

## **Novar1xxx-line PF-controller remote link communication description**

Programmer handbook

06/2011

Power factor controllers of types Novar-1106/1114/1206/1214/1312 can be equipped with RS-232 or RS-485 remote link. Controller operation can be monitored and controlled over the remote link from supervising system ( master, usually a PC ).

This handbook describes the communication from point of view of application programmer. Basic knowledge of controller parameters and C-language syntax is supposed.

### **1.1 Data structures**

The data interchanged between controller and master are organized to following structures :

- „Status“ ... contains actual controller state information ( type, serial number, state of outputs, alarms, errors etc.); is read-only
- „EEStatus“ ... contains another state information such like maximum registered values, number of switching operations and switch-on time of all outputs etc.; is read-only
- „NovarStatus“ ... contains basic information of controller state and actual values of quantities measured; especially for on-line visualisation purposes; is read-only
- „Config“ ... contains actual state of controller parameters; can be both read and written
- „NovarSetMap“ ... virtual structure, that serves for selected controller functions' starting; is write-only

The master can get information of controller state by reading a structure. By writing to appropriate structure it can change any of parameters, start some of controller function etc.

Description of the structures follows in separate chapter below.

### **1.2 Communication protocols**

The communication between a master and the controller (slave) runs over asynchronous serial link ( COM ) with RS-232 or RS-485 interface. If the RS-485 interface is used several controllers can be connected to a single link. At the master side a RS-232/RS-485 converter with automatic transmission direction switch can be used, or the converter direction need to be controlled by the master program.

The controllers are shipped with proprietary “KMB” protocol preset as default. Optionally the Modbus-RTU protocol can be set.

The communication rate can be set according controller technical parameters.

#### **1.2.1 KMB communication protocol**

The communication channel is set to 8 bits, no parity, one stop-bit.

Communication type is “Master-Slave”, i.e. after receiving message-command from master (PC) the controller processes it and transmits message-answer back to the master.

The message format is as follows :

1. Device address (1 byte)
2. Message length (in bytes) without final message checksum. (1 byte ). It has the value of (3 + message body length).
3. Message type ( 1 byte).
4. Message body - its length differs each from other according the message type. Some messages can have no body (i.e. these messages’ body length is zero).
5. Message checksum (1 byte) - sum of all preceding bytes modulo 256 ( 1 byte).

When receiving correct command, the slave (controller) processes it and transmits answer. If it can process the command successfully, the message-type value in the answer is cleared to zero. Otherwise the message-type value contains error-specification.

The slave must answer during 600 ms after receiving a command from the master, available gap of up to 4 bytes transmit time between bytes during transmitting can occur.

**1.2.1.1 Message types**

Following message types can be used for reading/writing data structures :

message no. (hex)	message type
0x14	Device Status Read - Status, EEStatus
0x16	Device Setting Read – Config
0x17	Device Setting Write - Config
0x30	Device Status Read – NovarStatus
0x31	Device Function Start – NovarSetMap Write

**1.2.1.1.1 Device Status Read (Status, EEStatus) – 0x14**

Message no. 0x14. The slave returns in answer the Status (34 bytes long) and the EEStatus (110 bytes) structures, i.e. 144 bytes.

Example :

Master must send following sequence of bytes (address value 1 is supposed) :

| 0x01| 0x03 | 0x14 | checksum = 0x18 |

The command has no body.

Answer :

| 0x01| 0x93| 0x00 | ..... message body = Status+EEStatus (144 bytes) ..... | checksum |

(2<sup>nd</sup> byte, i.e. message length without checksum, is 144 + 3 = 147 = 0x93).

**1.2.1.1.2 Device Setting Read ( Config ) – 0x16**

Message no. 0x16. The slave returns the Config structure ( 80 bytes, since 1.3 version 100 bytes ).

Command :

| 0x01| 0x03 | 0x16 | checksum = 0x1A |

Answer :

| 0x01| 0x53| 0x00 | ..... message body = Config ( 80 bytes ) ..... | checksum |

#### 1.2.1.1.3 Device Setting Write ( Config ) – 0x17

Message no. 0x17. The master can write the Config structure (80 bytes, since 1.3 version 100 bytes) to slave with this command.

