communications. The Network port is also used for configuring the MicroGate II.

**Table 2 - Serial Port Pinouts**

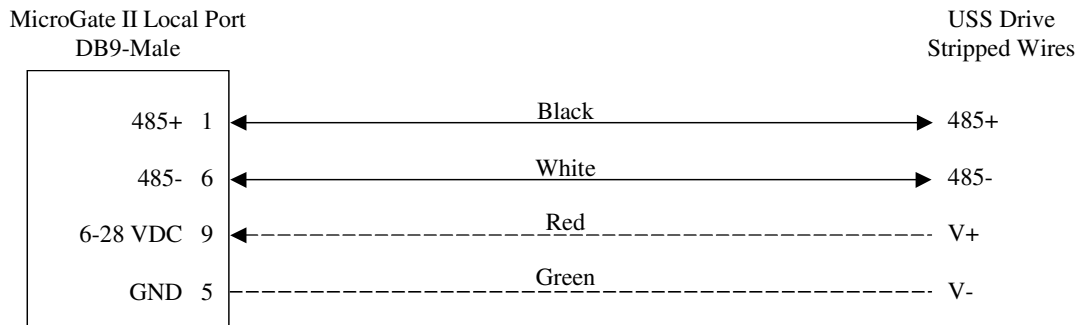
Local: DB9-Female			Network: DB9-Male		
Pin	Label	Description	Pin	Label	Description
1	485+	RS485 D+	1	485+	RS485 D+
2	TXD	RS232 TxD	2	RXD	RS232 RxD
3	RXD	RS232 RxD	3	TXD	RS232 TxD
4	DTR	RS232 DTR	4	-	not used
5	GND	Reference Ground	5	GND	Reference Ground
6	485-	RS485 D-	6	485-	RS485 D-
7	CTS	RS232 CTS	7	RTS	RS232 RTS
8	RTS	RS232 RTS	8	CTS	RS232 CTS
9	VCC	+5VDC Input	9	-	not used

### USS SED2 Drive Cable

One end of the RS485 Siemens Drive cable (Part # 6000-0003-A) connects to the DB9 Female Local port on the MicroBridge. The other end of the cable has stripped wires for connection to the corresponding terminals on the drive. SED2 drive power should be off while connecting the wires to the drive terminals.

- ❑ If powering the MicroGate II from the SED2, connect the red and green wires to terminals 9 and 28 on the SED2, respectively.
- ❑ If powering the MicroGate II from an external 6-28 VDC power supply through the Local port, connect the red and green wires to the external power supply.
- ❑ If powering the MicroGate II through the Input Power jack on the side of the unit, leave the red and green wires unconnected.

**WARNING! Do not apply power to the MicroGate II through pin 9 of the Local port and through the Input Power jack on the side of the unit at the same time!**



**Figure 1 - USS Drive Cable**

**Table 3 – SED2 Cable Connections**

Signal	Connection
485+	SED2 Terminal #29
458-	SED2 Terminal #30
V+ (24 VDC)	SED2 Terminal #9 (optional)
V- (0 VDC)	SED2 Terminal #28 (optional)

## BACnet Network Cable

One end of the RS485 BACnet cable (Part # 6000-0006) connects to the DB9 Male Network port on the MicroGate II. Since network connectors vary significantly among various RS485 devices, the other end of the cable has stripped wires. The pin configuration of the BACnet RS485 network cable is shown in the following figure.

