FAULTMASTER 2500
MODBUS IMPLEMENTATION AND REGISTER MAP

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MODBUS FUNCTIONS SUPPORTED
03     Read Setpoints
       Register range 00 through 68 for setpoints

04     Read System Values
       Register range 00 through 28

05     Remote Operation
       Operation Address Assignment (Operation code):
       00 = JVR Trip/Close (0xFF00 = Trip, 0x0000 = Close)
       01 = Reclose Enable/Disable (0xFF00 = Enable, 0x0000 = Disable)
       02 = GF Trip Enable/Disable (0xFF00 = Enable, 0x0000 = Disable)
       03 = Lockout Reset (0xFF00 = Reset, 0x0000 = don't care)
       04 = Initiate Battery Test (0xFF00 = Battery Test, 0x0000 = don't care)
       05 = Clear Event Recorder (0xFF00 = Clear Events, 0x0000 = don't care)
       06 = Clear Peak Demands (0xFF00 = Clear Peak, 0x0000 = don't care)

06     Store Single Setpoint
       Register range 00 through 67 (can not change communication
       address or time/date).  The range of the value is checked for
       validity - if range is violated, the setpoint will not be changed
       and an ILLEGAL DATA error will be issued.

07     Read Operating Status
       Bit Assignment:
       b0: 1 = JVR Tripped (open)
       b1: 1 = Reclose Enabled
       b2: 1 = GF Trip Enabled
       b3: 1 = Lockout
       b4: 1 = Remote Enabled
       b5: 1 = Batteries OK
       b6: 1 = Caps OK
       b7: 1 = Alarm (any system event, except battery or cap failures,
               e.g. checksum or processor com fail)

12     Read Event Log (each event is 8 'registers' long)
       Event Range 00 to 99
       The starting event number and number of events to be transmitted
       must be sent.  Any event not logged will return NULL values for
       all entries, including the event number, in the event.  This is
       not standard MODBUS implementation, see below for query and
       response format.
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16 Store Multiple Setpoints
Register range 00 through 67 (can not change communication address or time/date). The ranges of all values are checked for validity - if any one range is violated, no setpoints will be changed and an ILLEGAL DATA error will be issued.

30 Write custom curve table. Not in the MODBUS standard. JVRCOM should be used for this operation.

31 Read custom curve table. Not in the MODBUS standard. JVRCOM should be used for this operation.

SETPOINTS

Adr.	Setpoint	Range	Step	Default	Units
0	PHASE PICK-UP	50-1600	1	300	Amps
1	PHASE FAST CURVE	0-4	1	0	Curve Set
	0 = Moderate Inverse (default)				
	1 = Normally Inverse				
	2 = Very Inverse				
	3 = Extremely Inverse				
	4 = Custom (can only be loaded by JVRCOM)				
2	PHASE FAST TIME DIAL	1-32	1	1	(only for curves 0-3)
3	PHASE FAST DEF TIME	0-60	1	0	Cycles
4	PHASE SLOW CURVE	0-4	1	0	Curve Set
	0 = Moderate Inverse (default)				
	1 = Normally Inverse				
	2 = Very Inverse				
	3 = Extremely Inverse				
	4 = Custom (can only be loaded by JVRCOM)				
5	PHASE SLOW TIME DIAL	1-32	1	1	(only for curves 0-3)
6	PHASE SLOW DEF TIME	0-60	1	0	Cycles
7	PHASE ALT PICK-UP	50-1600	1	300	Amps
8	PHASE INST PICK-UP	0-12000	50	6000	Amps
9	PHASE INST DELAY	0-60	1	0	Cycles
10	PHASE INST BLOCK	0-3	1	0	"AFTER TRIP #" (0=OFF)
11	PHASE INST LOCKOUT	0-1	1	0	0=OFF,1=ON
12	GROUND PROTECTION	0-1	1	0	0=OFF,1=ON
13	GROUND PICK-UP	5-800	1	150	Amps
14	GROUND FAST CURVE	0-4	1	0	Curve Set
	0 = Moderate Inverse (default)				
	1 = Normally Inverse				
	2 = Very Inverse				
	3 = Extremely Inverse				
	4 = Custom (can only be loaded by JVRCOM)				
15	GND FAST TIME DIAL	1-32	1	1	(only for curves 0-3)
16	GROUND FAST DEF TIME	0-60	1	0	Cycles
17	GROUND SLOW CURVE	0-4	1	0	Curve Set
	0 = Moderate Inverse (default)				
	1 = Normally Inverse				
	2 = Very Inverse				
	3 = Extremely Inverse				
	4 = Custom (can only be loaded by JVRCOM)				
18	GND SLOW TIME DIAL	1-32	1	1	(only for curves 0-3)
19	GROUND SLOW DEF TIME	0-60	1	0	Cycles
20	GROUND ALT PICK-UP	5-800	1	150	Amps
21	GROUND INST PICK-UP	0-3000	25	3000	Amps