Command :

| 0x01| 0x53 | 0x17 | ..... message body = Config (80 bytes) ..... | checksum |

Answer :

| 0x01| 0x03| 0x00 | checksum = 0x04 |

Comment : DeviceAddr and RemoteBDRate variables cannot be set over communication link, the values written to the variables are arbitrary.

#### 1.2.1.1.4 Device Status Read ( NovarStatus ) – 0x30

Message no. 0x30. The slave returns state information in the NovarStatus structure ( 60 bytes, for Novar1414 models 100 bytes ), necessary especially for on-line monitoring and visualisation purposes.

Command :

| 0x01| 0x03 | 0x30 | checksum = 0x34 |

Answer :

| 0x01| 0x3F| 0x00 | ..... message body = NovarStatus ( 60 bytes ) ..... | checksum |

#### 1.2.1.1.5 Device Function Start ( with NovarSetMap ) – 0x31

Message no. 0x31. Some of controller functions can be started by writing to the NovarSetMap virtual structure ( 6 bytes ). The functions are selected by setting appropriate values to 1.

Command :

| 0x01| 0x09 | 0x31 | ..... message body = NovarSetMap ( 6 bytes ) ..... | checksum |

Answer :

| 0x01| 0x03| 0x00 | checksum = 0x04 |

## 1.2.2 Modbus-RTU protocol

Standard Modbus-RTU communication protocol can be used optionally for connection with master. Except slave address and communication rate, parity bit function can be set ( even / odd / none parity ).

The slave must answer during 600 ms after receiving a command from the master, available gap of up to 1.5 bytes transmit time between bytes during transmitting can occur.

Broadcast-mode is not supported.

*Note* : In compliance with the Modbus protocol definition, 9-data-bit transfer is used even if no parity bit is set; in such case the bit value is ignored. But some applications use at this setting 8-bit data transfer and then instrument doesn't reply on such commands. Setting protocol to 2 stopbits can help to solve this problem.

Implemented Modbus functions are listed in following table :

function no.	function	application
03	Read Holding Registers	Config read : <ul style="list-style-type: none"> <li>– registers 40101-40140(addressed 100 – 139, for firmware versions up to 1.2 )</li> <li>– registers 40101-40150(addressed 100 – 149, for firmware versions from 1.3 )</li> </ul>
04	Read Input Registers	Status+EEStatus read – registers 30101-30172 (addressed 100 – 171 ) NovarStatus read : <ul style="list-style-type: none"> <li>– registers 30201-30230 (addressed 200 – 229; valid for all models excluding Novar1414 )</li> <li>– registers 30201-30250 (addressed 200 – 249; valid for Novar1414 )</li> </ul>
06	Preset Single Register	Config write – for registers range see above NovarSetMap write – registers 40201-40203 (addressed 200 – 202 )
08	Diagnostics – 00 – Return Query Data 01 – Restart Comm Option 02 – Return Diagnostic Register 04 – Force Listen Only Mode 10 – Clear Ctrs & Diag. Register 11 – Return Bus Message Count	basic diagnostics
16	Preset Multiple Registers	same as 06 - Preset Single Register
17	Report Slave ID	slave identification

The data structure access is available by reading/writing from/to appropriate registers (see table above ). Every structure corresponds with appropriate continuous group of registers.

Example 1 :

Controller state reading (NovarStatus) through „Read Input Registers“ function, address 1 supposed :

Command :

| 0x01| 0x04 | 0x00 | 0xC8| 0x00 | 0x1E | 0xF1 = CRCLo | 0xFC = CRChi |

NovarStatus is placed from input-register no. 30201( address 200 = 0xC8), structure length is 60 bytes = 30 registers ( = 0x1E = 60 bytes ).

