

DISCLAIMER

There is not a convention on the write-ability of registers. You may write to any register in the system including registers THAT MAY DAMAGE OR DESTROY your Classic and attached equipment like battery banks. Please make sure that you understand what you are doing before attempting to change any settings (like battery voltage) using the raw MODBUS interface. MidNite Solar cannot take responsibility for any damage to your Classic in the event of misconfiguration.

Registers and bits marked RESERVED are not necessarily unimplemented. Great care must be taken not to overwrite these registers or bits to ensure proper operation of the Classic.

Wherever possible we have tried to indicate settings that may have an adverse effect on your system if set incorrectly.

If you need to configure your system, please consider using the MNGP's built in configuration wizard which will step you through the process.

Conventions:

Register units are expressed using formulas to try to reduce the ambiguity surrounding converting from the raw bus formats and human-readable values. Due to the nature of the Classic's operation, there is not a uniform convention as far as data endianness so you may find some classes of values that follow a Most Significant Byte (MSB) first convention and others that use the Least Significant Byte (LSB) first convention.

Bits are numbered from 0-15 in the little-endian or LSB-0 notation. That is, the least significant bit is indexed by 0.

For Example, the number 43,981 is 0xABCD in hex is represented in binary as 1010101111001101.

The bit ordering is as shown in the following table:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	0	1	0	1	0	1	1	1	1	0	0	1	1	0	1

So that the binary digit indexed by (0) is 1. (1) is 0, (6) is 1, and (10) is 0.

MODBUS registers are 16-bit (2-octet/byte) in size. When using values from the map to indicate conversion formulas the following convention is used to access different octets:

Note that when talking about bytes or octets, it is more convenient to describe them in hexadecimal (base 16) form than in decimal. Some values are expressed in bytes as it is a more compact way of dealing with certain classes of numbers (IP addresses, for example). We use the 'C' convention of referring to hexadecimal numbers by prefixing them with '0x'. So the decimal value 10 is represented by the hexadecimal value 0x0A.

A note on Read/Write: The Classic MODBUS does not strictly enforce the Read/Write accessibility of some registers. It is possible to write to some registers marked Read Only. This will usually have no effect on Classic operation, but in some cases you may corrupt a register from which you wanted to read data. In some cases the registers are reset internally as new values. Additionally, some counters are

accessible directly. For example, the AbsorbTime (4139) timer is a “suggested” read only register; however, if your MODBUS application has reason to reset or adjust this register, there is nothing to prevent you from changing it however you please. Don’t be surprised if your batteries pop in and out of Absorb stage unexpectedly, though!

Operators:

Indexing

- [] square brackets around an address indicate the value of the register specified:
ex: [4116] indicates the value of the register at address 4116.
- []_{MSB} Square brackets followed by an _{MSB} means to use the most-significant byte of the register.
ex: if the value at register 4116 is 0x04B1 (decimal 1201):
[4116] = 0x04B1,
then
[4116]_{MSB} = 0x04
- []_{LSB} Square brackets followed by an _{LSB} means to use the least-significant byte of the register.
ex: if the value at register 4116 is 0x04B1 (decimal 1201):
[4116] = 0x04B1,
then
[4116]_{LSB} = 0xB1
- () Parentheses refer to bits within the register.
For example: [4116](0) means “the 0th bit of the value in register 4116.
So if 4116 held the value 1 (0x0001 hex) then [4116](0) would be a 1. [4116](1...15)
would all be 0s.
- ... Ellipses represent ranges of values or indices.
For example to refer to the first three bits of a register you may see:
[4116](0...3) which signifies the first three bits of the value of register 4116.
You may also see spans of registers as:
[4116...4120] which refer to registers 4116 to 4120 inclusive.

Arithmetic

- + Add two numbers together
- Subtract two numbers (or negate the value on the right)
- / Divide two numbers (integer implied)
- * Multiply two numbers (integer implied)

Logical

- << x Binary shift left. Shift the value x binary digits to the left. This is equivalent to multiplying the decimal number by 2^x . Ex:
[4116] = 0x0001
Then
[4116] << 1 = 0x0002.
- >> x Binary shift right. Shift the value x binary digits to the right. This is equivalent to dividing the decimal number by 2^x .
[4116] = 0x0002
Then
[4116] >> 1 = 0x0001.
- | OR two numbers together (aligned to LSB)
- & AND two numbers together (aligned to LSB)
- ^ XOR two numbers together (aligned to LSB)

String

- || Concatenate.
[4116] = 0x4142.
[4116]_{MSB} || [4116]_{LSB} => 0x41 || 0x42 => 'A' || 'B' => "AB"

Examples:

Using the example of the Average PV Voltage register: dispavgVpv @ 4116
Suppose using a MODBUS scanner you retrieve the following (integer) value from the dispavgVpv register at address 4116:

4116: 1201

- The address itself: 4116
- Full 16-bit value at the address: [4116] = 1201 (0x04B1 hex)
- The top-most (MSB) octet of the register: [4116]_{MSB} = 0x04 hex
- The bottom-most (LSB) octet of the register [4116]_{LSB} = 0xB1 hex
- Applying the Conversion (**[4116] / 10**) Volts:
 - [4116] = 1201
 - $1201 / 10 = 120.1$ Volts

File Transfer and Function Execution modes:

Coming soon (*next revision of this document*) will be information on how to use the MODBUS File Transfer and Function execution commands. File Transfer will be necessary, for instance, to transfer wind power curves to/from the Classic or logging and audio data to/from the Classic and/or MNGP.