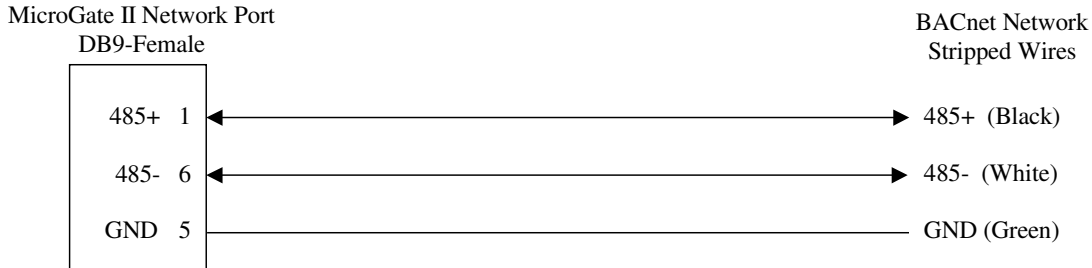


Figure 2 - BACnet Network Cable

## LED Indicators

There are a total of 3 Bi-color LED indicators on the MicroGate II. The NET LED displays communications activity on the Network (BACnet) port. The STAT LED displays the overall status of the MicroGate II. The LCL LED displays communications activity on the Local (USS-SED2) port. During normal operations, the NET and LCL LEDs will quickly alternate red and green flashes, making it look almost amber. This is normal.

Table 4 – MicroGate II General Status LED (STAT)

For this state:	LED is:	To indicate:
No Power	Off	There is no power applied to the device.
Run Mode	Flashing Green (250ms On, 250ms Off)	The MicroGate II is operating normally in RUN Mode.
Configuration Mode	Flashing Green (1.5 sec On, 1.5 sec Off)	The MicroGate II is in Configuration Mode.
Fatal Error	Flashing Yellow (250ms On, 250ms Off)	The MicroGate II has experienced a fatal error, and has halted communications.

Table 5 - Network Communications Activity LED (NET)

For this state:	LED is:	To indicate:
Receive Data	Red	The MicroGate II is receiving data from the BACnet Network.
Transmit Data	Green	The MicroGate II is transmitting data onto the BACnet Network.

Table 6 – USS-SED2 Communications Activity LED (LCL)

For this state:	LED is:	To indicate:
Receive Data	Red	The MicroGate II is receiving data from the SED2 drive.
Transmit Data	Green	The MicroGate II is transmitting data to the SED2 drive.

## MICROGATE II CONFIGURATION

### Configuration Cable

One end of the MicroGate II Configuration cable (Part # 6000-0010) connects to the DB9 Male Network port on the MicroGate II during configuration mode. The other end connects to a serial port on a PC. A standard off-the-shelf RS232 null-modem DB9-F to DB9-F cable (pins 2 and 3 crossed) can be used as well.

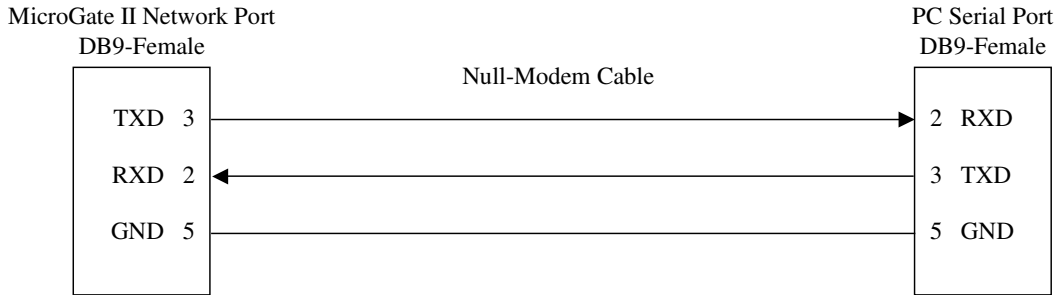


Figure 3 - Configuration Cable (null-modem)

### Default Configuration

The BACnet protocol on the Network Port of the MicroGate II is configurable to make it easy to add it to an existing BACnet network. The configuration parameters that may be changed are shown in the following table:

Table 7 - Configuration Options

Parameter	Options	Default
Data Link	MS/TP Master MS/TP Slave	MS/TP Master
MAC Address	0-127 (Master) 0-255 (Slave)	10
Device Instance	0-4194303	1
Baud Rate	9600 bps 19200 bps 38400 bps 76800 bps Autobaud	19200 bps

The MicroGate II always acts as a Server on the BACnet network. However, the data link layer may be configured as BACnet MS/TP Master (token passing) or BACnet MS/TP Slave (non token passing).

