Specification

TCP Modbus interface of MMC products (SRD, COM, RCU, EC2)

Contents

Versionshistorik

Rev	Datum	Namn	Beskrivning
0.1	2014-04-24	JRA	Original version, EC2
0.2	2014-05-16	JRA	Added bad func exception. Added KV
0.3	2014-09-19	JRA	Added manual mode for AV and DV. More AV and MB, P, I and D for regulators
0.4	2015-06-01	JRA	Added AV01dl, alarm flag for AV
0.5	2017-04-21	JRA	Minor corrections
0.6	2019-06-13	JRA	Added TU object. Curve tags moved up.
0.7	2020-07-14	JRA	For ver 4.9.02: Added AQ, and RC state.
0.8	2021-03-04	JRA	For ver 4.9.05: TO, HR and more RC
0.9	2023-05-31	JRA	For ver 4.9.12: Added alarm delay

Rev	Datum	Namn	Beskrivning
0.10		JRA	For ver 4.9.13: Added WR object, with status enum.

1 Introduction

A TCP Modbus server interface has been added to the MMC family of products. This document describes available data and settings, data formats and function codes supported.

2 Communications interface

The Modbus server answer to TCP messages sent to the set Modbus-port. Default port is 502.

The Modbus interface is by default disabled (for security reasons). To use it, make sure it is enabled. This is done in the communication settings of the device.

Time delay for answer to come varies depending on the request, with a worst case of less than 4 seconds. Short requests (< 10 values) will always be handled within less than a second.

3 Data formats

All data is transmitted as twos complement signed 32 bit long words, with least significant 16 bit word sent first.

A special value, 2147483646 (= hex 7ffffffe), marks not available values, or sensor error.

Data can have one of the following data formats:

Format	Formal name	Explanation
Integer	INT	32 bit integer, no decimals. Also used for bit patterns.
Integer with resolution 0.1	FLOAT10	32 bit integer, 1 decimal
Integer with resolution 0.01	FLOAT100	32 bit integer, 2 decimals
Integer with resolution 0.001	FLOAT1000	32 bit integer, 3 decimals
Selection	SEL	Selection from a specified list of alternatives. A number from 0 – (N-1), where N is the number of alternatives.
Boolean	BOOL	0 or 1, false or true
Date	DATE	Year, month date, in one value calculated as: (date -1) + (month -1)*31 + year * 372
Time	TIME	Time of day, hours, minutes and seconds, in one value calculated as: sec + min * 60 + hour * 3600

3.1 Selection lists

No	Use	Alternatives
1	Units	<none>, °C, Pa, %, V, MWh, kWh, m3, m/s, sec, min, hr, ppm, %RH, mBar, °, kW, m3/h, Bar, kPA, l, l/s, Lux, W, Wh, l/h, kg, Ohm, Hz, °mn

No	Use	Alternatives
2	Alarm status	OK, C Hi Ack., B Hi Ack., A Hi Ack., C Hi Ret., B Hi Ret., A Hi Ret., C Hi Active, B Hi Active, A Hi Active, OK unsent, C Hi Ack unsent, B Hi Ack unsent, A Hi Ack unsent, C Hi Ret unsent, B Hi Ret unsent, A Hi Ret unsent, C Hi Act unsent, B Hi Act unsent, A Hi Act unsent, C Lo Ack., B Lo Ack., A Lo Ack., C Lo Ret., B Lo Ret., A Lo Ret., C Lo Active, B Lo Active, A Lo Active, OK unsent, C Lo Ack unsent, B Lo Ack unsent, A Lo Ack unsent, C Lo Ret unsent, B Lo Ret unsent, A Lo Ret unsent, C Lo Act unsent, B Lo Act unsent, A Lo Act unsent, C SE Ack., B SE Ack., A SE Ack., C SE Ret., B SE Ret., A SE Ret., C SE Active, B SE Active, A SE Active, OK unsent, C SE Ack unsent, B SE Ack unsent, A SE Ack unsent, C SE Ret unsent, B SE Ret unsent, A SE Ret unsent, C SE Act unsent, B SE Act unsent, A SE Act unsent, C Dig Ack., B Dig Ack., A Dig Ack., C Dig Ret., B Dig Ret., A Dig Ret., C Dig Active, B Dig Active, A Dig Active, OK unsent, C Dig Ack unsent, B Dig Ack unsent, A Dig Ack unsent, C Dig Ret unsent, B Dig Ret unsent, A Dig Ret unsent, C Dig Act unsent, B Dig Act unsent, A Dig Act unsent
3	Alarm types	Off, C-alarm, B-alarm, A-alarm
4	Value reset period	Never, Hour, Day, Now (means reset now, and then return setting to previous)
5	MB com status	---, OK, TIMEOUT, COLLISION, CHECK ERR, SENDERROR, SENDING
6	Digital mode	Auto, On, Off
7	Analog mode	Auto, Manual
8	RC state	Off, Normal, Limit
9	AQ function	No func, Max, Min, Average, Mid Average, Sum, Difference, Efficiency, Multiply, Divide, Dew Point, Pressure to flow, Filter, COP, accumulate degree-minutes
10	WR state	Default, Ramp in, Ramp out, Active

3.2 TU day bit patterns

In time schedule object, bit patterns are used to tell which days (week days and holidays) each on period is valid. A bit pattern can be seen as a sum of values that are all even 2 exponentials.