Base Registers				
Address	R/W	Name	Conversion	Notes
4101	R	UNIT_ID	PCB revision = [4101] _{MSB} Unit Type = [4101] _{LSB}	The PCB revision is a value between 0 and 255 indicating the hardware revision of the PC board. The Unit Type is an integer value indicating the voltage category of the Classic See Table 4101-1.
4102 4103	R	UNIT_SW_DATE_RO	Year = [4102] Month = [4103] _{MSB} Day = [4103] _{LSB}	Software Build date.
4104 4105	R	UNIT_SerialNumber	([4105] << 16) + [4104]	The serial number of the unit as appears on the label.
4106 4107 4108	R	UNIT_MAC_AddressI	[4108] _{MSB} : [4108] _{LSB} : [4107] _{MSB} : [4107] _{LSB} : [4106] _{MSB} : [4106] _{LSB}	The unit's Ethernet MAC address.
4109 4110	R	UNIT_IP_Address	[4110] _{MSB} . [4110] _{LSB} . [4109] _{MSB} . [4109] _{LSB}	The Unit's TCP/IP Address
4111 4112	R	UNIT_Device_ID	([4112] << 16) + [4111]	The device ID of the unit.
4113	RESERVED (Do NOT Write)			
4114	R	RestartTimerms	[4114] Mili Seconds	Time after which the Classic can wake up. (countdown)
4115	R	dispavgVbatt	([4115] / 10) Volts	Average Battery Voltage
4116	R	dispavgVpv	([4116] / 10) Volts	Average PV terminal input Voltage
4117	R	IbattDisplaySi_mbus	([4117] / 10) Amps	Average Battery Current
4118	R	kWhoursAdj	([4118] / 10) kWh	Average Energy to the Battery This is reset once per day
4119	R	Watts	([4119] / 10) Watts	Average Power to the Battery
4120	R	mbComboChrgStge	Charge Stage = [4120] _{MSB} State = [4120] _{LSB}	See Table 4120-1 for battery charge state. See Table 4120-2 for State
4121	R	PvInputCurrent	([4121] / 10) Amps	Average PV terminal input Current.
4122	R	VocLastMeasured	([4122] / 10) Volts	Last measured open-circuit Voltage at the PV terminal input.

Address	R/W	Name	Conversion	Notes
4123	R	RESERVED	([4123])	RESERVED
4124	R	MatchPointShadow	[4124]	Instantaneous value of Wind curve being used. Values [1...16]
4125	R	AmpHours	([4125] / 10) Amp Hour	Daily Amp Hours reset once per day
4126 4127	R	TotalkWhours	(([4127] << 16) + [4126]) kWh	Lifetime Energy Generation
4128 4129	R	TotalAmpHours	(([4129] << 16) + [4128]) Amp Hours	Lifetime Amp-Hour Generation
4130 4131	R	InfoFlagsBits	([4131] << 16) + [4130]	See Table 4130-1
4132	R	BATTtemperature	([4132] / 10) °C/F	Temperature measured at the external Battery Temperature Sensor (if installed, else 25C)
4133	R	FETtemperature	([4133] / 10) °C/F	Temperature of PWM FETs
4134	R	PCBtemperature	([4134] / 10) °C/F	Temperature of the Classic Control (top) PCB
4135		NiteMinutesNoPwr	[4135] minutes	Nighttime Check
4136	RESERVED (Do NOT Write)			
4137	RESERVED (Do NOT Write)			
4138	R	TimeMinutesFloatToday	[4138] minutes	Number of minutes that the Batteries have spent in float today. Reset next AM.
4139	R/W	AbsorbTime	[4139] seconds	Absorb Time Up/Down Counter
4140	R	DaysSinceLastFloat	[4140] days	Elapse days since battery was last in the Float stage
4141	R	PWM_ReadOnly	[4141] (0 to 1023)	Duty Cycle command of PWM signal. (NOT a Percent)
4142	R	SunRiseTodayMsrd	[4142] Minutes	Minutes since first wakeup today for solar modes
4143	R	Equalize Time	[4143] Seconds	Battery Stage Equalize Down Counter. Time remaining in Equalize Stage
4144	RESERVED (Do NOT Write)			
4145		RESERVED (Do NOT Write)	RESERVED	RESERVED (Do NOT Write)
4146		RESERVED (Do NOT Write)	RESERVED	RESERVED (Do NOT Write)

Address	R/W	Name	Conversion	Notes
4147	R	NoDoubleClickTimer	[4142] Seconds	Forced time space between manual MPPT sweeps.
4148	R/W	Battery output Current Limit	[4148] / 10) Amps	Battery Current Limit Amps (example: 23.4 A = 234)
4149	R/W	Absorb Set Point Voltage	([4149] / 10) Volts	Battery Absorb Stage Set point Voltage (example: 28.3V = 283)
4150	R/W	Float Voltage Set Point	([4150] / 10) Volts	Battery Float Stage Set Point Voltage
4151	R/W	Equalize Voltage Set Point	([4151] / 10) Volts	Battery Equalize Stage Set Point Voltage
4152	R	Sliding Current Limit	[4152] Amps	Sliding Current Limit (changes with V/Temp etc.)
4153	R/W	Minimum Absorb Time	[4153] seconds	Minimum time for Batteries to remain in Absorb Stage.
4154	R/W	Maximum Absorb Time	[4154] seconds	Maximum time for Batteries to remain in Absorb Stage.
4155	R/W	Maximum Battery Temperature Compensation Voltage	([4155] / 10) Volts	Highest Charge Voltage is limited to this value when battery temp sensor installed
4156	R/W	Minimum Battery Temperature Compensation Voltage	([4155] / 10) Volts	Lowest Charge Voltage is limited to this value when battery temp sensor installed
4157	R/W	Battery Temp Comp Value for each 2V cell	-([4157] / 10) mV/degree C/cell (0.5 mV steps) 0 to 10 mV per 2V cell	Absolute value of the Temperature Compensation Value in mV/°C /2V cell
4158	R/W	Battery Type	[4158]	Type of Batteries. See Table 4158-1 (unimplemented as of May 2011)
4159	R/W	RESERVED	[4159]	RESERVED
4160 4161	W	Force Flag Bits	([4161] << 16) + [4160]	See Table 4160-1.
4162	R/W	Equalize Time	[4162] Seconds	Initialize Time for Batteries to remain in Equalize Stage.
4163	R/W	Equalize Interval Days	[4164] Days	Number of days between Equalize Stages (Auto EQ)
4164	R/W	Mppt Mode (Solar, Wind, etc)	[4164] (bit 0 = On/Off)	Maximum Power Point Mode. See Table 4164-1.
4165	R/W	Aux 1 and 2 Function	[4165]	Combined Aux 1&2 Functions + On/Off. See Table 4208