SETPOINTS Continued

Adr.	Setpoint	Range	Step	Default	Units
22	GROUND INST DELAY	0-60	1	0	Cycles
23	GROUND INST BLOCK	0-3	1	0	"AFTER TRIP #" (0=OFF)
24	GROUND INST LOCKOUT	0-1	1	0	0=OFF,1=ON
25	JVR INTERRUPT RATING	4-6	1	6	kA(will clear duty monitor)
	4 = 6kA interrupt rating				
	5 = 10kA interrupt rating				
	6 = 12kA interrupt rating (default)				
26	SEF PROTECTION	0-1	1	0	0=OFF,1=ON
27	SEF PICK-UP	3-80	1	10	Amps
28	SEF DELAY	30-1200	30	1200	Cycles
29	SEF TRIPS TO LOCKOUT	1-4	1	4	Trips
30	TRIPS TO LOCKOUT	1-4	1	4	Trips
31	DEAD TIME 1	5-600	1	5	0.1 Seconds
32	DEAD TIME 2	10-600	10	20	0.1 Seconds
33	DEAD TIME 3	10-600	10	50	0.1 Seconds
34	RECLOSE RESET TIME	3-180	1	30	Seconds
35	NUMBER OF FAST TRIPS	1-4	1	2	
36	ALTERNATE PICK UP	0-1	1	0	0=OFF,1=ON
37	SEQUENCE COORD	0-1	1	0	0=OFF,1=ON
38	Reserved				
39	Reserved				
40	INRUSH DELAY	0-20	1	1	Seconds (0=OFF)
41	LOCKOUT CLOSE BLOCK	0-1	1	0	0=OFF,1=ON
42	CLOSE INTO FAULT	0-20	1	0	Seconds (0=OFF)
43	MINIMUM TRIP TIME	0-60	1	0	Cycles (0=OFF)
44	VOLTAGE PROTECTION	0-1	1	0	0=OFF,1=ON
45	PRIMARY VOLTAGE	0-380	1	138	0.1kV
46	UNDERVOLTAGE PICK-UP	0-100	1	80	Percent
47	UNDERVOLTAGE DELAY	0-30	1	30	Seconds
48	OVERVOLTAGE PICK-UP	100-150	1	135	Percent
49	OVERVOLTAGE DELAY	0-30	1	30	Seconds
50	SINGLE/MULTI PHASE	0-2	1	0	
	0 = Any phase or phases				
	1 = One or two phases only				
	2 = Three phases only				
51	USER ANALOG INPUT	0-1	1	0	0=OFF,1=ON
52	Reserved				
53	USER VALUE AT 0MA IN	0-9999	1	0	0.1User Units
54	USER VALUE AT 1MA IN	0-9999	1	5000	0.1User Units
55	USER MIN VALUE TRIP	0-100	1	0	Percent
56	USER MAX VALUE TRIP	0-100	1	0	Percent
57	USER MIN VALUE ALARM	0-100	1	15	Percent
58	USER MAX VALUE ALARM	0-100	1	85	Percent
59	USER EVENT DELAY	0-600	1	0	Seconds
60	USER EVENT ASSIGN	7-9	1	7	
	7 = Alarm Only				
	8 = Trip Only				
	9 = Alarm and trip				
61	DAYLIGHT SAVINGS	0-1	1	1	0=OFF,1=ON
62	DATE SET YEAR	0-99	1	96	
63	DATE SET DAY	1-31	1	26	
64	DATE SET MONTH	1-12	1	8	
65	TIME SET SECOND	0-59	1	54	
66	TIME SET MINUTE	0-59	1	30	
67	TIME SET HOUR	0-23	1	8	
68	COM STATION ADDRESS	1-247	1	1	