Day	Bit no	Bit value (hex)	Bit value (dec)
Monday	11	0x800	2048

Day	Bit no	Bit value (hex)	Bit value (dec)
Tuesday	10	0x400	1024
Wednesday	9	0x200	512
Thursday	8	0x100	256
Friday	7	0x80	128
Saturday	6	0x40	64
Sunday	5	0x20	32
Holiday 1	3	0x8	8
Holiday 2	2	0x4	4
Holiday 3	1	0x2	2
Holiday 4	0	0x1	1

4 Modbus functions

Values are read using Modbus function code “Read multiple registers” (3) or “Read input registers” (4).

Values are written using Modbus function code “Write multiple registers” (16)

4.1 Exceptions

4.1.1 Illegal function

If an unsupported function code is requested, MMC will answer with exception code 1 (“Illegal function”).

4.1.2 Illegal address

If only not available reference numbers are requested, MMC will answer with exception code 2 (“Illegal data address”).

4.1.3 Illegal length

If more than 63 values (126 16 bit words) are requested at once, MMC will answer with exception code 4 (“Illegal response length”).

4.2 Max number of values in one request

Max 63 values can be read in one request.

5 List of available values

The table is for SRD5322. Most products are subsets of this one, so the table should be valid for all KTC MMC products, with obvious adaptions.

Table columns:

- Header
- Reference number for first instance of that kind of value. For each instance, reference number is increased by 2.
- Number of instances available (in SRD5322, other products may have other figures).
- Data format according to table under ->Data formats.
- inreg for read-only, outreg for writable data.
- Value name for first instance according to KTC:s naming model. Second instance will have the same name, with index digit increased by one.
- Comment, e g unit, or selection list according to table under -> Selection lists. Bit Pattern means value according to table in 3.2

Modbus image of SRD 5322, 2023-08-11						
	System info:					
Time	2	1	TIME	outreg	RT01ti	
Date	4	1	DATE	outreg	RT01da	
Any alarm active	6	1	BOOL	inreg	RT01al	
Sum alarm A level	8	1	BOOL	inreg	RT01sa	
Sum alarm B level	10	1	BOOL	inreg	RT01sb	
Sum alarm C level	12	1	BOOL	inreg	RT01sc	
System serial id	14	1	INT	inreg	RT01id	
Any value in manual mode	16	1	BOOL	inreg	RT01vf	
	AV, analog values:					
AV value	100	64	FLOAT100	outreg	AV01va	
AV unit	300	64	SEL	outreg	AV01vu	1
AV input	500	64	FLOAT100	outreg	AV01i1	
AV al status	700	64	SEL	inreg	AV01al	2
AV al type	900	64	SEL	outreg	AV01at	3
AV al ack	1100	64	BOOL	outreg	AV01az	Write 0
AV al max limit	1300	64	FLOAT100	outreg	AV01a+	
AV al min limit	1500	64	FLOAT100	outreg	AV01a-	
AV al high	1700	64	BOOL	inreg	AV01hl	
AV al low	1900	64	BOOL	inreg	AV01ll	

AV sensor error	2100	64	BOOL	inreg	AV01gf	
AV manual value	2300	64	FLOAT100	outreg	AV01vh	
AV mode	2500	64	SEL	outreg	AV01md	7
AV alarm	2700	64	BOOL	inreg	AV01dl	
AV alarm delay	4800	64	INT	outreg	AV01ad	
	DV, digital values:					
DV value	3000	64	BOOL	inreg	DV01va	
DV input	3200	64	BOOL	outreg	DV01i1	
DV al status	3400	64	SEL	inreg	DV01al	2
DV al type	3600	64	SEL	outreg	DV01at	3
DV al ack	3800	64	BOOL	outreg	DV01az	Write 0
DV alarm	4000	64	BOOL	inreg	DV01dl	
DV mode	4200	64	SEL	outreg	DV01md	6
DV alarm delay	4400	64	INT	outreg	DV01ad	
	Analog IO:					
AI value	5000	44	FLOAT100	inreg	AI01va	Unit °C
UI value	5100	44	FLOAT100	inreg	UI01va	
UI unit	5200	44	SEL	outreg	UI01vu	1
AU value	5300	44	FLOAT100	inreg	AU01va	Unit %
AU voltage	5400	44	FLOAT100	inreg	AU01vv	Unit V
	PU, pump control					
PU on limit	5500	4	FLOAT100	outreg	PU01l+	Unit °C
PU off limit	5520	4	FLOAT100	outreg	PU01l-	Unit °C
PU on delay	5540	4	INT	outreg	PU01d+	Unit sec
PU off delay	5560	4	INT	outreg	PU01d-	Unit sec
PU mode	5580	4	SEL	outreg	PU01md	6
PU time left	5600	4	INT	outreg	PU01tr	Unit sec
	Mbus					
MB value 1	6000	8	FLOAT100	inreg	MB01v1	Unit in 7200
MB value 2	6200	8	FLOAT100	inreg	MB01v2	Unit in 7400
MB value 3	6400	8	FLOAT100	inreg	MB01v3	Unit in 7600
MB value 4	6600	8	FLOAT100	inreg	MB01v4	Unit in 7800
MB value 5	6800	8	FLOAT100	inreg	MB01v5	Unit in 8000
MB value 6	7000	8	FLOAT100	inreg	MB01v6	Unit in 8200