If Autobaud is selected for the Baud Rate, the MicroGate II will attempt to detect the baud rate of the network at startup. Once it has detected a valid baud rate to use, it will continue to use that baud rate. If the baud rate of the network changes after a valid baud rate has been detected, the MicroGate II will not detect the new baud rate unless it is powered off and back on.

## Changing the Configuration

The configuration stored in the MicroGate II may be changed from the default configuration by entering Configuration Mode.

1. Attach a configuration cable (null-modem) between the Network port on the MicroGate II and a serial port on a PC.
2. Start a terminal program, such as Hyper Terminal, on the PC, and connect using the following settings:
  - Baud = 9600 bps
  - Data bits = 8
  - Parity = None
  - Stop Bits = 1
  - Flow Control = None
3. With the Programming Switch set to “RUN”, apply power to the MicroGate II, and send a carriage return (press the **Enter** key) within 5 seconds of startup.

Once the MicroGate II is in Configuration Mode, it will send its current configuration information to the terminal program, as follows:

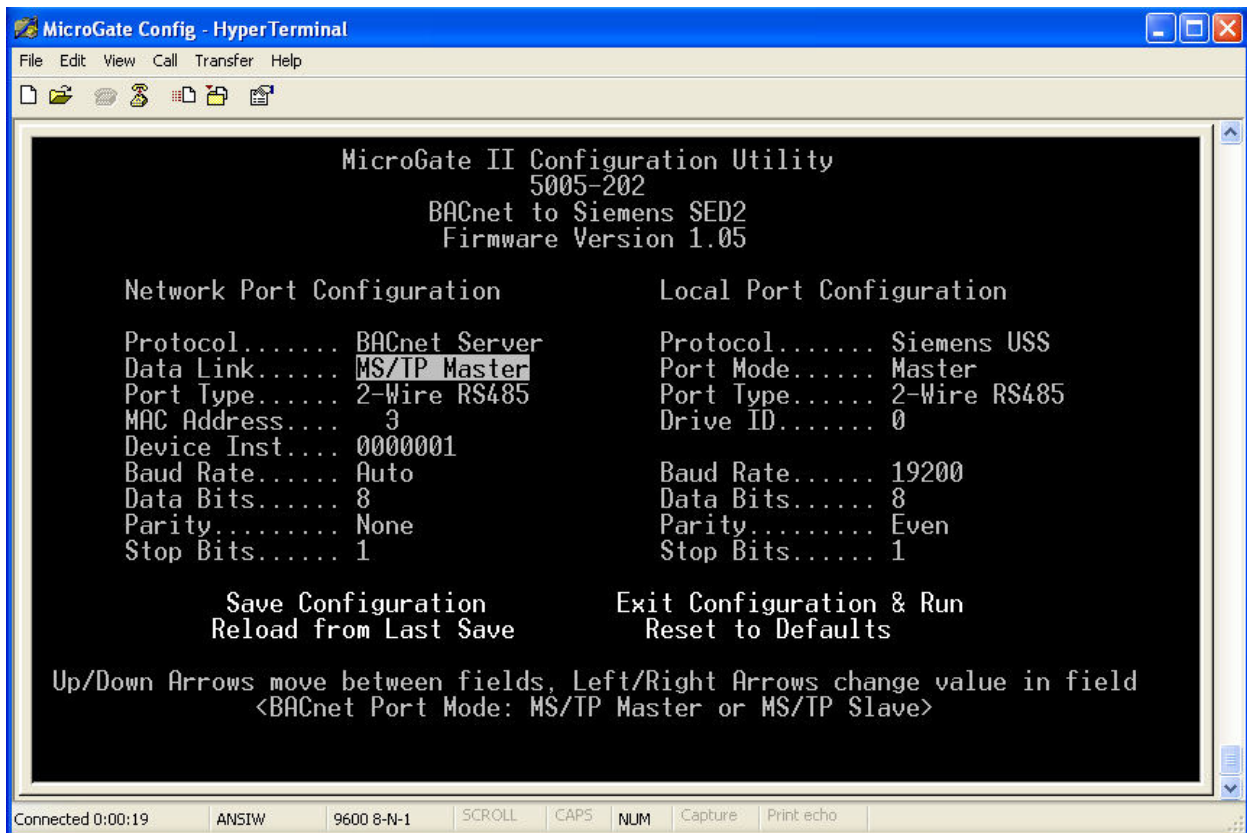


Figure 4 - MicroGate II Configuration Display

Use the **up** and **down** arrows on your keyboard to navigate to the field you want to change, then use the **left** and **right** arrows to change the value in that field. When you are finished, navigate to “Save Configuration” and press the **Enter** key to save the configuration information to the MicroGate II.

Once the configuration has been saved, remove power from the MicroGate II and remove the configuration cable.

## SED2 DRIVE SETUP

### SED2 Drive Parameter Configuration

The Siemens SED2 drive must be configured before the MicroGate II will communicate with the drive. The MicroGate II communicates with the SED2 drive using the USS protocol, with the following configuration:

- 19200 baud
- 8 data bits
- even parity
- 1 stop bit
- drive id 0

To setup the SED2 drive for communications with a MicroGate II, the drive parameters in the following table must be configured with the values shown via the SED2 keypad.

**Table 8 – SED2 Parameter Configuration**

SED2 Parameter	Function	Set Value
P0003	User Access Level	3 (Expert Setting)
P0700[0]	Command Source	5 if Starting/Stopping Drive from BACnet Otherwise: <b>Do Not Change</b>