Address	R/W	Name	Conversion	Notes
4166	R/W	Aux1VoltsLoAbs	([4166] /10) Volts	Aux 1 Absolute Low Threshold Voltage
4167	R/W	Aux1DelayT	[4167] Milli Seconds	Aux 1 Delay time before Asserting.
4168	R/W	Aux1HoldT	[4168] Milli Seconds	Aux 1 Hold time before De-asserting.
4169	R/W	Aux2PwmVwidth	([4169] /10) Volts	Voltage range over which PWM operates.
4170	R/W	RESERVED	[4170]	RESERVED (Do NOT Write)
4171	R/W	RESERVED	[4171]	RESERVED (Do NOT Write)
4172	R/W	Aux1VoltsHiAbs	([4172] /10) Volts	Aux 1 Absolute High Voltage Threshold
4173	R/W	Aux2VoltsHiAbs	([4173] /10) Volts	Aux 2 Absolute High Voltage Threshold
4174	R/W	Aux1VoltsLoRel (Relative to charge stage set point V)	([4174] /10) Volts	Aux 1 Relative Lower Voltage Threshold (Charge Stage Rel)
4175	R/W	Aux1VoltsHiRel (Relative to charge stage set point V)	([4175] /10) Volts	Aux 1 Relative Upper Voltage Threshold (Charge Stage Rel)
4176	R/W	Aux2VoltsLoRel (Relative to charge stage set point V)	([4176] /10) Volts	Aux 2 Relative Lower Voltage Threshold (Charge Stage Rel)
4177	R/W	Aux2VoltsHiRel (Relative to charge stage set point V)	([4177] /10) Volts	Aux 2 Relative Upper Voltage Threshold (Charge Stage Rel)
4178	R/W	Aux1VoltsLoPv (absolute)	([4178] /10) Volts	Aux 1 Lower PV Voltage Threshold
4179	R/W	Aux1VoltsHiPv (absolute)	([4179] /10) Volts	Aux 1 High PV Voltage Threshold
4180	RESERVED (Do NOT Write)			
4181	R/W	Aux2VoltsHiPv (absolute)	([4181] /10) Volts	Aux 2 High PV Voltage Threshold
4182	RESERVED (Do NOT Write)			
4183	R/W	ArcFaultSenstvty	Time = [4183] Sense = [4183]	Arc Fault Protection sensitivity response adjustments
4184	RESERVED (Do NOT Write)			
4185				
4186				

Address	R/W	Name	Conversion	Notes
4187	R/W	Enable Flags bits	[4187]	See Table 4187-1
4188	R/W	RESERVED	[4188]	RESERVED (Do NOT Write)
4189	R/W	Vbatt_Offset	([4189] /10)	Battery Voltage Offset Tweak (Range Limited) (Signed)
4190	R/W	Vpv_Offset	([4190] /10)	Input Voltage Offset Tweak (Range Limited) (Signed)
4191	R	VpvTargetRd	([4191] /10) Volts	Input Target (V regulation) Voltage (Usually Vmpp)
4192	RESERVED (Do NOT Write)			
4193	R/W	RESERVED	[4193]	RESERVED (Do NOT Write)
4194	R/W	RESERVED	[4194]	RESERVED (Do NOT Write)
4195	R/W	RESERVED	[4195]	RESERVED (Do NOT Write)
4196	R/W	RESERVED	[4196]	RESERVED (Do NOT Write)
4197	R/W	LgcySweepIntervalSecs	[4197] Seconds	Legacy P&O, Hydro, Solar, U-Set Sweep Interval, Seconds (Forcing Sweep resets timer)
4198	R/W	MinSwpVocPercentage	([4198] / 100) %	Minimum sweep as a percentage of V _{oc} (Unused)
4199	R/W	MaxSwpVocPercentage	([4199] / 100)%	Maximum sweep as a percentage of V _{oc} (Unused)
4200	R/W	SweepDepth	[4200] Watts %	Percent of last Mpp Watts
4201	R/W	RESERVED	[4201] RESERVED	RESERVED (Do NOT Write)
4202	R/W	ClipperCmdVolts	([4202] /10) Volts	Variable Voltage command to Clipper or Aux in Clipper mode
4203	R/W	WindNumberOfPoles	[4203] poles	Number of turbine alternator poles (for RPM Calc)
4204	R/W	MppPercentVoc	[4204] 00 to 100 %	% of Voc for U-Set mode
4205	R/W	WindTableToUse	[4205]	FUTURE power curve select
4206	R/W	WindTableLearn	[4206]	FUTURE Wind Learn usage
4207	R/W	LEDmode	[4207]	See Table 4207-1
4208 4209		RESERVED	RESERVED	RESERVED (Do NOT Write)
4210 4211 4212 4213	R/W	ID name	[4210] _{MSB} [4210] _{LSB} [4210] _{MSB} [4210] _{LSB} [4210] _{MSB} [4210] _{LSB} [4210] _{MSB} [4210] _{LSB} (End with 00 if less than 8 characters)	Unit Name. DHCP and MODBUS name. 8 character maximum ASCII. Takes place of MODBUS address in MNGP display if present (this needs some work)

Address	R/W	Name	Conversion	Notes
4214 4215	W	CTIME0	([4215] << 16) + [4214] (possibly atomic op)	Consolidated Time Registers SEE Table 4214-1
4216 4217	W	CTIME1	([4217] << 16) + [4216] (possibly atomic op)	Consolidated Time Registers SEE Table 4216-1
4218	W	CTIME2	[4218]	Consolidated Time Registers SEE Table 4218-1
4219	R/W	BaudRateStopStartEtc	[4219] Baud rate, bps (Not implemented as of May 2011)	MODBUS Serial Baud rate. Note that writing this register will immediately change the target unit's serial baud rate which may result in communication problems with other units in the system including the unit's MNGP.
4220	R/W	RemoteMenuMode	[4220]	Present Remote Menu sent from MNGP
4221	R/W	RemoteButtons	[4221]	Remote Buttons pressed from MNGP
4222	R/W	VbatOvrshootSenstvtvy	[4222]	Overshoot Sensitivity (<i>not implemented</i>)
4223	R/W	RESERVED	[4223]	RESERVED (Do NOT Write)
4224	R/W	PreVoc	([4224] /10) Volts	PV Terminal V before Relay
4225	R/W	RESERVED	[4225]	RESERVED (Do NOT Write)
4226	R/W	VauxA2Dinput	[4226] TBD	Aux 2 A to D input (TBD)
4227	R/W	RESERVED	[4227]	RESERVED (Do NOT Write)
4228	R	RESERVED	[4228]	RESERVED (Do NOT Write)
4229	R/W	RESERVED	[4229]	RESERVED (Do NOT Write)
4230		RESERVED	[4230]	RESERVED (Do NOT Write)
4231	R	VocRD	([4231] /10) Volts	Last V _{OC} reading
4232	R	RESERVED	[4232]	RESERVED (Do NOT Write)
4233	R	RESERVED	[4233]	RESERVED (Do NOT Write)
4234	R	RESERVED	[4234]	RESERVED (Do NOT Write)
4235	RESERVED (Do NOT Write)			
4236	R/W	AbsorbTime	[4236] seconds	Absorb Time Counter (DUP!)
4237	R/W	AntiClickSenstvtvy	[4237]	Best Left Alone
4238		SiestaTime	[4238] seconds	Sleep timer

