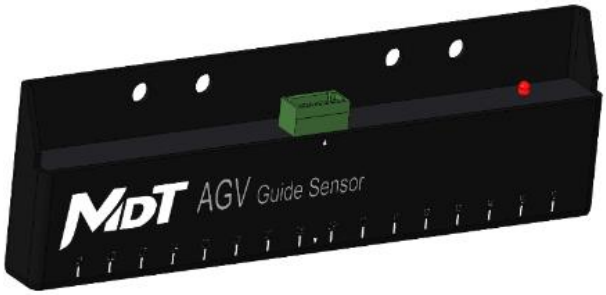
AGV-TMR25X4 (RS485)



AGV Magnetic Guide Sensors

DESCRIPTION

AGV-TMR25X4 is a 16-channel digital signal and 1mm accuracy absolute position output magnetic guide sensor with RS-232 and RS-485 interface. It is available as standard with N pole, S pole and N/S pole magnetic modes including corresponding LED indicators. AGV-TMR25X4 sensor is adaptive to installation height and tape width with excellent protection against magnetic material interference. Incorporating tunneling magnetoresistance (TMR) technique, AGV-TMR25X4 sensors are designed for tape and marker guided magnetic navigation with excellent temperature characteristics, good consistency, fast frequency response, high sensitivity and low power consumption performance.

FEATURES AND BENEFITS

- RS-232 and RS-485 interface
- Magnetic pole indicator
- 16-channel digital output
- 1 mm accuracy absolute position output
- Support 3 magnetic tracks detection
- Magnetic tape/marker detection
- N pole, S pole and N/S poles detection modes
- Reverse polarity protection, overload protection, surge suppression
- Adaptive installation height
- Superior protection against EMI
- Superior protection against magnetic material interference
- Excellent temperature characteristics

APPLICATIONS

- Magnetic navigation with tape/marker
- Automated guided vehicle (AGV)
- Automated guided cart (AGC)
- Trackless mobile shelving
- Logistics sortation

SPECIFICATIONS

Parameters	Value
Supply voltage	10 Vdc ~ 30 Vdc
Supply current	50 mA
Communication type	RS232, RS485
Circuit protection	reverse polarity protection, overload protection, surge suppression
Output signal 1	pole status and track quantity
Output signal 2	16-channel digital
Output signal 3	absolute position
Operating mode of N pole	green LED stay lit constantly
Operating mode of S pole	red LED stay lit constantly
Operating mode of N/S pole	red / green LED alternating blink
Detectable tracks	up to 3
Accuracy	1 mm
Effective detection range	0~150 mm
Detection height	10 mm~60 mm
Optimum Installation Height	35 mm
Magnetic field	5 Gs~25 Gs
Operating temperature	-25℃~80℃
Operating humidity	35%~95%
Response time	5 ms
Dimensions	180 mm*17 mm*50 mm
Potting material	AB glue
Housing material	Metal, Epoxy Resin
Ingress Protection	IP65

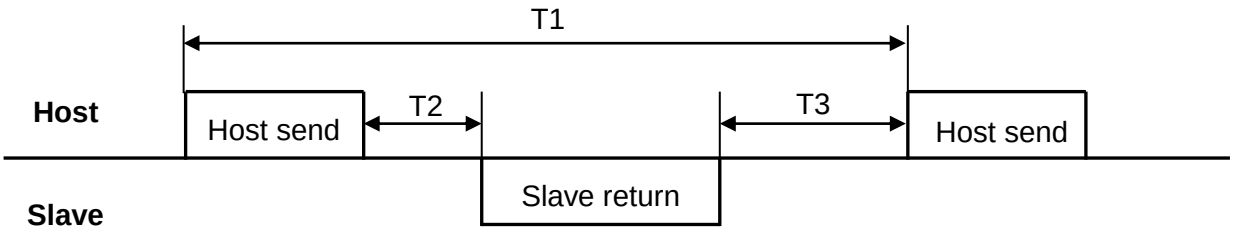
RS-232, RS-485 COMMUNICATION PROTOCOL

RS-232 protocol is customizable to communicate with host computer

RS-485 protocol is based on Modbus RTU, details as follows:

Interface	RS-485 half-duplex
Baud rate	4800, 9600, 19200, 38400, 115200 (default)
Character setting	11 bits: 1 start bit + 8 data bits + 1 check bit + 1 stop bit (no check)
Slave address	1~128 (default 0X01)
Host send	address + function code + start address + data length requested + CRC16 (low byte) + CRC16 (high byte)
Slave return	address+ function code + data length returned + data 1……data n + CRC16 (low byte) + CRC16 (high byte)