P1000[0]	Frequency Setpoint Source	5 if Setting the Frequency from BACnet Otherwise: <b>Do Not Change</b>
P2009[0]	USS Normalization	0 (Disabled)
P2010[0]	USS Baud Rate	7 (19.2K baud)
P2011[0]	USS Address	0
P2014[0]	USS telegram off time	0 to Disable the USS “watchdog” timer, or > 0 to enable the USS “watchdog” timer (NOTE: values less than 100ms are not recommended)
P2041[0]	Protocol Selection for RS485 port	0 (USS Protocol)

### USS Watchdog Timer Setup

The SED2 has a timeout function for the USS port, which is controlled by Parameter 2014, “USS telegram off time”. Once the MicroGate II has established communications with an SED2 drive with the watchdog function enabled, the watchdog timer is activated. If communications are subsequently lost for the specified length of time, the SED2 will automatically generate a F0072 fault. Setting Parameter 2014 to a value of 0 disables the watchdog timer function. Setting Parameter 2014 to a non-zero value enables the watchdog timer function with the specified time. Avoid setting this value too low, as that could result in false fault indications.

## Verifying the Installation

After all necessary connections have been made, power up the SED2 drive and the MicroGate II, and wait approximately 5 seconds. If the MicroGate II has been installed correctly, the STAT led will be flashing green, and the LCL led will be alternating so fast between red and green that it will appear to be glowing amber.

If the MicroGate II is set up as an MS/TP Master, and it is connected to a BACnet network, the NET led will be alternating between red and green. If the MicroGate II is set up as an MS/TP Slave, the NET led will be flickering red (it will only flash green when it responds to a request from a master).

To verify that the MicroGate II and drive are set up correctly, set the P0700[0] and P1000[0] on the SED2 to '5', then send the following Write Property requests to the network port of the MicroGate II:

- `FREQ STPT PCT (AV 17)` → 50.0 (%)
- `CDS (BV24)` → 1 (YES)
- `RUN ENA CMD (BV 26)` → 1 (ENABLED)
- `OFF 2 (BV 27)` → 1 (READY)
- `OFF 3 (BV 28)` → 1 (READY)
- `RUN/STOP CMD (BV 20)` → 1 (ON)

At this point, if everything else is set up correctly, the drive should start running. The drive frequency may be changed at any time during this process by writing to `FREQ STPT PCT (AV 17)` again.