Address	R/W	Name	Conversion	Notes
4239		SiestaAbortVocAdj	([4239] / 10) Volts	Volts above last Voc reading to abort Siesta.
4240 4241	R	flagsRD	([4241] << 16) + [4240]	Internal Flags See Table 4240-1
4242	R	RESERVED		RESERVED (Do NOT Write)
4243	R	RESERVED	[4243]	RESERVED (Do NOT Write)
4244	R	VbattRegSetPTmpComp	([4244] / 10) Volts	Temperature compensated battery regulation target voltage
4245	R/W	VbattNominal	[4245] 12 * 1 thru 10 (120 Max for 250 KS)	Nominal Battery bank voltage (i.e. 12V, 24V, etc)
4246	R/W	EndingAmps	([4246] /10) Amps	Goes to Float below this Batt I
4247		EndingSoc		
4248		EndAmpSocMAddress		
4249	R/W	RebulkVolts	([4249] /10) Volts	Rebulks if battery drops below this for > 90 Seconds
4250	R	BattMonVolts	TBD	TBD
4251	R	BattMonSOC	TBD	TBD
4252	R	BattMonAmps	TBD	TBD
4253	R	BattMonAHefficiency	TBD	TBD
4254	RESERVED (Do NOT Write)			
4255				
4256				
4257	R/W	RebulkTimerSec	[4257] seconds	Rebulk interval timer. Cleared if Vbatt >= Rebulk V
4258 4259 4260 4261 4262	RESERVED (Do NOT Write)			
4263	R	RESERVED	[4263]	RESERVED (Do NOT Write)
4264 4265		Voc_Qualify_Timer_1ms	(([4265] << 16) + [4264]) msec	Timer (msec) qualifying time till turn on valid (not 2 useful)
4266	R	MinVpvTurnOn	([4266] / 10) Volts	Minimum Turn On Volts(Best Left Alone) Not too useful
4267		RESERVED	[4267]	RESERVED (Do NOT Write)
4268		RESERVED	[4268]	RESERVED (Do NOT Write)

Address	R/W	Name	Conversion	Notes
4269 4270		RESERVED	RESERVED	RESERVED (Do NOT Write)
4271	R	RestartTimerms	[4271] Milli Seconds	Count Down Time until Wake Allowed
4272	R	Ibatt	([4272] /10) Amps	Battery Current, Unfiltered
4273		RESERVED	RESERVED	RESERVED (Do NOT Write)
4274		RESERVED	RESERVED	RESERVED (Do NOT Write)
4275		ReasonForResting	[4275] Reason number	Reason Classic went to Rest (See Table 4275-1)
4276	R	Output Vbatt	([4376] / 10) Volts	Battery Voltage Unfiltered
4277	R	Input Vpv	([4377] / 10) Volts	PV Voltage Unfiltered
4278 4279		Typeint	([4279] << 16) + [4278]	TBD
4280	RESERVED (Do NOT Write)			
4281				
4282				
4283				
4283				

Table 4101-1 Device Type

Name	Value	Description
Classic150	150	Classic 150
Classic200	200	Classic 200
Classic250	250	Classic 250
Classic250 KS	251	Classic 250 with 120 V Battery bank capability (lower current than 250)

Table 4120-1 Battery Stage (UPPER Byte of mbComboChrgStge register)

Name	Value	Description
Resting	0	Off , No Power, Waiting for Power Source, Battery V over set point, etc.
Absorb	3	Regulating battery voltage at Equalize Set point
BulkMppt	4	Max Power Point Tracking until Absorb (Bulk Terminate) Voltage reached
Float	5	Battery is FULL and regulating battery voltage at Float Set point
FloatMppt	6	Max Power Point Tracking. Seeking Float set point Voltage
Equalize	7	Regulating battery voltage at Equalize Set point
HyperVoc	10	Input Voltage is above maximum Classic operating Voltage
EqMppt	18	Max Power Point Tracking. Seeking Equalize set point Voltage

Table 4120-2 Classic States (LOWER Byte of mbComboChrgStge register)

Name	Value	Description
Internal Resting state 0	0	
Internal state 1 through 6	1,2,3,4,5, 6,7	Internal state machine states

Table 4130-1 Info Flag Bits: READ ONLY

Flag	Value	Description
Classic Over Temperature	0x00000001	Classic Over Temperature if set
EEPROM error	0x00000002	Classic EEprom read/write found an error if set
RESERVED	0x00000004	RESERVED
Equalize In Progress	0x00000008	Equalize Charge stage Active if set
RESERVED	0x00000010	RESERVED
RESERVED	0x00000020	RESERVED
RESERVED	0x00000040	RESERVED
EQ MPPT	0x00000080	Battery V is less than EQ Voltage (EQ MPPT)
In V is Lower Than Out	0x00000100	Input Voltage (PV) is lower than Vbatt if set
Current Limit	0x00000200	User current limit or internal temperature current limit reached
HyperVoc	0x00000400	Hyper Voc PV input is between Vmax and Vmax+Vbatt
RESERVED	0x00000800	RESERVED
RESERVED	0x00001000	RESERVED
Battery Temp Sensor Installed	0x00002000	Battery temperature sensor installed if set
Aux1 State On	0x00004000	Aux 1 ON (aux 1 connector has V or relay closed)
Aux2 State On	0x00008000	Aux 2 ON (aux 2 connector has V present)
GroundFaultF	0x00010000	Ground Fault detected if set
DefCon4ErrF	0x00020000	FET Drive Error if set (lower priority than DefCon3)
ArcFaultF	0x00040000	Arc Fault occurred if set
NegBatCurrentF	0x00080000	Negative battery current if set
DefCon3ErrF	0x00100000	FET error (higher priority and DefCon 4)
XtraInfo2DsplyF	0x00200000	Extra info is available to display (Shading, etc)
PvPartialShadeF	0x00400000	Partial Shade detected during SOLAR sweep
WatchdogResetF	0x00800000	watchdog reset flag indicator (for debugging)
LowBatteryVF	0x01000000	VERY low battery) Vbatt is lower than 8.0 Volts
StackumperF	0x02000000	Stack Jumper is NOT installed if set
EqDoneF	0x04000000	EQ Finished. Resets when mode changed or new day
TempCompShortedF	0x08000000	Indication of shorted Temp Comp if set (all fans should come on if this is true)
LockJumperF	0x10000000	Lock Jumper is NOT installed if set
XtraJumperF	0x20000000	Extra Jumper is NOT installed if set

