

# Synchronizace senzorů mobilního mapovacího systému

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# Seznámení MMS

- inerciální jednotka iVRU-RSSC od iMAR

(3x akcelerometr, 3x gyroskop)



- liniový laserový skener LMS 200 od Sick (2x)



- geodetická GPS

(Trimble 5800 nebo GeoXR)



- software Inertial Explorer od Waipoint

# Problém synchronizace




- přiřazení přesného času k datům LS
  - 75 Hz
- máme z GPS případně z INS
  - PPS
  - NMEA

\$GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4,M,46.9,M,,\*47

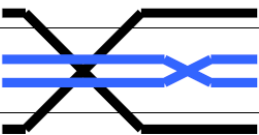


Where:            123519 = 12:35:19 UTC  
                    4807.038,N Latitude 48 deg 07.038' N  
                    01131.000,E Longitude 11 deg 31.000,  
                    .....

# Komunikace s LMS 200

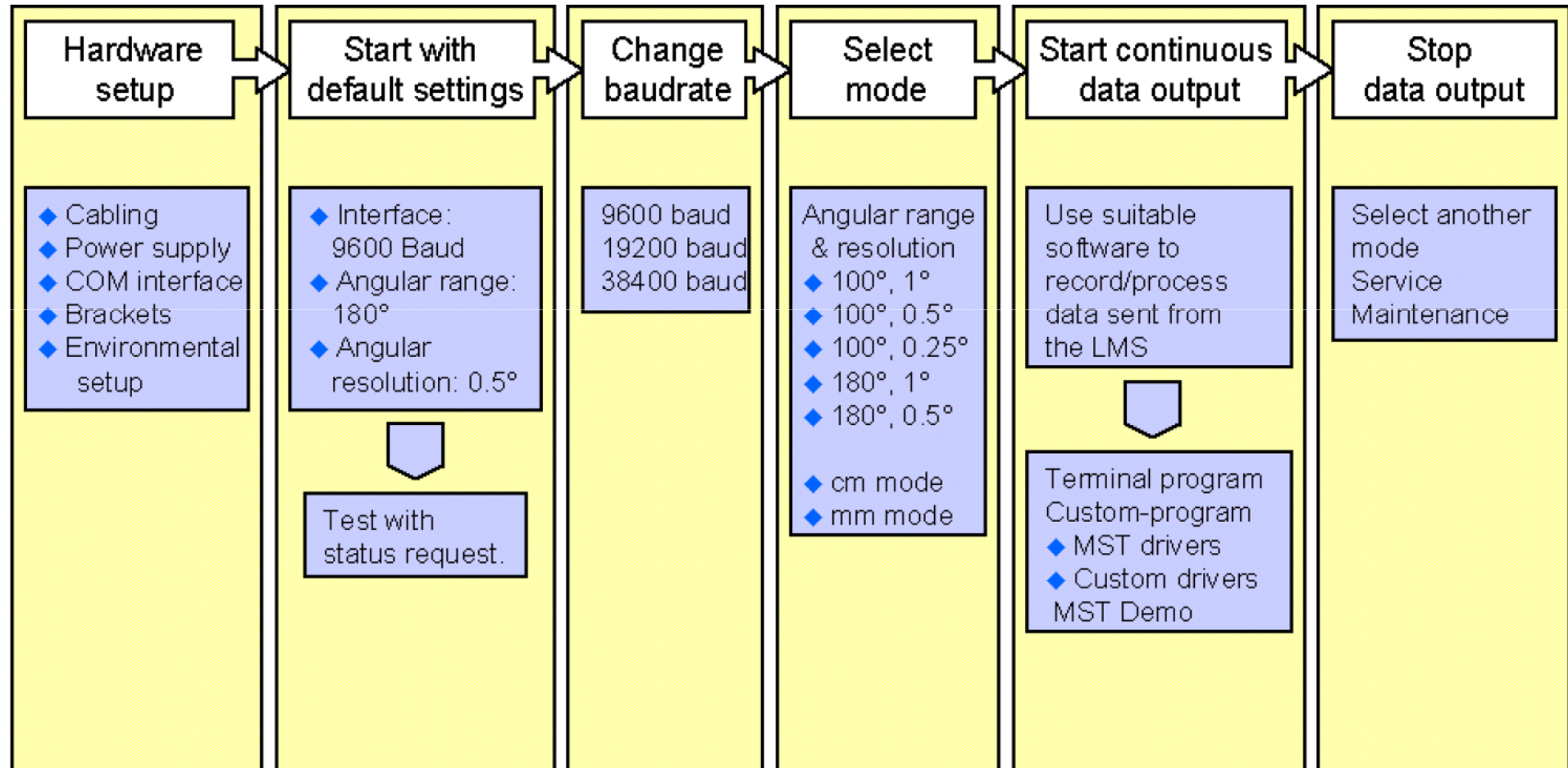
- RS322

LMS			PC	
Signal designation	PIN No.		PIN No.	Signal designation
Not connected	1		1	NC
RxD	2		2	RxD
TXD	3		3	TXD
Not connected	4		4	Not connected
GND	5		5	GND
Not connected	6		6	Not connected
Not connected	7		7	Not connected
Not connected	8		8	Not connected
Not connected	9		9	Not connected