Response :

| 0x01| 0x04 | 0x3C | register 30201 Hi| reg. 30201 Lo| reg. 30202 Hi | reg. 30202 Lo | .....  
..... | reg. 30230 Hi | reg. 30230 Lo | CRCLo | CRChi |

Behind address ( 0x01 ) and function number ( 0x04 ) byte count ( 0x3C = 60 ) and the register contents follow. The contents corresponds with the NovarStatus as follows :

reg. 30201 Hi	-	SoftVersion –Hi
reg. 30201 Lo	-	SoftVersion –Lo
reg. 30202 Hi	-	DeviceNo - Hi
reg. 30202 Lo	-	DeviceNo – Lo
.....	-	.....
reg. 30230 Hi	-	RegTime
reg. 30230 Lo	-	no meaning

Example 2 :

Actual PF reading ( the “Kos” variable from the NovarStatus structure) through „Read Input Registers“ function, address 1 supposed :

Command :

| 0x01| 0x04 | 0x00 | 0xD1| 0x00 | 0x01 | 0x61| 0xF3 |

The “Kos” variable is placed in NovarStatus structure byte No. 20, i.e. it is placed in low byte of (sixteen-bit) input-register No. 30210 ( address 209 = 0xD1).

Response :

| 0x01| 0x04 | 0x02 | 0x8B| 0x4B | 0x9F| 0xF7 |

The register contains value of 0x8B4B; in the low byte there is value the „Kos“ = 0x4B = 75. That means that actual PF is 0.75 .

### 1.3 Structures description

The syntax is conform to C-language. Long/ulong and int/uint variables are stored in high-low order (high byte is followed with low byte).

//=====

#### Status :

```
typedef struct {
    uchar    HWEError; /* hardware error info */
                /* bit0...EPROM error */
                /* bit1...RAM error */
                /* bit2...SEEPROM error */
                /* bit3...calibration error */
    uchar    OutputSwitchNo[14]; /* number of switch-ons, lower values */
    uint     Event; /* actual nonstandard event info */
                /* bit0...1=undercurrent */
                /* bit1...1=overcurrent */
                /* bit2...1=voltage loss */
                /* bit3...1=undervoltage */
                /* bit4...1=overvoltage */
                /* bit5...1=THDI exceeded */
                /* bit6...1=THDU exceeded */
                /* bit7...1=CHL exceeded */
                /* bit8...1=out of compensation */
                /* bit9...1=back feeding */
                /* bit10...1=switching number limit exceeded */
                /* bit11...1=step error */
                /* bit12...1=overheated */
                /* bit13...1=external alarm */
                /* bit14...1=connection unknown */
                /* bit15...1=step values unknown */
    uint     ActRelayState; /* actual relay state, 1=ON */
    uint     ReqRelayState; /* scheduled relay state */
    uchar    State; /* state */
                /* bit0-3...control process state */
                /* bit4...1= connection unknown */
                /* bit5...1= step values unknown */
    uint     AlarmSigActive; // active alarm signalling
    uint     AlarmActionActive; // active alarm action
                // both coded in the same way as „Event“
    uint     BadSteps; /* map of error steps (which are in standby mode) */
    uint     SoftVersion; /* lowbyte...software version */
                /* highbyte...special version */
    uint     DeviceNo; // serial number
    uint     DeviceType; // device type :
                /* 0x12...N1312 */
                /* 0x13...N1206 */
                /* 0x14...N1214 */
                /* 0x15...N1106 */
                /* 0x16...N1114 */
} SType; /* Status -34 bytes */
```