MB unit 1	7200	8	SEL	inreg	MB01u1	1
MB unit 2	7400	8	SEL	inreg	MB01u2	1
MB unit 3	7600	8	SEL	inreg	MB01u3	1
MB unit 4	7800	8	SEL	inreg	MB01u4	1
MB unit 5	8000	8	SEL	inreg	MB01u5	1
MB unit 6	8200	8	SEL	inreg	MB01u6	1
MB serial number	8400	8	INT	inreg	MB01sn	
MB com status	8600	8	SEL	inreg	MB01ci	5
MB sensor error	8800	8	BOOL	inreg	MB01gf	
MB energy	9000	8	FLOAT100	inreg	MB01ve	Unit kWh
MB volume	9200	8	FLOAT100	inreg	MB01vv	Unit m3
	Digital IO:					
DI value	9400	48	BOOL	inreg	DI01va	
DI pulse count	9500	48	INT	outreg	DI01vc	
DI frequency	9600	48	FLOAT100	inreg	DO01vf	Unit Hz
DU value	9700	44	BOOL	inreg	DU01va	
	Regulators:					
RC current ref value	10000	4	FLOAT100	inreg	RC01va	Unit in 10200
RC set point	10020	4	FLOAT100	outreg	RC01vs	Unit in 10200
RC ext ref 1	10040	4	FLOAT100	inreg	RC01r2	Unit in 10200
RC ext ref 2	10060	4	FLOAT100	inreg	RC01r3	Unit in 10200
RC output 1	10080	4	FLOAT100	inreg	RC01v1	Unit %
RC output 2	10100	4	FLOAT100	inreg	RC01v2	Unit %
RC output 3	10120	4	FLOAT100	inreg	RC01v3	Unit %
RC output 4	10140	4	FLOAT100	inreg	RC01v4	Unit %
RC actual value	10160	4	FLOAT100	inreg	RC01ia	Unit in 10200
RC active	10180	4	BOOL	inreg	RC01on	
RC unit	10200	4	SEL	inreg	RC01vu	1
RC limit reg value	10220	4	FLOAT100	inreg	RC01la	Unit in 10240
RC limit reg unit	10240	4	SEL	inreg	RC01lu	1
RC limit max	10260	4	FLOAT100	outreg	RC01l+	Unit in 10240
RC limit min	10280	4	FLOAT100	outreg	RC01l-	Unit in 10240
RC offset 1	10300	4	FLOAT100	outreg	RC01o1	Unit in

						10200
RC offset 2	10320	4	FLOAT100	outreg	RC01o2	Unit in 10200
RC offset 3	10340	4	FLOAT100	outreg	RC01o3	Unit in 10200
RC offset 4	10360	4	FLOAT100	outreg	RC01o4	Unit in 10200
RC reg diff max	10380	4	FLOAT100	outreg	RC01r+	Unit in 10200
RC reg diff min	10400	4	FLOAT100	outreg	RC01r-	Unit in 10200
RC reg diff reset	10420	4	SEL	outreg	RC01rr	4
RC sensor error	10440	4	BOOL	inreg	RC01gf	
RC current reg diff	10460	4	FLOAT100	inreg	RC01df	
RC P band 1	10480	4	FLOAT100	outreg	RC01p1	Unit in 10200
RC P band 2	10500	4	FLOAT100	outreg	RC01p2	Unit in 10200
RC P band 3	10520	4	FLOAT100	outreg	RC01p3	Unit in 10200
RC P band 4	10540	4	FLOAT100	outreg	RC01p4	Unit in 10200
RC I time	10560	4	INT	outreg	RC01t1	Unit s
RC D time	10580	4	FLOAT100	outreg	RC01d1	Unit s
RC state	10600	4	SEL	inreg	RC01st	8
RL current ref value	11000	4	FLOAT100	inreg	RL01va	
RL set point	11020	4	FLOAT100	outreg	RL01vs	
RL ext ref 1	11040	4	FLOAT100	inreg	RL01r2	
RL ext ref 2	11060	4	FLOAT100	inreg	RL01r3	
RL output 1	11080	4	FLOAT100	inreg	RL01v1	Unit in 11140
RL actual value	11100	4	FLOAT100	inreg	RL01ia	
RL active	11120	4	BOOL	inreg	RL01on	
RL unit	11140	4	SEL	outreg	RL01u1	1
RL reg diff max	11160	4	FLOAT100	outreg	RL01r+	
RL reg diff min	11180	4	FLOAT100	outreg	RL01r-	
RL reg diff reset	11200	4	SEL	outreg	RL01rr	4
RL sensor error	11220	4	BOOL	inreg	RL01gf	
RL current reg diff	11240	4	FLOAT100	inreg	RL01df	
RL P band	11260	4	FLOAT100	outreg	RL01p1	
RL I time	11280	4	INT	outreg	RL01-1	Unit s
RL D time	11300	4	FLOAT100	outreg	RL01-2	Unit s