Table 4158-1 Battery Type (not used yet as of May 2011)

Name	Value	Description
Flooded	1	Lead Acid (Flooded)
Gel	2	Lead Acid (Gel)
AGM	3	Lead Acid (AGM)
AGM2	4	Lead Acid (AGM2)
Lithium	5	LiIon
Nicad	6	Nickel Cadmium
VRLA	7	AGM or AGM or AGM2 actually
AbsolyteIIP	8	TBD
User1	9	TBD

Table 4160-1 ForceFlagsBits (can write to low or high 16 bits independently if wanted)

Name	Value	Description
RESERVED	0x00000001	RESERVED (Do NOT Set to 1)
ForceRstDailyKwHrsF	0x00000002	Reset Daily kWh count
ForceEEPromUpdateWriteF	0x00000004	Write all current settings to internal EEPROM
ForceEEPromInitReadF	0x00000008	Reset all values to EEPROM defaults (MAY not work yet)
ForceResetInfoFlags	0x00000010	Force ALL Info Flags to zero when set to 1 (Will reset info flags to 0) (or course some may pop back to 1 after resetting if applicable)
ForceFloatF	0x00000020	Force battery charge stage to Float
ForceBulkF	0x00000040	Force new Bulk/Absorb charge stage
ForceEqualizeF	0x00000080	Force new Equalize stage
ForceNiteF	0x00000100	Force a new night time
Force25HrDayF	0x00000200	Otherwise it's a 24 Hour day
ForcePandOsweepF	0x00000400	Force a Mini-Sweep for Legacy P&O mode
ForceSweepF	0x00000800	Force a Sweep (<i>at least for U-Set</i>)
RESERVED	0x00001000	RESERVED (Do NOT Set to 1)
ForceGetTimeF	0x00002000	Set time from MNGP Remote Modbus (CTIME)
RESERVED	0x00004000	RESERVED (Do NOT Set to 1)
RESERVED	0x00008000	RESERVED (Do NOT Set to 1)
RESERVED	0x00010000	RESERVED (Do NOT Set to 1)
RESERVED	0x00020000	RESERVED (Do NOT Set to 1)
RESERVED	0x00040000	RESERVED (Do NOT Set to 1)
RESERVED	0x00080000	RESERVED (Do NOT Set to 1)
RESERVED	0x00100000	RESERVED (Do NOT Set to 1)
RESERVED	0x00200000	RESERVED (Do NOT Set to 1)
RESERVED	0x00400000	RESERVED (Do NOT Set to 1)
ForceResetFaultsF	0x00800000	Just reset all of the faults
RESERVED	0x01000000	RESERVED (Do NOT Set to 1)

Table 4164-1 MPPT MODE Bit 0 is the ON/OFF (Enable/Disable) Table shows modes as ON

NOTE: MPPT MODE will automatically revert to OFF during mode change

	Value	Description
PV_Uset	0x0001	U-SET MPPT MODE (includes MPPT ENABLED (On) FLAG i.e. if 0x0000 MPPT mode is OFF)
DYNAMIC	0x0003	Slow Dynamic Solar Tracking (old Solar 1 O & P)
Legacy P&O	0x0009	Legacy P & O sweep mode
SOLAR	0x000B	Fast SOLAR track (old PV Learn mode)
MICRO HYDRO	0x000D	Micro Hydro mode (similar to Legacy P&O)
WIND TRACK	0x0005	Wind Track Mode
WIND LEARN (future mode)	0x0007	Wind Learn Mode (not implemented as of May 2011)
PV COMBO 1	0x000F	PV COMBO 1
RESERVED	0x0011	RESERVED
BOOST CHRГ	0x0013	Boost Charge Mode (Lower to Higher Voltage, Unimplemented as of May 2011)

Table 4207-1

Name	Value	Description
All Off	0	No LED activity except on startup
Rick Mode	1	Minimal Activity: Remote Yellow LED indicates Current Limiting or FET Temperature Limit.
Blinky	2	All LEDs Active: Lightshow! MNGP Red LED : MNGP->Classic MODBUS active
LED 1	3	Status Mode: MNGP Green LED = Battery Full (Float) Classic Red LED = Aux 1 Active. Classic Yellow LED = Aux 2 Active Classic Blue LED = Unimplemented
LED 2	4	Unimplemented
LED 3	5	Unimplemented

Table 4240-1 Internal Flags bits (Read Only) (flagsRD)

Name	Value	Description
RESERVED	0x00000001	RESERVED
RESERVED	0x00000002	RESERVED
RESERVED	0x00000004	RESERVED
RESERVED	0x00000008	RESERVED
RESERVED	0x00000010	RESERVED
RESERVED	0x00000020	RESERVED
RESERVED	0x00000040	RESERVED
AbsorbTimeRunf	0x00000080	Bulk/Absorb Timer Counting is Enabled
EqTimeRunf	0x00000100	EQualize Timer Run flag
FloatTimeRunf	0x00000200	Float Time accumulate flag
kWhAccumRunf	0x00000400	kiloWatt-hour & Amp-Hour accumulate enabled
RESERVED	0x00000800	RESERVED
AbsorbCountUpf	0x00001000	Absorb Timer is counting UP if set
OK2WriteIVtables	0x00004000	OK to write WindPowerTableV[] & I[]
WindLowflag	0x00008000	Indicates that we turned off because of low power
SweepDwnEnabledf	0x00010000	Slowly Sweeping Down V input
LowLightflag	0x00020000	State 2 detected low light (May not be accurate)
RESERVED	0x00040000	RESERVED
RESERVED	0x00080000	RESERVED
RESERVED	0x00100000	RESERVED
SweepUpEnabledf	0x00200000	Slowly Sweeping UP V input
RESERVED	0x00400000	RESERVED
RESERVED	0x00800000	RESERVED
RESERVED	0x01000000	RESERVED
BattFull	0x02000000	Battery Full, Absorb complete, Float
RESERVED	0x04000000	RESERVED
EqCountUpf	0x08000000	EQ Timer is counting Up
RESERVED	0x10000000	RESERVED
RESERVED	0x20000000	RESERVED
RESERVED	0x40000000	RESERVED
RESERVED	0x80000000	RESERVED