//=====

#### EEStatus :

```
typedef struct {
    uint     PrecisedSteps; /* precised steps map */
                /* 1=precised step, 0=not precised yet */
    uchar    MaxTHD[2]; /* max. value since last clearing */
                // THD[0]...THDU, THD[1]...THDI
                // THD coding :
                // 0 ÷100 ... 0.00 ÷ 50.0%, step 0,5%
```

```

//      101÷200 ... 52.5 ÷ 300.0%, step 2,5%
//      201÷250 ... 310 ÷ 800%, step 10%
//      255 ... undefined
uchar  MaxCHL;      /* max. value since last clearing */
// CHL coding :
//      0 ÷150 ... 0 ÷ 150%, step 1%
//      151÷200 ... 155 ÷ 400%, step 5%
//      201÷250 ... 410 ÷ 900%, step 10,0%
//      255 ... undefined
uchar  MaxHar[9];  /* max. value of 3-5-7-9-11-13-15-17-19th voltage harmonic */
// Har coding :
//      0 ÷100 ... 0.00 ÷ 10.0%, step 0,1%
//      101÷200 ... 10.5 ÷ 60.0%, step 0,5%
//      201÷254 ... 62.5 ÷ 195.0%, step 2,5%
//      255 ... undefined
uchar  Res0;      /* res */
uchar  Res1;      /* res */
char   MaxT;      /* max. temperature since last clearing, i degree of Celsius*/
char   MinKos;    /* minimum cos value since last clearing */

int    MaxAveP;   // max. value of Pavg
int    MaxAveQ;   // max. value of Qavg
int    MaxAveDeltaQ; // max. value of DeltaQavg
// coded as current, to be multiplied with Unom to get power values

float  AveP[2];   // sliding average of P (for internal use only)
float  AveQ[2];   // sliding average of Q (for internal use only)
float  AveDeltaQ; // sliding average of DeltaQ (for internal use only)
ulong  AvePQCounter[2]; // sliding window counter (for internal use only)

uint   OutputSwitchNo64[14]; // number of step switching in 64-units („higher“ values )
// OutputSwitchNo need to be added to get
// real number of switching operations
uint   OutputSwitchOnTime2H[14]; /* switch-on time of each step */
// in 2-hour units */
// max. range 65000, i.e. 130000 hours */
uint   ManualStepValue; /* step map in manual mode; 0=ON, 1=OFF */
} EESType; /* EEStatus-110 bytu */

```

```
//=====
```

### NovarStatus :

```

typedef struct {
uint   SoftVersion; /* low byte...software version */
// high byte...special version number(usually zero) */
uint   DeviceNo;    /* serial number */
uint   DeviceType;  /* device type, the same as in the Status */
uint   MTP;         /* CT ratio, 1-6000 */
// bits 14-0...CT primary nominal value in 5A-units */
// bit 15...0= CT secondary nom. value 1A (CT-ratio xxx/1A) */
// 1= CT secondary nom. value 5A (CT-ratio xxx/5A) */
uchar  Fr;         // frequency; coding :
// step 0.1Hz, 55Hz=0x80, 0= 42.,2Hz, 254=67.6Hz, 255=undefined
uint   I;          /* eff. current (on secondary side of the CT) in 0.25mA units*/
// as all current values, the Ck and step values, it must be */
// multiplied with the CT-ratio to get primary values */
uint   I50;        /* fundamental harmonic current value in 0.25mA-units*/
int    Ir;         /* fund. harmonic active component current value in 0,25mA-units*/
int    Ii;         /* fund. harmonic reactive component current value in 0,25mA-units*/
// both signed, negative means export of active energy or */
// capacitive character of reactive energy */
int    Fi;         // voltage vs. current phasor angle in degrees
char   Kos;        /* cos fi in 0,01-units, negative=capacitive character */
// if(Kos == 0) -> cos fi = 0.00L */