	KF, Cascade factor					
KF setpoint	11500	4	FLOAT100	outreg	KF01vs	Unit °C
KF factor	11520	4	FLOAT100	outreg	KF01-1	
KF max	11540	4	FLOAT100	outreg	KF01v+	Unit °C
KF min	11560	4	FLOAT100	outreg	KF01v-	Unit °C
KF value out	11580	4	FLOAT100	outreg	KF01va	Unit °C
	TM, thermostat					
TM on limit	12000	24	FLOAT100	outreg	TM01l+	
TM off limit	12200	24	FLOAT100	outreg	TM01l-	
TM on delay	12400	24	INT	outreg	TM01d+	Unit sec
TM off delay	12600	24	INT	outreg	TM01d-	Unit sec
	FV, frost guard					
FV output	13000	4	FLOAT100	inreg	FV01v0	Unit %
FV frost guard signal	13020	4	FLOAT100	inreg	FV01v1	Unit %
FV keep warm signal	13040	4	FLOAT100	inreg	FV01v2	Unit %
FV keep warm ref value	13060	4	FLOAT100	inreg	FV01vb	Unit °C
	TR, timer					
TR on delay	13100	8	INT	outreg	TR01t1	Unit sec
TR off delay	13200	8	INT	outreg	TR01t2	Unit sec
TR time counter	13300	8	INT	outreg	TR01tr	Unit sec
	MT, Exercise blocks					
MT Interval	13500	4	INT	outreg	MT01td	Unit Days
MT Time of day	13600	4	TIME	outreg	MT01ti	
MT Pulse length	13700	4	INT	outreg	MT01t2	Unit sec
	AQ, analog calculations					
AQ value	14000	24	FLOAT100	inreg	AQ01va	Unit 14100
AQ unit	14100	24	SEL	outreg	AQ01vu	1
AQ function	14200	24	SEL	outreg	AQ01fu	9
AQ manual	14300	24	FLOAT100	outreg	AQ01vm	Unit 14100
AQ mode	14400	24	SEL	outreg	AQ01md	7
AQ fact 1	14500	24	FLOAT100	outreg	AQ01c1	
AQ fact 2	14600	24	FLOAT100	outreg	AQ01c2	
AQ fact 3	14700	24	FLOAT100	outreg	AQ01c3	
AQ fact 4	14800	24	FLOAT100	outreg	AQ01c4	
AQ fact 5	14900	24	FLOAT100	outreg	AQ01c5	
AQ sensor error	15000	24	BOOL	inreg	AQ01gf	
	TO, Time Object					
TO value	15500	16	INT	outreg	TO01va	Unit sec

TO last period	15600	16	INT	inreg	TO01v1	Unit sec
	HR, Event counter object					
HR value	16000	8	INT	outreg	HR01va	Unit 16100
HR Unit	16100	8	SEL	inreg	HR01vu	1
HR last period	16200	8	INT	inreg	HR01v1	Unit 16100
	LR, linear translation					
LR value	17000	16	FLOAT100	inreg	LR01va	Unit 17300
LR invärde	17100	16	FLOAT100	inreg	LR01vi	
LR enable	17200	16	BOOL	outreg	LR01sv	
LR unit	17300	16	SEL	outreg	LR01vu	1
LR x1	17500	16	FLOAT100	outreg	LR01i1	
LR x2	17600	16	FLOAT100	outreg	LR01i2	
LR y1	17700	16	FLOAT100	outreg	LR01u1	Unit 17300
LR y2	17800	16	FLOAT100	outreg	LR01u2	Unit 17300
	AT, Average Temperature					
AT value	18000	4	FLOAT100	inreg	AT01va	Unit 17100
AT Unit	18100	4	SEL	inreg	AT01vu	1
AT num OK	18200	4	INT	inreg	AT01no	
AT excl high	18300	4	INT	outreg	AT01nh	
AT excl low	18400	4	INT	outreg	AT01nl	
AT num OK	18500	4	INT	inreg	AT01no	
AT sensor error	18600	4	BOOL	inreg	AT01gf	
	WR, Write object					
WR write	19000	7	FLOAT100	outreg	WR01wr	
WR value	19020	4	FLOAT100	inreg	WR01va	
WR state	19040	4	SEL	inreg	WR01st	10
WR time	19060	4	INT	outreg	WR01tr	Unit sec
WR timeout	19080	4	INT	outreg	WR01to	Unit sec
WR ramp in	19100	4	INT	outreg	WR01ri	Unit sec
WR ramp out	19120	4	INT	outreg	WR01ro	Unit sec
WR unit	19140	4	SEL	outreg	WR01vu	1
WR default	19160	4	FLOAT100	outreg	WR01dv	
WR time	19180	4	TIME	inreg	WR01ti	
	TU, Time schedule					
TU Value	30000	1	BOOL	inreg	T101va	
TU mode	30002	1	SEL	outreg	T101m1	
TU forced	30004	1	BOOL	inreg	T101vf	
TU days 1	30006	1	INT	outreg	T101d1	Bit pattern
TU time on 1	30008	1	TIME	outreg	T101+1	

TU time off 1	30010	1	TIME	outreg	T101-1	
TU days 2	30012	1	INT	outreg	T101d2	Bit pattern
TU time on 2	30014	1	TIME	outreg	T101+2	
TU time off 2	30016	1	TIME	outreg	T101-2	
TU days 3	30018	1	INT	outreg	T101d3	Bit pattern
TU time on 3	30020	1	TIME	outreg	T101+3	
TU time off 3	30022	1	TIME	outreg	T101-3	
TU days 4	30024	1	INT	outreg	T101d4	Bit pattern
TU time on 4	30026	1	TIME	outreg	T101+4	
TU time off 4	30028	1	TIME	outreg	T101-4	
TU days 5	30030	1	INT	outreg	T101d5	Bit pattern
TU time on 5	30032	1	TIME	outreg	T101+5	
TU time off 5	30034	1	TIME	outreg	T101-5	
TU days 6	30036	1	INT	outreg	T101d6	Bit pattern
TU time on 6	30038	1	TIME	outreg	T101+6	
TU time off 6	30040	1	TIME	outreg	T101-6	
TU Value	30050	1	BOOL	inreg	T102va	
TU mode	30052	1	SEL	outreg	T102m1	
TU forced	30054	1	BOOL	inreg	T102vf	
TU days 1	30056	1	INT	outreg	T102d1	Bit pattern
TU time on 1	30058	1	TIME	outreg	T102+1	
TU time off 1	30060	1	TIME	outreg	T102-1	
TU days 2	30062	1	INT	outreg	T102d2	Bit pattern
TU time on 2	30064	1	TIME	outreg	T102+2	
TU time off 2	30066	1	TIME	outreg	T102-2	
TU days 3	30068	1	INT	outreg	T102d3	Bit pattern
TU time on 3	30070	1	TIME	outreg	T102+3	
TU time off 3	30072	1	TIME	outreg	T102-3	
TU days 4	30074	1	INT	outreg	T102d4	Bit pattern
TU time on 4	30076	1	TIME	outreg	T102+4	
TU time off 4	30078	1	TIME	outreg	T102-4	
TU days 5	30080	1	INT	outreg	T102d5	Bit pattern
TU time on 5	30082	1	TIME	outreg	T102+5	
TU time off 5	30084	1	TIME	outreg	T102-5	
TU days 6	30086	1	INT	outreg	T102d6	Bit pattern
TU time on 6	30088	1	TIME	outreg	T102+6	
TU time off 6	30090	1	TIME	outreg	T102-6	
TU Value	30100	1	BOOL	inreg	T103va	
TU mode	30102	1	SEL	outreg	T103m1	

