



PR2000 protocol for MORSE

verze 9.0.17.0
8/7/2007

1. Introduction

Protocol PR2000 is used in devices from the English company Serck. These devices are used mostly for controlling technological processes. The networks utilizing this protocol work typically in the Master - Slave mode.



Important

The terminology is unified from Setr version 9.0.17.0 according next schedule:

PLC Master - CU RADIOSLAVE ... CU RADIOMASTER - Slave PLC

CU (radiomodem) connected via SCC to PLC Master is called Radioslave (RS),
CU connected to PLC Slave is called Radiomaster (RM).

Changes appear at a new Setr version, the firmware version has not influence.

The older Setr uses different terminology, also:

(PLC Master - CU MASTER ... CU SLAVE - Slave PLC)

2. Data Format

Data format including example according to point 3.4.

SYNC1/8	SYNC2/8	OS/8	COUNT+F/16	BCH1/8	DATA/8*COUNT	BCH2/16
AA	80	BB	02 00	6C	AAAA	FEFD

where:

SYNC1 first synchronisation byte

SYNC2 second synchronisation byte

OS Outstation - address of RADIOMASTER (RADIORELAY)

COUNT+F 4th and 5th byte understood together like a Word in Intel

COUNT No. of bytes in DATA field (14 bits ; 0 to 5th bit in 5th byte + 8 bits in 4th byte)

**Warning**

Max. size of Morse system packet is 1600 bytes

- F 2 bit flag located into 5th byte has the following meaning:
Bit 7 - ACK Flag
- 0 - Outstation acknowledges previous packet (ACK)
 - 1 - Outstation does not acknowledge previous packet (NACK)
- Bit 6 = 0
- BCH1 check byte via head of packet - first 5 bytes (SYNC1, SYNC2, OS, COUNT, F) counted according to polynomial $x^8 + x^7 + x^4 + x^3 + x + 1$.
- DATA actual transmitted data of length COUNT
- BCH2 check Word via DATA, counted 16 bit CRC according to the polynomial: $x^{16} + x^{15} + x^2 + 1$. In the case of an odd number of bytes the data is supplemented at the beginning with byte 00h

3. Implementation in Morse

It is presumed that external devices will be connected to the CU (e.g. MR400) of the MORSE system through the SCC (serial port).

3.1. Communication in MORSE mode

a) External equipment -> CU

1. selecting SYNC1, SYNC2 in the received packet
2. Check of min. size of packet from SYNC1 (8 bytes), shorter packet is cancelled
3. Check of ACK flag
4. Check of BCH1 - if in disagreement packet is cancelled
5. Check of BCH2 - ditto
6. Dispatch of data (MORSE packet) to node (typically on RF channel)
 - ACK Flag = 0 type of MORSE packet USER DATA
 - ACK Flag = 1 type of MORSE packet PROT DATA

when using packet type PROT DATA a "service Word" is supplemented at the beginning of the data. For ACK Flag = 1 value 0001h. This Word serves only for Morse system and is not accessible to users.

 - RADIOSLAVE - packet is sent to the address according to OS

- RADIOMASTER - packet is sent to the address according to parameter (a): or (A)ut:

b) CU -> External equipment

1. SYNC1, SYNC2, OS, COUNT, F, BCH1, BCH2 are supplemented to the received data (MORSE packet) from node (RF channel)
2. address supplemented to the OS field:
 - v CU RADIOSLAVE - source from MORSE packet
 - v CU RADIOMASTER – destination from MORSE packet
3. packet sent to relevant SCC (serial port)

From the above it is apparent that only service data secured by MORSE system algorithms are transmitted via the (RF) channel. Data on the SC channel is secured by algorithms of the PR2000 protocol.

3.2. Communication in C92 mode

For reasons of compatibility with networks built from earlier RD300FS radio modems, data is transmitted in mode C92 in the following way (after setting parameter(R)D300FS to ON):

a) External equipment -> CU

1. selecting SYNC1, SYNC2 in the received packet
2. check min. size of packet from SYNC1 (8 bytes), shorter packet is cancelled
3. "cut-off" SYNC1, SYNC2 from packet
4. Send packet on RF channel, Morse packet type C92_VAE_DATA (64h)

b) CU -> External equipment

1. SYNC1, SYNC2 are added to the beginning of the received data(MORSE packet) from node (RF channel)
2. the packet is sent to relevant SCC (serial port)

From the above it is obvious that data is transmitted via the RF channel in the way it was delivered to the SC channel, only without SYNC1 and SYNC2, of course secured with MORSE system algorithms.

3.3. Handshake

There is no handshake used on the CU-Serck link- not even SW (via ACK or other characters in the link layer of the protocol) not even HW (only three connections are used - RXD, TXD, GND). In case of overflow of queues of packets for sending to the RF channel (4 packets) there is no way to inform the Serck, and therefore other possible incoming packets are discarded.

3.4. Communication example

```
SERCK Master ---> CU RADIOSLAVE 690F00AA
      FFFF AA80 BB02 006C AAAA FEDF FFFF

MORSE packet data  CU RS AA ---> CU RM BB
      AAAA

CU RADIOMASTER BB ---> SERCK Outstation (Slave)
      AA80 BB02 006C AAAA FEDF

SERCK Slave Outstation ---> RM BB
      AA80 BB02 006C 6666 AB8A

MORSE packet data  RM BB ---> RS AA
      6666

RS AA ---> SERCK Master
      AA80 BB02 006C 6666 AB8A
```

4. Configuration Parameters

PR2000 parameters:

```
PLC Master - CU RADIOSLAVE ... CU RADIOMASTER - Slave PLC
(m):RADIOMASTER (wired to SLAVE)
(s)ync word:AA80h
(R)D300FS:OFF
slave only: (a):AAh (A)ut:OFF (t)imeout:2000ms
(q)uit
>>
```

(m) CU mode

Select Mode

- (S) RADIOSLAVE (wired to MASTER)
- (M) RADIOMASTER (wired to SLAVE)
- (R) RADIORELAY

- RADIOSLAVE - connected to PLC Master - sends data to address, which is created such that the lowest byte of the actual address (relevant node) is overwritten with the OS byte
- RADIORELAY - in the case that OS is the same as the lowest byte its own address behaves as RADIOMASTER, otherwise is behaves as RADIOSLAVE
- RADIOMASTER - connected to PLC Slave - sends data to the address listed in parameter (a) - address of RS

ATTENTION - The Setr older than 9.0.17.0 uses the reverse labelling M/S !

It is necessary to correctly set the 8 bits mask in the relevant channel at the same time (CNI menu).

- (s) Entering SYNC1 and SYNC2 - together a whole Word, typically AA80 (SYNC1 higher byte, SYNC2 lower byte - in terms of Motorola format).
- (R) (R)D300FS compatible - switches on communication mode in C92 mode

Next parameters use the RADIOMASTER and RADIORELAY only:

- (a) Address of the RADIOSLAVE to which the RADIOMASTER (RADIORELAY) sends data. It only takes into consideration the lowest byte. The remaining bytes of the address are supplemented from its own address on the relevant node.
- (A) OFF - RM responses to the address according the parameter (a)
ON - RM responses to RS address, from which the request came. The request must be accomplished if the time shorter then parameter (t)imeout.
- (t) (t)imeout - RADIOMASTER waits for the response from PLC Slave for this time

5. History

- 478 z 10/2000 - valid from this version
- 9.0.17.0 z 06/2007 - unification of terms RS/RM in the Setr