## BACNET OBJECTS

The following tables contain the list of all BACnet objects available on the MicroGate II.

**Table 9 - Binary Input Objects Supported**

Instance	Object Name	Description	Active Text	Inactive Text	Present Value Access Type	Mapped to
BI 01	DI 1 ACT	Status of Digital Input #1	ON	OFF	R	r0722:0
BI 02	DI 2 ACT	Status of Digital Input #2	ON	OFF	R	r0722:1
BI 03	DI 3 ACT	Status of Digital Input #3	ON	OFF	R	r0722:2
BI 04	DI 4 ACT	Status of Digital Input #4	ON	OFF	R	r0722:3
BI 05	DI 5 ACT	Status of Digital Input #5	ON	OFF	R	r0722:4
BI 06	DI 6 ACT	Status of Digital Input #6	ON	OFF	R	r0722:5
BI 07	DI 7 ACT	Status of Digital Input #7	ON	OFF	R	r0722:6
BI 08	DI 8 ACT	Status of Digital Input #8	ON	OFF	R	r0722:7
BI 11	DO 1 ACT	Status of Digital Output #1	ON	OFF	R	r0747:0
BI 12	DO 2 ACT	Status of Digital Output #2	ON	OFF	R	r0747:1

**Table 10 - Binary Value Objects Supported**

Instance	Object Name	Description	Active Text	Inactive Text	Present Value Access Type	Mapped to
BV 00	RUN/STOP ACT	Indicates inverter status, regardless of control source	STOP	RUN	R	ZSW:2
BV 01	FWD/REV ACT	Indicates rotation direction, regardless of control source	FWD	REV	R	ZSW:14
BV 02	FAULT ACT	Indicates current fault status of inverter	FAULT	OK	R	ZSW:3
BV 03	WARN ACT	Indicates current warning status of inverter	WARN	OK	R	ZSW:7
BV 04	HAND/AUTO ACT	Indicates mode status of inverter	HAND	AUTO	R	P0718
BV 08	AT SETPOINT	Indicates inverter has reached its setpoint	YES	NO	R	ZSW:8
BV 09	AT MAX FREQ	Indicates inverter has reached maximum frequency	YES	NO	R	ZSW:10
BV 20	RUN/STOP CMD	Command to start/stop drive (inverter must be configured for BACnet control)	RUN	STOP	C	STW:0
BV 21	FWD/REV CMD	Command to change the rotation of motor (inverter must be configured for BACnet control)	REV	FWD	C	STW:11
BV 22	FAULT RESET	Command to reset a fault (inverter must be configured for BACnet control)	RESET	NO	W	STW:7
BV 24	CDS	Local/Remote	YES	NO	C	STW:15
BV 26	RUN ENA CMD	Enable inverter to run	ENABLED	DISABLED	C	STW:3
BV 27	OFF 2	Coast to stop	READY	STOP	C	STW:1
BV 28	OFF 3	Fast stop	READY	STOP	C	STW:2
BV 30	KWH RESET	Reset kWh	RESET	NO	W	P0040
BV 50	ENABLE PID	Enable PID Controller	ENABLED	DISABLED	W	P2200
BV 61	DO 1 CMD	Commanded Value of Digital Output #1	ON	OFF	W	P0731
BV 62	DO 2 CMD	Commanded Value of Digital Output #2	ON	OFF	W	P0732