TU forced	30104	1	BOOL	inreg	T103vf	
TU days 1	30106	1	INT	outreg	T103d1	Bit pattern
TU time on 1	30108	1	TIME	outreg	T103+1	
TU time off 1	30110	1	TIME	outreg	T103-1	
TU days 2	30112	1	INT	outreg	T103d2	Bit pattern
TU time on 2	30114	1	TIME	outreg	T103+2	
TU time off 2	30116	1	TIME	outreg	T103-2	
TU days 3	30118	1	INT	outreg	T103d3	Bit pattern
TU time on 3	30120	1	TIME	outreg	T103+3	
TU time off 3	30122	1	TIME	outreg	T103-3	
TU days 4	30124	1	INT	outreg	T103d4	Bit pattern
TU time on 4	30126	1	TIME	outreg	T103+4	
TU time off 4	30128	1	TIME	outreg	T103-4	
TU days 5	30130	1	INT	outreg	T103d5	Bit pattern
TU time on 5	30132	1	TIME	outreg	T103+5	
TU time off 5	30134	1	TIME	outreg	T103-5	
TU days 6	30136	1	INT	outreg	T103d6	Bit pattern
TU time on 6	30138	1	TIME	outreg	T103+6	
TU time off 6	30140	1	TIME	outreg	T103-6	
TU Value	30150	1	BOOL	inreg	T104va	
TU mode	30152	1	SEL	outreg	T104m1	
TU forced	30154	1	BOOL	inreg	T104vf	
TU days 1	30156	1	INT	outreg	T104d1	Bit pattern
TU time on 1	30158	1	TIME	outreg	T104+1	
TU time off 1	30160	1	TIME	outreg	T104-1	
TU days 2	30162	1	INT	outreg	T104d2	Bit pattern
TU time on 2	30164	1	TIME	outreg	T104+2	
TU time off 2	30166	1	TIME	outreg	T104-2	
TU days 3	30168	1	INT	outreg	T104d3	Bit pattern
TU time on 3	30170	1	TIME	outreg	T104+3	
TU time off 3	30172	1	TIME	outreg	T104-3	
TU days 4	30174	1	INT	outreg	T104d4	Bit pattern
TU time on 4	30176	1	TIME	outreg	T104+4	
TU time off 4	30178	1	TIME	outreg	T104-4	
TU days 5	30180	1	INT	outreg	T104d5	Bit pattern
TU time on 5	30182	1	TIME	outreg	T104+5	
TU time off 5	30184	1	TIME	outreg	T104-5	
TU days 6	30186	1	INT	outreg	T104d6	Bit pattern
TU time on 6	30188	1	TIME	outreg	T104+6	

TU time off 6	30190	1	TIME	outreg	T104-6	
TU Value	30200	1	BOOL	inreg	T105va	
TU mode	30202	1	SEL	outreg	T105m1	
TU forced	30204	1	BOOL	inreg	T105vf	
TU days 1	30206	1	INT	outreg	T105d1	Bit pattern
TU time on 1	30208	1	TIME	outreg	T105+1	
TU time off 1	30210	1	TIME	outreg	T105-1	
TU days 2	30212	1	INT	outreg	T105d2	Bit pattern
TU time on 2	30214	1	TIME	outreg	T105+2	
TU time off 2	30216	1	TIME	outreg	T105-2	
TU days 3	30218	1	INT	outreg	T105d3	Bit pattern
TU time on 3	30220	1	TIME	outreg	T105+3	
TU time off 3	30222	1	TIME	outreg	T105-3	
TU days 4	30224	1	INT	outreg	T105d4	Bit pattern
TU time on 4	30226	1	TIME	outreg	T105+4	
TU time off 4	30228	1	TIME	outreg	T105-4	
TU days 5	30230	1	INT	outreg	T105d5	Bit pattern
TU time on 5	30232	1	TIME	outreg	T105+5	
TU time off 5	30234	1	TIME	outreg	T105-5	
TU days 6	30236	1	INT	outreg	T105d6	Bit pattern
TU time on 6	30238	1	TIME	outreg	T105+6	
TU time off 6	30240	1	TIME	outreg	T105-6	
TU Value	30250	1	BOOL	inreg	T106va	
TU mode	30252	1	SEL	outreg	T106m1	
TU forced	30254	1	BOOL	inreg	T106vf	
TU days 1	30256	1	INT	outreg	T106d1	Bit pattern
TU time on 1	30258	1	TIME	outreg	T106+1	
TU time off 1	30260	1	TIME	outreg	T106-1	
TU days 2	30262	1	INT	outreg	T106d2	Bit pattern
TU time on 2	30264	1	TIME	outreg	T106+2	
TU time off 2	30266	1	TIME	outreg	T106-2	
TU days 3	30268	1	INT	outreg	T106d3	Bit pattern
TU time on 3	30270	1	TIME	outreg	T106+3	
TU time off 3	30272	1	TIME	outreg	T106-3	
TU days 4	30274	1	INT	outreg	T106d4	Bit pattern
TU time on 4	30276	1	TIME	outreg	T106+4	
TU time off 4	30278	1	TIME	outreg	T106-4	
TU days 5	30280	1	INT	outreg	T106d5	Bit pattern
TU time on 5	30282	1	TIME	outreg	T106+5	