```

```

/* . . . */
/* if(Kos == 99) -> cos fi = 0.99L */
/* if(Kos == 100) -> cos fi = 1.00 */
/* if(Kos == -99) -> cos fi = 0.99C */
/* . . . */
/* if(Kos == -1) -> cos fi = 0.01C */
/* if(Kos == -100) -> cos fi = 0.00C */
/* . . . */
/* if(Kos == 127)-> cos fi undefined (for ex. when I==0) */
// Note : 3-phase cos fi for the Novar1414 models
uchar THD[2]; // 0...U, 1...I; for coding see EEStatus
uchar Har[2][9]; // 0...U, 1...I, value of 3-5-7-9-11-13-15-17-19th harmonic
// for coding see EEStatus
// Note : the THD and the Har values irrelevant for the Novar1414
// models; see individual phase values below
uint U; // effective voltage, in 0.1V steps; 0xFFFF...undefined
uint U50; // fundamental harmonic of voltage U, in 0.1V steps; 0xFFFF...undefined
uchar CHL; // Capacitor Harmonic Load factor; for coding see EEStatus */
int Deltali; // missing fund. harmonic reactive component current; for coding see I
char T; // temperature in degrees of Celsius
uchar Input; // bit 0: ...0 = external input open
// ...1 = external input closed
uchar Res0; /* reserve */

uchar MTN; // VT-ratio
// coding :
// 0=1(without VT)
// 1=10 ÷ 100=1000, i.e. 1000/100 ÷ 100000/100
// 101=1100 ÷ 140=5000, i.e. 110000/100 ÷ 500000/100
// 140...500kV/100V, maximum
// >140...withot VT, direct conection, the same meaning as 0
uchar Unom; // nominal measurement voltage (without VT-ratio)
// coding :
// 9 ...50V
// 10 ...55V
// 11 ...58V
// 12 ÷ 150 ...60V ÷ 750V, step 5 V
uint ActRelayState; /* actual relay state, 1=ON */
uchar Res1;
uchar Res2;
uchar RegState; /* controller state */
// STATEMASK 0x0F /* lower 4 bits-controller state : */
/* specifies actual controller state */
// STATEINIT 0x00 /* after-reset state */
// STATETEST 0x01 /* start-up test in progress */
// STATEUIMODERE 0x02 /* UIMode-recognition ("AP") in progress */
// STATEUIMODEUK 0x03 /* UIMode-unknown ("P=0") */
// STATECLVALUESRE 0x04 /* CLValues-recog. ("AC") in progress */
// STATECLVALUESUK 0x05 /* CLValues-unknown ("C=0") */
// STATERUN 0x06 /* normal controll in progress */
// STATESTANDBYCLOFF 0x07 /* standby-outputs OFF (excl. fixed-steps) */
// STATESTANDBYALLOFF 0x08 /* standby - all outputs OFF */
// STATEIDLE 0x09 /* idle - no measured data available */
// STATEMANUAL 0x0F /* manual mode */
/* upper 4 bits – non-standard states mask */
// STATEUIMODEUNKNOWN 0x10 /* UIMode unknown ("P=0") */
// STATECLVALUESUNKNOWN 0x20 /* CLValues unknown ("C=0") */
// STATEVOLTAGEBAD 0x40 /* voltage too low („U=0“) */
// STATECURRENTLOW 0x80 /* current too low („I=0“) */
uchar StateLEDs; /* panel indicating LED-diodes state */
/* bit0...TrendL */
/* bit1...TrendLFlash */
/* bit2...TrendC */

```

```

        /* bit3...TrendCFlash */
        /* bit4...PwrReverse */
        /* bit5...Alarm */
        /* bit6...reserve */
        /* bit7...Error */
uchar   RegTime; /* time to next control action in %; it decreases from 100 to 0 */
uchar   Res3;

// for all models but the Novar1414 the structure ends here. For the Novar1414 models additional
// variables follow :
uint    I[3];      /* eff.value of individual phase currents, in 0.25mA units*/
char    Kos[3];    /* individual phase power factors */
uchar   THDI[3];   /* individual phase THDIs
uchar   HarI[9][3]; /* individual phase current harmonics
uchar   Res4;

        } NSType; /* NovarStatus-60 bytes; for Novar1414 100 bytes */
//=====

```

**Config :**

```

typedef struct {
    char   ReqCos;      /* target cos, range from -80 to +80 */
                        /* 0x7F... value unknown */
                        /* or in degrees: 101= +10° ÷ 121= -10°
uchar   SwitchDelayL; /* control period for undercompensation */
uchar   SwitchDelayC; /* control period for overcompensation */
                        /* control periods coding, bits 3÷0:
                        /* 0...5 sec
                        /* 1...10 sec
                        /* 2...15 sec
                        /* 3...20 sec
                        /* 4...30 sec
                        /* 5...45 sec
                        /* 6... 1 min
                        /* 7... 1 min 30 sec
                        /* 8... 2 min
                        /* 9... 3 min
                        /* 10... 4 min
                        /* 11... 5 min
                        /* 12... 7 min
                        /* 13... 10 min
                        /* 14... 15 min
                        /* 15... 20 min
                        /* otherwise...value not valid
                        /* bit 7...0= square-proportional control time */
                        /* ...1= linear-proportional control time */
    uchar   ReqCosBandWidth; /* control bandwidth width
                        /* in 0.005 steps, range 0÷8, i.e. 0.000 ÷ 0.040
    char   Res1;      /* res.*/
} RegParType;

typedef struct {
    uchar   RegMode; /* control mode setting */
                        /* bit0...0=manual, 1=automat */
                        /* bit1...0=evaluation of tariff2 input */
                        /* bit2...1=automatic step value recognition active */
                        /* bit3...1= password not retained- required*/
                        /* 0= password retained - not required*/
                        /* bit 4...if bit1 is active(0) :
                        /* ...1(default)...tariff2 activated by 2nd-tariff input
                        /* ...0.....tariff2 activated by back feeding event
                        /* bit5...1...if bit 2 active(1)...AUTO-mode of step recognition
                        /* bit 6...= 1...standard control
                        /* = 0...linear control mode, for harmonic filters control