Tables 4165 AUX 1 and 2 modes Extracted and encoded as combined in Aux12Function

Table 4165-1 AUX 1 Off – Auto – On (Extracted/Encoded as Aux12Function bits 6,7)

$$\text{Aux1OffAutoOn} = (((\text{Aux12Function} \& 0xc0) \gg 6));$$

Name	Value	Description
Aux 1 Off	0	Aux 1 output is OFF (0 Volts)
Aux 1 Auto	1	Aux 1 operates as defined in Aux2Funtion
Aux 1 On	2	Aux 1 output is ON (~14 Volts)
Aux 1 Unimplemented	3	Unassigned at present

Table 4165 -2 AUX 2 Off – Auto – On (Extracted/Encoded as Aux12Function bits 14,15)

$$\text{Aux2OffAutoOn} = ((\text{Aux12FunctionS} \& 0xc000) \gg 14);$$

Name	Value	Description
Aux 2 Off	0	Aux 2 output is OFF (0 Volts)
Aux 2 Auto	1	Aux 2 operates as defined in Aux2Funtion
Aux 2 On	2	Aux 2 output is ON (~14 Volts)
Aux 2 Unimplemented	3	Unassigned at present

Table 4165 -3 AUX 1 Function (Extracted/Encoded as Aux12Function bits 0-5)

$$\text{Aux1Function} = \text{Aux12Function} \& 0x3f;$$

Name	Value	Description
DIVERSION SLW+	1	Non-PWM On at Vbatt > Aux1 VoltsHiAbs Off at Vbatt < Aux1 VoltsLoAbs (Active High)
DIVERSION SLW-	2	Same as DIVERSION SLW+ but Active Low
BAT DIV V REL+	3	Non-PWM On at Vbatt > Aux1 VoltsHiAbs Off at Vbatt < Aux1 VoltsLoAbs (Active High)
BAT DIV V REL-	4	Non-PWM On at Vbatt > Aux1 VoltsHiAbs Off at Vbatt < Aux1 VoltsLoAbs (Active Low)
PV V TRIGGER +	7	Active High output if Vin exceeds Aux1 VoltsHiPv
PV V TRIGGER -	8	Active Low output if Vin exceeds Aux1 VoltsHiPv
MANUAL ON-OFF	9	MANUAL On/Off allowed using Off-Auto-On Selection
TOGGLE TEST	13	Out Once per second On-Off-On-Off automatic toggle
NITE LITE HIGH	14	Active High indicating Night Time. Inactive at Wakeup
NITE LITE LOW	15	Active Low indicating Night Time. Inactive at Wakeup
WIND CLIPPER	16	Output goes Active High when V input is above PV input V plus headroom voltage

Table 4165 -4 AUX 2 Function *(Extracted/Encoded as Aux12Function bits 8-13)*
 Aux2Function = (Aux12FunctionS & 0x3f00) >> 8; (Digital/Analog Input/Output)

Name	Value	Description
DIVERT DGTL F+	0	Digital Out PWM Battery Diversion (Active High)
DIVERT DGTL F-	1	Digital Out PWM Battery Diversion (Active Low)
BAT DIV V REL+	2	Digital Out PWM Relative to Charge Stage Voltage Threshold Diversion (Use It Or Lose It) (Active High)
BAT DIV V REL-	3	Digital Out PWM Relative to Charge Stage Voltage Threshold Diversion (Use It Or Lose It) (Active Low)
TOGGLE TEST	6	Out Once per second On-Off-On-Off automatic toggle
PV IN TRIG +	7	Active High output if Vin exceeds Aux2VoltsHiPv
PV IN TRIG -	8	Active Low output if Vin exceeds Aux2VoltsHiPv
MANUAL ON-OFF	9	MANUAL On/Off allowed using Off-Auto-On Selection
WIND CLIPPER	10	PWM output Active High when V input is above PV input V plus headroom voltage
NITE LITE HIGH	11	Active High indicating Night Time. Inactive at Wakeup
NITE LITE LOW	12	Active Low indicating Night Time. Inactive at Wakeup

Table 4187-1 EnableFlags bits [4187]

Name	Value	Description
GroundFaultEn	0x0001	Ground Fault Protection Enabled when Set to 1
ArcFaultEn	0x0002	Arc Fault Protection Enabled when Set to 1
RESERVED	0x0004	RESERVED (Do NOT set this bit)
PvPartialShadeEn	0x0008	Partial Shade reporting Enabled when Set to 1
RESERVED	0x0010	RESERVED (Do NOT set this bit)
DefCon3ErrEn	0x0020	DefCon3 Error reporting enabled if set to 1
DefCon4ErrEn	0x0040	DefCon3 Error reporting enabled if set to 1
PwmLowMaxFlag	0x0080	Low Max Enabled if Set to 1 (Low Vin - Vout)
RESERVED	0x0100	RESERVED (Do NOT Set to 1)
RESERVED	0x0200	RESERVED (Do NOT Set to 1)
BumpWindI	0x0400	When adjusting wind curve, automatically “bumps” adjacent current set points out of the way if set to 1
DivrsnAbsEqTmrEn	0x0800	Enables Absorb & EQ timer counting when Aux functions are diverting if set to 1.
RESERVED	0x1000	RESERVED (Do NOT Set to 1)
RESERVED	0x4000	RESERVED (Do NOT Set to 1)
RESERVED	0x8000	RESERVED (Do NOT Set to 1)