TU time off 5	30284	1	TIME	outreg	T106-5	
TU days 6	30286	1	INT	outreg	T106d6	Bit pattern
TU time on 6	30288	1	TIME	outreg	T106+6	
TU time off 6	30290	1	TIME	outreg	T106-6	
TU Value	30300	1	BOOL	inreg	T107va	
TU mode	30302	1	SEL	outreg	T107m1	
TU forced	30304	1	BOOL	inreg	T107vf	
TU days 1	30306	1	INT	outreg	T107d1	Bit pattern
TU time on 1	30308	1	TIME	outreg	T107+1	
TU time off 1	30310	1	TIME	outreg	T107-1	
TU days 2	30312	1	INT	outreg	T107d2	Bit pattern
TU time on 2	30314	1	TIME	outreg	T107+2	
TU time off 2	30316	1	TIME	outreg	T107-2	
TU days 3	30318	1	INT	outreg	T107d3	Bit pattern
TU time on 3	30320	1	TIME	outreg	T107+3	
TU time off 3	30322	1	TIME	outreg	T107-3	
TU days 4	30324	1	INT	outreg	T107d4	Bit pattern
TU time on 4	30326	1	TIME	outreg	T107+4	
TU time off 4	30328	1	TIME	outreg	T107-4	
TU days 5	30330	1	INT	outreg	T107d5	Bit pattern
TU time on 5	30332	1	TIME	outreg	T107+5	
TU time off 5	30334	1	TIME	outreg	T107-5	
TU days 6	30336	1	INT	outreg	T107d6	Bit pattern
TU time on 6	30338	1	TIME	outreg	T107+6	
TU time off 6	30340	1	TIME	outreg	T107-6	
TU Value	30350	1	BOOL	inreg	T108va	
TU mode	30352	1	SEL	outreg	T108m1	
TU forced	30354	1	BOOL	inreg	T108vf	
TU days 1	30356	1	INT	outreg	T108d1	Bit pattern
TU time on 1	30358	1	TIME	outreg	T108+1	
TU time off 1	30360	1	TIME	outreg	T108-1	
TU days 2	30362	1	INT	outreg	T108d2	Bit pattern
TU time on 2	30364	1	TIME	outreg	T108+2	
TU time off 2	30366	1	TIME	outreg	T108-2	
TU days 3	30368	1	INT	outreg	T108d3	Bit pattern
TU time on 3	30370	1	TIME	outreg	T108+3	
TU time off 3	30372	1	TIME	outreg	T108-3	
TU days 4	30374	1	INT	outreg	T108d4	Bit pattern
TU time on 4	30376	1	TIME	outreg	T108+4	

TU time off 4	30378	1	TIME	outreg	T108-4	
TU days 5	30380	1	INT	outreg	T108d5	Bit pattern
TU time on 5	30382	1	TIME	outreg	T108+5	
TU time off 5	30384	1	TIME	outreg	T108-5	
TU days 6	30386	1	INT	outreg	T108d6	Bit pattern
TU time on 6	30388	1	TIME	outreg	T108+6	
TU time off 6	30390	1	TIME	outreg	T108-6	
	Curves:					
KV value	31500	8	FLOAT100	inreg	KV01va	
KV input	31520	8	FLOAT100	inreg	KV01ia	
KV unit	31540	8	SEL	outreg	KV01vu	1
KV01 in 1	31560	1	FLOAT100	outreg	KV01x1	
KV01 in 2	31562	1	FLOAT100	outreg	KV01x2	
KV01 in 3	31564	1	FLOAT100	outreg	KV01x3	
KV01 in 4	31566	1	FLOAT100	outreg	KV01x4	
KV01 in 5	31568	1	FLOAT100	outreg	KV01x5	
KV01 in 6	31570	1	FLOAT100	outreg	KV01x6	
KV01 in 7	31572	1	FLOAT100	outreg	KV01x7	
KV01 in 8	31574	1	FLOAT100	outreg	KV01x8	
KV01 in 9	31576	1	FLOAT100	outreg	KV01x9	
KV01 ut 1	31580	1	FLOAT100	outreg	KV01y1	Unit in 31540
KV01 ut 2	31582	1	FLOAT100	outreg	KV01y2	Unit in 31540
KV01 ut 3	31584	1	FLOAT100	outreg	KV01y3	Unit in 31540
KV01 ut 4	31586	1	FLOAT100	outreg	KV01y4	Unit in 31540
KV01 ut 5	31588	1	FLOAT100	outreg	KV01y5	Unit in 31540
KV01 ut 6	31590	1	FLOAT100	outreg	KV01y6	Unit in 31540
KV01 ut 7	31592	1	FLOAT100	outreg	KV01y7	Unit in 31540
KV01 ut 8	31594	1	FLOAT100	outreg	KV01y8	Unit in 31540
KV01 ut 9	31596	1	FLOAT100	outreg	KV01y9	Unit in 31540
KV02 in 1	31600	1	FLOAT100	outreg	KV02x1	
KV02 in 2	31602	1	FLOAT100	outreg	KV02x2	
KV02 in 3	31604	1	FLOAT100	outreg	KV02x3	