```

```

/* bit7...res. */
uchar   Res0;           // no sense
RegParType RegPar[2];  /* second set of values valid for 2nd tariff */
uint    MTP;           /* CT ratio 1-9950 */
/* bits 14-0...primary value in 5A-units */
/* bit 15...0= CT- nominal secondary current 1A */
/*           1= 5A */
uchar   SwitchBlockDelay; /* reconnection block time */
/* for coding see SwitchDelayL/C */
uchar   UIMode;        /* connection type */
/* bits 2-0: */
/* for bit 3=1, i.e. phase voltage : */
/*     1...U10 */
/*     2...U20 */
/*     3...U30 */
/*     4...U01 */
/*     5...U02 */
/*     6...U03 */
/* for bit 3=0, i.e. line voltage : */
/*     1...U12 */
/*     2...U23 */
/*     3...U31 */
/*     4..U21 */
/*     5..U32 */
/*     6..U13 */
/* bits 7-4 : */
/* if bits 0-3 out of range: */
/*     upper nibble=0.....aut. recognition unsuccessful */
/*     upeer nibble=1-F...UIMode not set yet, automatic */
/*                               recognition process will be started */
uchar   CSRatio;      /* compensation step ratio */
/* 0x00...-individual settings */
/* 1...1:1:1:1:1 */
/* 2...1:1:2:2:2 */
/* 3...1:1:2:2:4 */
/* 4...1:1:2:3:3 */
/* 5...1:1:2:4:4 */
/* 6...1:1:2:4:8 */
/* 7...1:2:2:2:2 */
/* 8...1:2:3:3:3 */
/* 9...1:2:3:4:4 */
/* 10...1:2:3:6:6 */
/* 11...1:2:4:4:4 */
/* 12...1:2:4:8:8 */
uchar   Ck;           /* from 0,02 to 2A in 0,01A-steps, coded in the same */
/* way as current */
uchar   Steps;        /* number of inductive and capacitive steps used */
/* bits 3-0...CSteps; bits 7-4...LSteps */
uchar   QuickSteps;   /* for Novar1312 only: number of transistor group */
/* steps used; for other types without sense */
int     CLVal[14];    /* step values*/
/* coded in the same way as current (see NovarStatus) */
/* capacitors-positive value, inductor-negative value */
/* value 0x7FFF...the step value is unknown */
uint    FixedSteps;   /* bit map of fixed steps, 0=fixed step */
uint    FixedStepValue; /* step value of fixed steps; 0=ON, 1=OFF */
char    LCosMargin;   /* limit cos-value for decompensation choke operation */
/* coded in the same way as the cos fi (see NovarStatus) */
uchar   QuickControlSpeed; /* for Novar1312 only: transistor group control */
/* speed and reconnection block time */
// value  contr./sec  block. time [s]
// 0      1      10 (default)
// 1      1      5.0
// 2      1      2.0
// 3      1      1.0