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SYSTEM VALUES
Adr.  System Value            Units
0     PHASE A CURRENT         Amps
1     PHASE B CURRENT         Amps
2     PHASE C CURRENT         Amps
3     GROUND CURRENT          Amps
 // if voltage protection disabled, voltages will not be updated
4     PHASE A VOLTAGE         0.1kV
5     PHASE B VOLTAGE         0.1kV
6     PHASE C VOLTAGE         0.1kV
 // if user analog input disabled, analog value will not be updated
7     USER ANALOG             0.1 User defined
8     CAUSE OF LAST TRIP      Event Code (only trip events are available here)
            Event Code  Event Text
            0           INSTANT CURRENT TRIP
            1           TIMED CURRENT TRIP
            2           OVERVOLTAGE TRIP
            3           UNDERVOLTAGE TRIP
            4           SENSITIVE EARTH TRIP
            5           USER LOW LIMIT TRIP
            6           USER HIGH LIMIT TRIP
9     YEAR AT LAST TRIP
10    DAY AT LAST TRIP
11    MONTH AT LAST TRIP
12    SECOND AT LAST TRIP
13    MINUTE AT LAST TRIP
14    HOUR AT LAST TRIP
15    PHASE AT LAST TRIP      Amps
16    PHASE AT LAST TRIP      Amps
17    PHASE AT LAST TRIP      Amps
18    GROUND LAST TRIP        Amps
19    NUMBER OF TRIPS
20    CONTACT DUTY PHASE A    0.01 Percent
21    CONTACT DUTY PHASE B    0.01 Percent
22    CONTACT DUTY PHASE C    0.01 Percent
23    PEAK DEMAND PHASE A     Amps
24    PEAK DEMAND PHASE B     Amps
25    PEAK DEMAND PHASE C     Amps
26    REVISION
27    SERIAL ID NUMBER        0.1
28    LAST EVENT NUMBER

EVENT LOG
Prior to event retrieval, the "Last Event" (System Value 28) will be read from
the system values and, if less than 99, one event beyond this will be read to
check for unrecorded event space (if null data is read, then the remainder of
event space is blank, else the event recorder is full).
   Query:
      Slave Address     = (unit address of slave)
      Function Code     = 12
      Event Address     = 0-99 (starting address of one of 100 events)
      Number of events  = 1-100 (number of events to be retrieved)
      CRC (2 error check bytes)
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Response:
Slave Address = (unit address of slave)
Function Code = 12
Number of events = 1-100 (number of events to be retrieved)
Event Data = data contained in the number of requested events sequentially starting with the event addressed in the query's Event Address
CRC (2 error check bytes)

Event Value Structure has 8 bytes and 4 words in the following order:
1st byte is the Event Code:

Event Code	Event Text	Data
0	INSTANT CURRENT TRIP	4 - Phase and ground currents
1	TIMED CURRENT TRIP	4 - Phase and ground currents
2	OVERVOLTAGE TRIP	3 - Phase Voltages
3	UNDERVOLTAGE TRIP	3 - Phase Voltages
4	SENSITIVE EARTH TRIP	1 - Ground current
5	USER LOW LIMIT TRIP	1 - User Value
6	USER HIGH LIMIT TRIP	1 - User Value
7	USER LOW LIM ALARM	1 - User Value
8	USER HIGH LIM ALARM	1 - User Value
9	SYSTEM CHECKSUM FAIL	2 - Good and bad checksum
10	JVR DISCREPANCY CLS	None
11	JVR DISCREPANCY OPEN	None
12	SYSTEM BATTERY FAIL	None
13	LOW CLOSE CAP ENERGY	None
14	LOW OPEN CAP ENERGY	None
15	MANUAL CLOSE	None
16	MANUAL OPEN	None
17	TEST TRIP	None
18	RECLOSE ENABLED	None
19	RECLOSE DISABLED	None
20	GROUND TRIP ENABLED	None
21	GROUND TRIP DISABLED	None
22	LOCKOUT RESET	None
23	PROCESSOR COM FAIL	None
24	JVR SOLENOID FAIL	None
25	Reserved	
26	NO PROTECTION TRIPS	None
27	LOCKOUT	None
28	SEF TRIPS ENABLED	None
29	SEF TRIPS DISABLED	None
30	Reserved	

2nd byte is the Event Number (event record number 0-99).
Next 3 bytes are the year, day, and month in order.
Next 3 bytes are the second, minute, and hour in order.
Next 4 words (16 bits per word) are data associated with events that have data as noted above. Events that do not have associated data or those that do not fill the fields will have invalid data in those fields.

SERIAL COMMUNICATION SETUP:
The character frame is 1 start bit, 8 data bits, NO parity, and 1 stop bit. The data rate is 9600 BAUD.