KV02 in 4	31606	1	FLOAT100	outreg	KV02x4	
KV02 in 5	31608	1	FLOAT100	outreg	KV02x5	
KV02 in 6	31610	1	FLOAT100	outreg	KV02x6	
KV02 in 7	31612	1	FLOAT100	outreg	KV02x7	
KV02 in 8	31614	1	FLOAT100	outreg	KV02x8	
KV02 in 9	31616	1	FLOAT100	outreg	KV02x9	
KV02 ut 1	31620	1	FLOAT100	outreg	KV02y1	Unit in 31542
KV02 ut 2	31622	1	FLOAT100	outreg	KV02y2	Unit in 31542
KV02 ut 3	31624	1	FLOAT100	outreg	KV02y3	Unit in 31542
KV02 ut 4	31626	1	FLOAT100	outreg	KV02y4	Unit in 31542
KV02 ut 5	31628	1	FLOAT100	outreg	KV02y5	Unit in 31542
KV02 ut 6	31630	1	FLOAT100	outreg	KV02y6	Unit in 31542
KV02 ut 7	31632	1	FLOAT100	outreg	KV02y7	Unit in 31542
KV02 ut 8	31634	1	FLOAT100	outreg	KV02y8	Unit in 31542
KV02 ut 9	31636	1	FLOAT100	outreg	KV02y9	Unit in 31542
KV03 in 1	31640	1	FLOAT100	outreg	KV03x1	
KV03 in 2	31642	1	FLOAT100	outreg	KV03x2	
KV03 in 3	31644	1	FLOAT100	outreg	KV03x3	
KV03 in 4	31646	1	FLOAT100	outreg	KV03x4	
KV03 in 5	31648	1	FLOAT100	outreg	KV03x5	
KV03 in 6	31650	1	FLOAT100	outreg	KV03x6	
KV03 in 7	31652	1	FLOAT100	outreg	KV03x7	
KV03 in 8	31654	1	FLOAT100	outreg	KV03x8	
KV03 in 9	31656	1	FLOAT100	outreg	KV03x9	
KV03 ut 1	31660	1	FLOAT100	outreg	KV03y1	Unit in 31544
KV03 ut 2	31662	1	FLOAT100	outreg	KV03y2	Unit in 31544
KV03 ut 3	31664	1	FLOAT100	outreg	KV03y3	Unit in 31544
KV03 ut 4	31666	1	FLOAT100	outreg	KV03y4	Unit in 31544
KV03 ut 5	31668	1	FLOAT100	outreg	KV03y5	Unit in 31544

KV03 ut 6	31670	1	FLOAT100	outreg	KV03y6	Unit in 31544
KV03 ut 7	31672	1	FLOAT100	outreg	KV03y7	Unit in 31544
KV03 ut 8	31674	1	FLOAT100	outreg	KV03y8	Unit in 31544
KV03 ut 9	31676	1	FLOAT100	outreg	KV03y9	Unit in 31544
KV04 in 1	31680	1	FLOAT100	outreg	KV04x1	
KV04 in 2	31682	1	FLOAT100	outreg	KV04x2	
KV04 in 3	31684	1	FLOAT100	outreg	KV04x3	
KV04 in 4	31686	1	FLOAT100	outreg	KV04x4	
KV04 in 5	31688	1	FLOAT100	outreg	KV04x5	
KV04 in 6	31690	1	FLOAT100	outreg	KV04x6	
KV04 in 7	31692	1	FLOAT100	outreg	KV04x7	
KV04 in 8	31694	1	FLOAT100	outreg	KV04x8	
KV04 in 9	31696	1	FLOAT100	outreg	KV04x9	
KV04 ut 1	31700	1	FLOAT100	outreg	KV04y1	Unit in 31546
KV04 ut 2	31702	1	FLOAT100	outreg	KV04y2	Unit in 31546
KV04 ut 3	31704	1	FLOAT100	outreg	KV04y3	Unit in 31546
KV04 ut 4	31706	1	FLOAT100	outreg	KV04y4	Unit in 31546
KV04 ut 5	31708	1	FLOAT100	outreg	KV04y5	Unit in 31546
KV04 ut 6	31710	1	FLOAT100	outreg	KV04y6	Unit in 31546
KV04 ut 7	31712	1	FLOAT100	outreg	KV04y7	Unit in 31546
KV04 ut 8	31714	1	FLOAT100	outreg	KV04y8	Unit in 31546
KV04 ut 9	31716	1	FLOAT100	outreg	KV04y9	Unit in 31546
KV05 in 1	31720	1	FLOAT100	outreg	KV05x1	
KV05 in 2	31722	1	FLOAT100	outreg	KV05x2	
KV05 in 3	31724	1	FLOAT100	outreg	KV05x3	
KV05 in 4	31726	1	FLOAT100	outreg	KV05x4	
KV05 in 5	31728	1	FLOAT100	outreg	KV05x5	
KV05 in 6	31730	1	FLOAT100	outreg	KV05x6	
KV05 in 7	31732	1	FLOAT100	outreg	KV05x7	