```

```

//      4      2      5.0
//      5      2      2.5
//      6      2      1.0
//      7      2      0.5
//      8      3      3.3
//      9      3      1.7
//     10      3      0.7
//     11      3      0.3
//     12      5      2.0
//     13      5      1.0
//     14      5      0.4
//     15      5      0.2
//     16      10     1.0
//     17      10     0.5
//     18      10     0.2
//     19      10     0.1
uint    AlarmSig;    /* alarm signalling map */
// for coding see Event
uint    AlarmAction; /* alarm action map, similar to AlarmSig */
uchar   FixedStepsFH; /* optional function of last two steps; if the step as fixed :
// bit 1,0...for last step :
// bit 0...1=optional function off
//      0= optional function on; in such case :
// bit 1...1=F(fan)
//      0=H(heating)
// bit 3,2...the same meaning for step before the last
uchar   MTN;        /* CT-ratio; for coding see NovarStatus
uchar   Unom;       /* nominal measurement voltage; for coding see NovarStatus
char    TFHLimit[2]; /* 0...temperature limit for fan switching
// 1...temperature limit for heating switching, in deg. of Celsius
uchar   ULimit[2]; /* voltage limit in percents of Unom:
// 0... for undervoltage, 1...for overvoltage
// range 10% ÷ 150%
uchar   THDLimit[2]; /* THD limit, 0...for voltage, 1...for current
// coding as THD; 0xFF.... off
uchar   CHLLimit; /* CHL limit, coding as CHL
uchar   TLimit; /* temperature limit, coding as T
uchar   SwitchNoLimit; /* switch number limit value for alarm signalling */
// from 10000 do 2000000, in 10000-units*/
uchar   TCF; /* temp. display : bit 0...1=Celsius, 0=Fahrenheit
uchar   ScanFreq; /* bity 1, 0 :
//      1 x      auto
//      0 1      fixed 50 Hz
//      0 0      fixed 60 Hz
uchar   Res3; /* res */
uchar   Res4; /* res */
uchar   DeviceAddr; /* address */
uchar   RemoteBdRate; /* low nibble = Bd-rate */
// 6..4800 Bd */
// 7..9600 Bd */
// 8..19200 Bd */
// high-nibble = protocol: */
// bit7...reserve (0) */
// bit6...0 = protocol KMB */
// 1 = ModBus RTU */
// bits 5,4...parity (for ModBus only) */
// bit5.....0=no parity(i.e. 2stopbits)*/
// 1=parity: */
// bit4.....0=even */
// 1=odd */
uchar   AvePQWindowLength; /* sliding window legths for P/Q/cos averaging and
// minimum/maximum values evaluation
// low nibble...for avg, high nibble...for max/min
// coding:
// 0....1min.....1/12

```

```

//      1...15min.....1/180
//      2...1hour.....1/720
//      3...8hours.....1/5760
//      4...1day.....1/17280
//      5...7days.....1/120960
//      otherwise...7 days
uchar   UIMode23;    // for Novar-1414 models only :
//      UIMode expansion : bits 2-0 ...U2 position
//      : bity 6-4 ...U3 position

```

// since 1.3 firmware version, following 20 bytes are inserted :

```

uchar   RemoteControl;    // no meaning
char    ExtCosValue[5];   // no meaning
uchar   ExtCosValueRes[4]; // no meaning
int     OffsetCLVal[2];   // offsetu value; individual for each tariff
uchar   OffsetMode;      // bit0 = 1 ... standard control without offset
//      0 ... control with offset
uchar   RemoteControlTimeout; // no meaning
uchar   OffsetRes[4];     // no meaning

```

// end of insertion

```

uint    ConfigCRC;        /* no sense, may be set to any value */
} CType; /* Config - 80 bytes */

```

=====

**NovarSetMap :**

```

typedef struct {
uchar ClearLimit;    /* maximum values clearing and mode setting (value 1 active) */
// maximum values clearing :
// bit0= Acos, APac, Apre
// bit1= minCos,maxPac,maxPre,maxdPre
// bit2= MaxTemp
// bit3=maxCHL,maxTHDU,maxharU
// bit4=maxTHDI
uint ClearSwitchNo; // bit0-13... clear switching number of appropriate step
uchar Switch;      // controller action command
// bit0=lock editation(password will be required)
// bit1=go to control mode(if controller in manual mode)
// bit2=controller reinitialisation
// bit3=clear HWError-info
uint ClearSwitchOnTime; // bit0-13... clear switch-on time of appropriate step
} NovarSetMapType; /* NovarSetMap -6 bytes */

```

=====