Table 4214-1 CTIME0 ([4215] << 16) + [4214] Consolidated Time Registers 0 (write only to set Classic Time -- Normally, MNGP will set these registers from its battery backed RTC)

Name	Value	Description
BITS 5:0	0 to 59	Seconds Seconds value in the range of 0 to 59
BITS 5:0	RESERVED	RESERVED (Do NOT write ones to these bits)
BITS 13:8	0 to 59	Minutes value in the range of 0 to 59
BITS 15:14	RESERVED	RESERVED (Do NOT write ones to these bits)
BITS 20:16	0 to 23	Hours value in the range of 0 to 23
BITS 23:21	RESERVED	RESERVED (Do NOT write ones to these bits)
BITS 36:24	0 to 6	Day Of Week Day of week value in the range of 0 to 6
BITS 31:27	RESERVED	RESERVED (Do NOT write ones to these bits)

Table 4216-1 CTIME1 ([4217] << 16) + [4216] Consolidated Time Registers 1 (write only to set Classic Time -- Normally, MNGP will set these registers from its battery backed RTC)

Name	Value	Description
BITS 4:0	1 to 28, 29, 30, 31	Day of month value in the range of 1 to 28, 29, 30, or 31 (depending on the month and whether it is a leap year)
BITS 7:5	RESERVED	RESERVED (Do NOT write ones to these bits)
BITS 11:8	1 to 12	Month value in the range of 1 to 12
BITS 15:12	RESERVED	RESERVED (Do NOT write ones to these bits)
BITS 27:16	0 to 4095	Year value in the range of 0 to 4095
BITS 31:28	RESERVED	RESERVED (Do NOT write ones to these bits)

Table 4218-1 CTIME2 ([4218] Consolidated Time Register 2 (write only to set Classic Time -- Normally, MNGP will set these registers from its battery backed RTC)

Name	Value	Description
BITS 11:0	1 to 366 *	Day of year value in the range of 1 to 365 * (366 for leap years)
BITS 31:12	RESERVED	RESERVED (Do NOT write ones to these bits)

Table 4275-1 Reason For Resting

VALUE	REASON FOR RESTING
1	Anti-Click. Not enough power available (Wake Up)
2	Insane Ibatt Measurement (Wake Up)
3	Negative Current (load on PV input ?) (Wake Up)
4	PV Input Voltage lower than Battery V (Vreg state)
5	Too low of power out and Vbatt below set point for > 90 seconds
6	FET temperature too high (<i>always</i> shows up on boot up) (Cover is on maybe ?)
7	Ground Fault Detected
8	Arc Fault Detected
9	Too much negative current while operating
10	Battery is less than 8.0 Volts
11	PV input is available but V is rising too slowly. Low Light or bad connection
12	Voc has gone down from last Voc or low light. Re-check
13	Voc has gone up from last Voc enough to be suspicious. Re-check
14	Same as 11
15	Same as 12
16	Mppt MODE is OFF (Usually because user turned it off)
17	PV input is higher than operation range (too high for 150V Classic)
18	PV input is higher than operation range (too high for 200V Classic)
19	PV input is higher than operation range (too high for 250V or 250KS)
25	Battery Voltage too high of Overshoot (small battery or bad cable ?)

The network registers are all Read/Write. You may write any values to these registers, however this may result in erratic operation in some instances.

To set A static IP address, be sure to clear the DHCP bit in register 20481 before writing the static values to the

Network			
Address	Name	Units	Description
20481	IP Settings	[20481]	Network Settings Flags. See Table 20481-1
20482 20483	IP Address	[20483] _{MSB} . [20483] _{LSB} . [20482] _{MSB} . [20482] _{LSB}	The IP address of the Classic [†]
20484 20485	Gateway Address	[20485] _{MSB} . [20485] _{LSB} . [20484] _{MSB} . [20484] _{LSB}	Network Gateway Address. [†]
20486 20487	Subnet	[20487] _{MSB} . [20487] _{LSB} . [20486] _{MSB} . [20486] _{LSB}	Network Subnet Mask [†]
20488 20489	DNS_1	[20489] _{MSB} . [20489] _{LSB} . [20488] _{MSB} . [20488] _{LSB}	Primary DNS Address [†]
20490 20491	DNS_2	[20491] _{MSB} . [20491] _{LSB} . [20490] _{MSB} . [20490] _{LSB}	Secondary/Alternate DNS Address [†]
[†] Read Only if the DHCP flag is set. To assign a static IP to the Classic, first clear the DHCP flag in the IP Settings Register (20481).			

Table 20481-1

Name	Value	Description
DHCP	0x0001	Set this bit to enable DHCP.
Web Access	0x0002	Set this bit to enable online access to your Classic through http://www.mymidnite.com

The Version Registers are all Read Only. Writes to any of these registers will have no long-term effect.

Version			
Address	Name	units	Description
16385	app_version	Major: [16385](15...12) Minor: [16385](11...8) Release: [16385](8..4)	Release version of the application code
16386	net_version,	Major: [16386](15...12) Minor: [16386](11...8) Release: [16386](8...4)	Release version of the communications stack
16387 16388	app_rev	([16388] << 16) + [16387]	Build Revision of the application code
16389 16390	net_rev	([16390] << 16) + [16389]	Build Revision of the communications code stack

PRELIMINARY

Communication Statistics are all Read/Write registers. You may write any value to these registers which will be incremented should the trigger for that counter occur. The most useful type of write may be to periodically reset the counters to zero. These are all lifetime counters and due to the number of MODBUS transactions may overflow to 0.