Table 11 - Analog Input Objects Supported

Instance	Object Name	Description	Units	Present Value Access Type	Mapped to
AI 01	AI 1 ACT	Indicates actual value of Analog Input #1 before scaling	--	R	r0752[0]
AI 02	AI 2 ACT	Indicates actual value of Analog Input #2 before scaling	--	R	r0752[1]
AI 11	AI 1 SCALED	Indicates actual value of Analog Input #1 after scaling	Percent	R	r0754[0]
AI 12	AI 2 SCALED	Indicates actual value of Analog Input #2 after scaling	Percent	R	r0754[1]

Table 12 - Analog Value Objects Supported

Instance	Object Name	Description	Units	Present Value Access Type	Mapped to
AV 00	OUTPUT FREQ	Actual output frequency	Hertz	R	r0024
AV 01	OUTPUT FREQ PCT	Actual output frequency (%)	Percent	R	HIW (0-4000h = 0-100%)
AV 02	OUTPUT SPEED	Actual rotor speed	RPM	R	r0022
AV 03	DC BUS VOLT	DC bus voltage	Volts	R	r0026
AV 04	OUTPUT VOLT	AC output voltage	Volts	R	r0025
AV 05	CURRENT	Output (motor) current	Amps	R	r0027
AV 06	TORQUE	Output (motor) torque	Newton Meters	R	r0031
AV 07	POWER	Output (motor) power	Kilowatts	R	r0032
AV 08	INV TEMP	Inverter heatsink temperature	°C	R	r0037
AV 09	MOTOR TEMP	Measured or calculated motor temperature	°C	R	r0035
AV 10	KWH	Inverter's resettable energy usage	Kilowatt Hours	R	r0039
AV 12	INV RUN TIME	Inverter's resettable run time	Hours	R	r2114
AV 13	INV MODEL	Indicates power stack code of inverter	--	R	r0200
AV 14	INV FW VER	Indicates version of firmware in inverter	--	R	r0018
AV 15	INV POWER	Indicates rated power of inverter	Kilowatts	R	r0206
AV 16	FREQ STPT	Reference frequency for inverter	Hertz	W	P2000
AV 17	FREQ STPT PCT	Setpoint frequency for inverter	Percent	C	HSW (0-4000h = 0-100%)
AV 18	FREQ STPT ACT	Indicates frequency setpoint	Hertz	R	r0020
AV 28	AO 1 ACT	Indicates level of analog output 1	--	R	r0774[0]
AV 29	AO 2 ACT	Indicates level of analog output 2	--	R	r0774[1]
AV 30	MIN FREQ	Minimum frequency	Hertz	W	P1080
AV 31	MAX FREQ	Maximum frequency	Hertz	W	P1082
AV 32	ACCEL TIME	Ramp up time	Seconds	W	P1120
AV 33	DECEL TIME	Ramp down time	Seconds	W	P1121
AV 34	CUR LIM	Current limit	Percent	W	P0640
AV 50	PRC PID FBCK	Process PID feedback	Percent	R	r2294
AV 51	PRC PID STPT	Process PID setpoint	Percent	R	r2250
AV 52	PRC PID DEV	Process PID deviation	Percent	R	r2273
AV 53	PID SP REF	PID setpoint reference	Percent	W	P2240
AV 54	PID LO LMT	PID low limit	Percent	W	P2292
AV 55	PID UP LMT	PID high limit	Percent	W	P2291
AV 56	PRC PID P	Process PID proportional gain	--	W	P2280
AV 57	PRC PID I	Process PID integral time	Seconds	W	P2285
AV 58	PRC PID D	Process PID derivative time	Seconds	W	P2274
AV 59	PID FILTER	PID filter	Seconds	W	P2265
AV 60	PID FB GAIN	PID feedback gain	Percent	W	P2269
AV 61	PID OUTPUT	Indicates PID output	Percent	R	r2294