KV05 in 8	31734	1	FLOAT100	outreg	KV05x8	
KV05 in 9	31736	1	FLOAT100	outreg	KV05x9	
KV05 ut 1	31740	1	FLOAT100	outreg	KV05y1	Unit in 31548
KV05 ut 2	31742	1	FLOAT100	outreg	KV05y2	Unit in 31548
KV05 ut 3	31744	1	FLOAT100	outreg	KV05y3	Unit in 31548
KV05 ut 4	31746	1	FLOAT100	outreg	KV05y4	Unit in 31548
KV05 ut 5	31748	1	FLOAT100	outreg	KV05y5	Unit in 31548
KV05 ut 6	31750	1	FLOAT100	outreg	KV05y6	Unit in 31548
KV05 ut 7	31752	1	FLOAT100	outreg	KV05y7	Unit in 31548
KV05 ut 8	31754	1	FLOAT100	outreg	KV05y8	Unit in 31548
KV05 ut 9	31756	1	FLOAT100	outreg	KV05y9	Unit in 31548
KV06 in 1	31760	1	FLOAT100	outreg	KV06x1	
KV06 in 2	31762	1	FLOAT100	outreg	KV06x2	
KV06 in 3	31764	1	FLOAT100	outreg	KV06x3	
KV06 in 4	31766	1	FLOAT100	outreg	KV06x4	
KV06 in 5	31768	1	FLOAT100	outreg	KV06x5	
KV06 in 6	31770	1	FLOAT100	outreg	KV06x6	
KV06 in 7	31772	1	FLOAT100	outreg	KV06x7	
KV06 in 8	31774	1	FLOAT100	outreg	KV06x8	
KV06 in 9	31776	1	FLOAT100	outreg	KV06x9	
KV06 ut 1	31780	1	FLOAT100	outreg	KV06y1	Unit in 31550
KV06 ut 2	31782	1	FLOAT100	outreg	KV06y2	Unit in 31550
KV06 ut 3	31784	1	FLOAT100	outreg	KV06y3	Unit in 31550
KV06 ut 4	31786	1	FLOAT100	outreg	KV06y4	Unit in 31550
KV06 ut 5	31788	1	FLOAT100	outreg	KV06y5	Unit in 31550
KV06 ut 6	31790	1	FLOAT100	outreg	KV06y6	Unit in 31550
KV06 ut 7	31792	1	FLOAT100	outreg	KV06y7	Unit in 31550

KV06 ut 8	31794	1	FLOAT100	outreg	KV06y8	Unit in 31550
KV06 ut 9	31796	1	FLOAT100	outreg	KV06y9	Unit in 31550
KV07 in 1	31780	1	FLOAT100	outreg	KV07x1	
KV07 in 2	31782	1	FLOAT100	outreg	KV07x2	
KV07 in 3	31784	1	FLOAT100	outreg	KV07x3	
KV07 in 4	31786	1	FLOAT100	outreg	KV07x4	
KV07 in 5	31788	1	FLOAT100	outreg	KV07x5	
KV07 in 6	31790	1	FLOAT100	outreg	KV07x6	
KV07 in 7	31792	1	FLOAT100	outreg	KV07x7	
KV07 in 8	31794	1	FLOAT100	outreg	KV07x8	
KV07 in 9	31796	1	FLOAT100	outreg	KV07x9	
KV07 ut 1	31800	1	FLOAT100	outreg	KV07y1	Unit in 31552
KV07 ut 2	31802	1	FLOAT100	outreg	KV07y2	Unit in 31552
KV07 ut 3	31804	1	FLOAT100	outreg	KV07y3	Unit in 31552
KV07 ut 4	31806	1	FLOAT100	outreg	KV07y4	Unit in 31552
KV07 ut 5	31808	1	FLOAT100	outreg	KV07y5	Unit in 31552
KV07 ut 6	31810	1	FLOAT100	outreg	KV07y6	Unit in 31552
KV07 ut 7	31812	1	FLOAT100	outreg	KV07y7	Unit in 31552
KV07 ut 8	31814	1	FLOAT100	outreg	KV07y8	Unit in 31552
KV07 ut 9	31816	1	FLOAT100	outreg	KV07y9	Unit in 31552
KV08 in 1	31820	1	FLOAT100	outreg	KV08x1	
KV08 in 2	31822	1	FLOAT100	outreg	KV08x2	
KV08 in 3	31824	1	FLOAT100	outreg	KV08x3	
KV08 in 4	31826	1	FLOAT100	outreg	KV08x4	
KV08 in 5	31828	1	FLOAT100	outreg	KV08x5	
KV08 in 6	31830	1	FLOAT100	outreg	KV08x6	
KV08 in 7	31832	1	FLOAT100	outreg	KV08x7	
KV08 in 8	31834	1	FLOAT100	outreg	KV08x8	
KV08 in 9	31836	1	FLOAT100	outreg	KV08x9	
KV08 ut 1	31840	1	FLOAT100	outreg	KV08y1	Unit in 31554

KV08 ut 2	31842	1	FLOAT100	outreg	KV08y2	Unit in 31554
KV08 ut 3	31844	1	FLOAT100	outreg	KV08y3	Unit in 31554
KV08 ut 4	31846	1	FLOAT100	outreg	KV08y4	Unit in 31554
KV08 ut 5	31848	1	FLOAT100	outreg	KV08y5	Unit in 31554
KV08 ut 6	31850	1	FLOAT100	outreg	KV08y6	Unit in 31554
KV08 ut 7	31852	1	FLOAT100	outreg	KV08y7	Unit in 31554
KV08 ut 8	31854	1	FLOAT100	outreg	KV08y8	Unit in 31554
KV08 ut 9	31856	1	FLOAT100	outreg	KV08y9	Unit in 31554