Communication Statistics			
Address	Name	units	Description
Master / In Bus Interface			
10001 10002	rx_ok	([10002] << 16) + [10001]	Number of correctly received packets
10003 10004	rx_crc_err	([10004] << 16) + [10003]	Number of packets received with crc errors
10005 10006	requested_ok	([10006] << 16) + [10005]	Number of transactions originating from this unit that completed successfully
10007 10008	requested_err	([10008] << 16) + [10007]	Number of transactions originating from this unit that failed
10009 10010	forwarded	([10010] << 16) + [10009]	Number of packets forwarded through this interface
10011 10012	broadcast	([10012] << 16) + [10011]	Number of broadcast packets received
10013 10014	dropped_busy	([10014] << 16) + (10013)	Number of packets dropped due to the interface being busy.
10015 10016	RESERVED		
Slave / Out bus interface			
10017 10018	rx_ok	([10018] << 16) + [10007]	Number of correctly received packets
10019 10020	rx_crc_err	([10020] << 16) + [10020]	Number of packets received with crc errors
10021 10022	requested_ok	([10022] << 16) + [10021]	Number of transactions originating from this unit that completed successfully
10023 10024	requested_err	([10024] << 16) + [10023]	Number of transactions originating from this unit that failed
10025 10026	forwarded	([10026] << 16) + [10025]	Number of packets forwarded through this interface
10027 10028	broadcast	([10028] << 16) + [10027]	Number of broadcast packets received
10029 10030	dropped_busy	([10030] << 16) + [10029]	Number of packets dropped due to the interface being busy.
10031 10032	RESERVED		

Communication Statistics			
Remote bus interface			
10033 10034	rx_ok	$([10034] \ll 16) + [10033]$	Number of correctly received packets
10035 10036	rx_crc_err	$([10036] \ll 16) + [10035]$	Number of packets received with crc errors
10037 10038	requested_ok	$([10038] \ll 16) + [10037]$	Number of transactions originating from this unit that completed successfully
10039 10040	requested_err	$([10040] \ll 16) + [10039]$	Number of transactions originating from this unit that failed
10041 10042	forwarded	$([10042] \ll 16) + [10041]$	Number of packets forwarded through this interface
10043 10044	broadcast	$([10044] \ll 16) + [10043]$	Number of broadcast packets received
10045 10046	dropped_busy	$([10046] \ll 16) + [10045]$	Number of packets dropped due to the interface being busy.
10047 10048	RESERVED		
TCP bus interface			
10049 10050	rx_ok	$([10050] \ll 16) + [10049]$	Number of correctly received packets
10051 10052	rx_crc_err	$([10052] \ll 16) + [10051]$	Number of packets received with crc errors
10053 10054	requested_ok	$([10054] \ll 16) + [10053]$	Number of transactions originating from this unit that completed successfully
10055 10056	requested_err	$([10056] \ll 16) + [10055]$	Number of transactions originating from this unit that failed
10057 10058	forwarded	$([10058] \ll 16) + [10057]$	Number of packets forwarded through this interface
10059 10060	broadcast	$([10060] \ll 16) + [10059]$	Number of broadcast packets received
10061 10062	dropped_busy	$([10062] \ll 16) + [10061]$	Number of packets dropped due to the interface being busy.
10063 10064	RESERVED		

Reserved			
Address	Name	units	Description
61441-61442	Reserved		Reserved

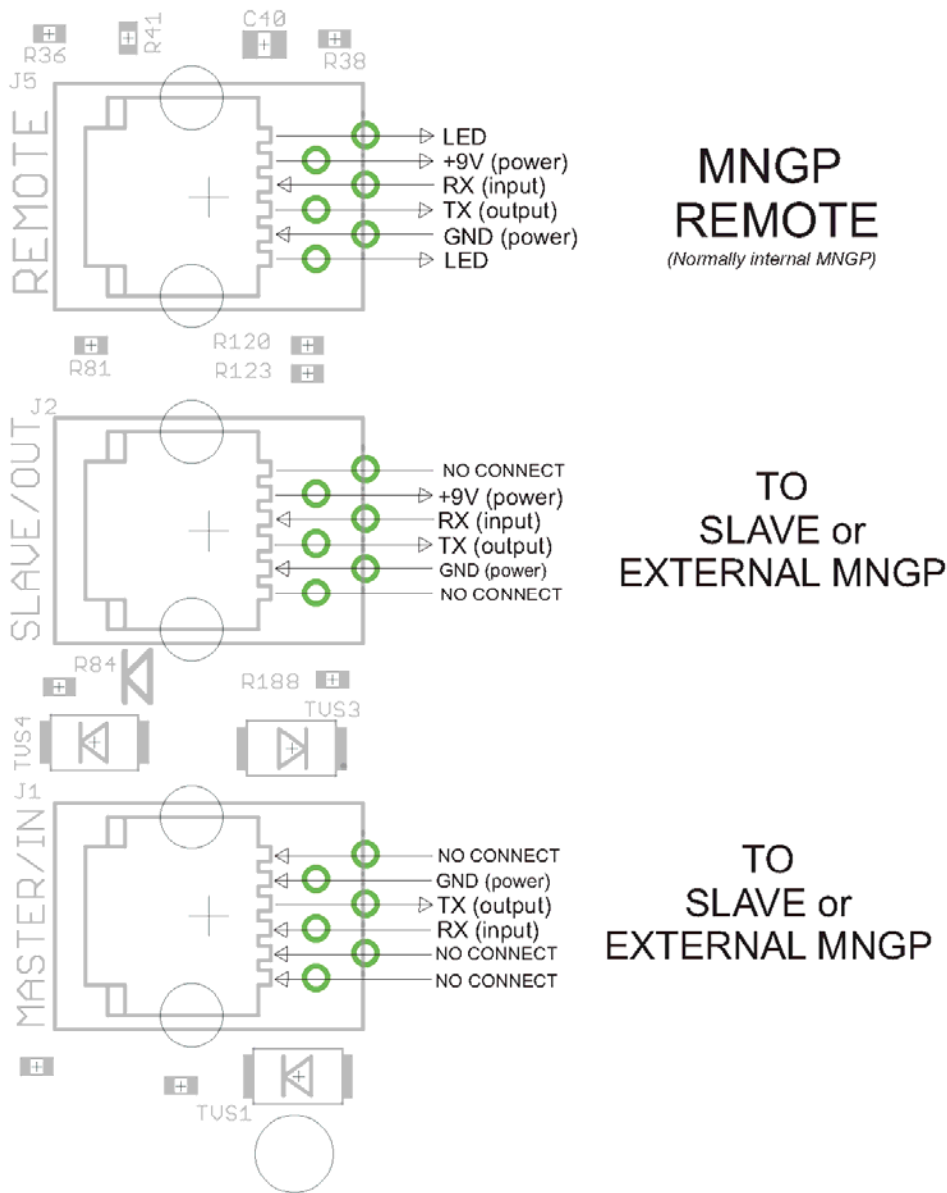


Figure 1. Classic RS-232 MODBUS RJ-11 PHONE JACK PINOUTS (Top View)