- RS422

LMS			PC	
Signal designation	PIN No.		PIN No.	Signal designation
RxD-	1		1	RxD-
RxD+	2		2	RxD+
TxD-	3		3	TxD-
TxD+	4		4	TxD+
GND	5		5	GND
Not connected	6		6	Not connected
Jumper 1	7		7	Not connected
Jumper 2	8		8	Not connected
Not connected	9		9	Not connected

# Komunikace s LMS 200



# Komunikace s LMS 200

- obousměrná komunikace - telegramy
- při každém restartu baud rate 9600

<b>LMS start-up message in hex LMS → PC</b>
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02 80 17 00 90 4C 4D 53 32 30 30 3B 33 30 31 30 36 33 3B 56 30 32 2E 31 30 20 10 72 D0
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- status request
- baud rate

<b>LMS baudrate setting</b>	<b>Telegram code in hex PC → LMS</b>	<b>Reply telegram in hex LMS → PC</b>
9600 baud	02 00 02 00 20 42 52 08	06 02 81 03 00 A0 00 10 36 1A
19200 baud	02 00 02 00 20 41 51 08	06 02 81 03 00 A0 00 10 36 1A
38400 baud	02 00 02 00 20 40 50 08	06 02 81 03 00 A0 00 10 36 1A

- další nastavení (rozsah, rozlišení, přesnost)

# Komunikace s LMS 200

LMS mode		LMS output data string header	Number of transferred measurement data values
Angular range	Angular resolution		
0°..100°	1°	02 81 CE 00 B0 65 00 ...	101
0°..100°	0.5°	02 81 96 01 B0 C9 00 ...	201
0°..100°	0.25°	02 81 26 03 B0 91 01 ...	401
0°..180°	1°	02 81 6E 01 B0 B5 00 ...	181
0°..180°	0.5°	02 81 D6 02 B0 69 01 ...	361

LMS continuous data output	Telegram code in hex PC → LMS	Data stream in hex LMS → PC
Start	02 00 02 00 20 24 34 08	06 02 81 03 00 A0 00 10 36 1A <output string header> < LMS data > (refer to section D.2.)

LMS continuous data output	Telegram code in hex PC → LMS	Reply telegram in hex LMS → PC
Stop	02 00 02 00 20 25 35 08	06 02 81 03 00 A0 00 10 36 1A

# Komunikace s LMS 200

Designation	Data size (number of bits)	Remarks
STX	8	Start byte (STX = 02 hex)
ADR	8	Address of the subscriber (in this case the PC) addressed. Typically, the value is (81 hex).
Len	16	Length of the total LMS output data string. Number of following output data string bytes excluding the checksum (CRC = 2 bytes)
CMD	8	Command byte, in this case (B0 hex), which is the command for continuous data output.
DataLen	16	Number of measurement data bytes (depending on measurement mode, refer to section C.8.)
Data ...	n x 16	Measurement data values (2 bytes each) according to the measurement mode settings. Please refer to the note below )*
Status	8	Status byte Indication of system error, pollution etc. Refer to telegram listing for exact information.
CRC	16	CRC Checksum

LMS measurement data value: Bits [0..12] max. value 8191													<del>13</del>	<del>14</del>	<del>15</del>
0	1	2	3	4	5	6	7	8	9	10	11	12	<del>13</del>	<del>14</del>	<del>15</del>



# Komunikace s LMS 200

<b>LMS baudrate Setting</b>	<b>Telegram code in hex PC → LMS</b>	<b>Reply telegram in hex LMS → PC</b>
500 kBaud	02 00 02 00 20 48 58 08	06 02 81 03 00 A0 00 10 36 1A

<b>Item/Specification</b>	<b>Description</b>	<b>SICK order number</b>
MOXA card for 500 kBaud <b>(ISA bus (old PC standard))</b>	2 x RS422, opto-decoupled, high-speed (500 kBaud)	6011807
Quatech card for 500 kBaud <b>(PCI bus (new PC standard))</b>	????	????
PCMCIA card for 500 kBaud SIO-card RS485-SICK	Order at: CSM GmbH Raiffeisenstrasse 34, 70794 Filderstadt Germany, Tel.: ++49 71177964-0	

# Rychlost přenosu

- $(401 \times 16 + 80) \times 75 = 487\,200 \text{ bit/s}$
- $(361 \times 16 + 80) \times 75 = 439\,200 \text{ bit/s}$
- $(201 \times 16 + 80) \times 75 = 247\,200 \text{ bit/s}$
- $(181 \times 16 + 80) \times 75 = 223\,200 \text{ bit/s}$
- $(101 \times 16 + 80) \times 75 = 127\,200 \text{ bit/s}$