**Table 13 - Multistate Value Objects Supported**

Instance	Object Name	Description	Number of States	States	Present Value Access Type	Mapped to
MV 01	ACTV FAULT 1	Indicates fault code of present fault 1	1000	F0001: Overcurrent F0002: Overvoltage F0003: Undervoltage F0004: Overtemperature (INV) F0005: I2T F0011: Overtemperature (Mtr) F0012: Temperature signal loss (INV) F0015: Temperature signal loss (Mtr) F0020: Phase loss F0021: Ground fault F0022: Power stack fault F0023: INV Output fault F0024: Rectifier overtemp F0030: Fan fault F0035: Auto restart failure F0041: Motor ID failure F0051: EEPROM fault F0052: Power stack fault F0053: IO EEPROM fault F0054: Incorrect IO connection F0060: ASIC timeout F0070: CB Stpt fault F0071: USS Stpt fault (BOP) F0072: USS Stpt fault (COM) F0080: AI signal loss F0085: External fault F0101: Stack overflow F0221: PID fdbk below min F0222: PID fdbk above max F0450: BIST failure F0452: Belt failure  No fault (1000)  all other states - Fxxxx: Undefined		r0947[0]
MV 02	ACTV FAULT 2	Indicates fault code of present fault 2	1000	Same as MV 01	R	r0947[1]
MV 03	PREV FAULT 1A	Indicates fault code of previous fault 1	1000	Same as MV 01	R	r0947[2]
MV 04	PREV FAULT 2A	Indicates fault code of previous fault 2	1000	Same as MV 01	R	r0947[3]
MV 05	PREV FAULT 1B	Indicates fault code of previous fault 1	1000	Same as MV 01	R	r0947[4]
MV 06	PREV FAULT 2B	Indicates fault code of previous fault 2	1000	Same as MV 01	R	r0947[5]
MV 07	PREV FAULT 1C	Indicates fault code of previous fault 1	1000	Same as MV 01	R	r0947[6]
MV 08	PREV FAULT 2C	Indicates fault code of previous fault 2	1000	Same as MV 01	R	r0947[7]

Instance	Object Name	Description	Number of States	States	Present Value Access Type	Mapped to
MV 11	ACTV WARN 1	Indicates code of present warning 1	1000	A0501: Current limit A0502: Overvoltage limit A0503: Undervoltage limit A0504: Overtemperature (INV) A0505: I2T A0506: Duty cycle A0511: Overtemperature (Mtr) A0520: Rectifier overtemp A0523: INV output fault A0541: Motor ID enabled A0600: RTOS data loss A0910: VDC cntrlr disabled (max) A0911: VDC cntrlr enable (max) A0912: VDC cntrlr enabled (min) A0920: Incorrect AI config A0921: Incorrect AO config A0922: No load connected A0952: Belt failure detected  No warning (1000)  all other states - Axxxx: Undefined	R	r2110[0]
MV 12	ACTV WARN 2	Indicates code of present warning 2	1000	Same as MV 11	R	r2110[1]
MV 13	PREV WARN 1	Indicates code of previous warning 1	1000	Same as MV 11	R	r2110[2]
MV 14	PREV WARN 2	Indicates code of previous warning 2	1000	Same as MV 11	R	r2110[3]

In the above tables, the Present Value Access Type indicates whether the present value of an object is read-only (R), writeable (W) or commandable (C). Commandable objects use a priority array.

If the MicroGate II fails to read a parameter from the SED2 drive for some reason, any object(s) associated with that parameter are marked as Out Of Service until the parameter is successfully read from the drive.

If the MicroGate II loses communications with the SED2 drive altogether, all objects are marked as Out Of Service until communications can be reestablished and a new value is read from the drive for that object.

It is possible for certain parameters in the SED2 drive to be assigned a value via the drive keypad interface inconsistent with the values in the above tables. For example, DO 1 CMD and DO 2 CMD may be assigned values other than 0 or 1 (when the states of the associated digital outputs are to be driven by other parameters rather than directly). In such a case, the object will be marked as Unreliable until such time as the value of the parameter in the SED2 drive again corresponds to a value consistent with the object type.

**MECHANICAL**