Frame sequence



Frame configuration

Baud rate	4800	9600	19200	38400	115200
Max. frame frequency	20 Hz	25 Hz	50 Hz	100 Hz	200 Hz
Min. frame interval (T1)	50 ms	40 ms	20 ms	10 ms	5 ms
Min. Response time (T2)	8.5 ms	4.5 ms	2.5 ms	2 ms	1.5 ms

Note:

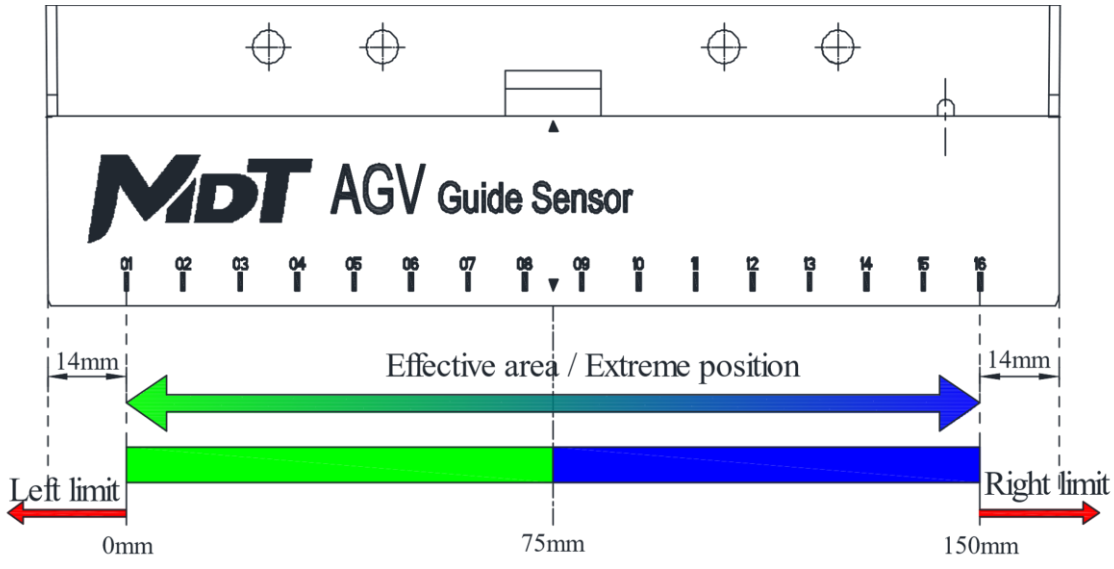
① T1 is the time interval between two consecutive request sent from host, and the setting value should follow the table above

② T2 is the response time of the slave after host sending the request

③ Set T3 > T2 to ensure communication normal

RS-485 COMMUNICATION DATA INSTRUCTION

The detection channels of AGV-TMR25X4 sensor defined as the figure below:



The host send 01 03 00 00 00 03 05 CB to AGV-TMR25X4 sensor with no external magnetic field, then slave (sensor) returns 01 03 06 00 FF FF FF 00 00 35 45.

Host sends

Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t
0x01	0x03	0x00	0x00	0x00	0x03	0x05	0xCB
ID/address	function code*	16-bit register start address high byte	16-bit register start address low byte	16-bit data length high byte	16-bit data length low byte	CRC-16 low byte	CRC-16 high byte

*refer to Modbus protocol

Slave returns

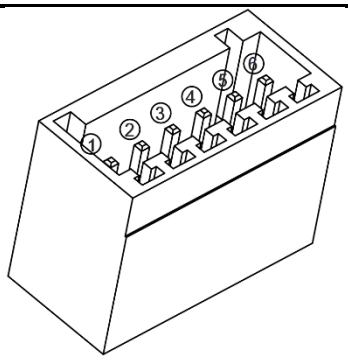
Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8	Byte9	Byte10	Byte11
Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t	Uint8_t
0x01	0x03	0x06	0x00	0xFF	0xFF	0xFF	0x00	0x00	0x35	0x45
ID/ address	function code	return byte length	pole status and track quantity	1st track position	2nd track position	3rd track position	point position high byte	point position low byte	CRC-16 low byte	CRC-16 high byte

Return data instructions

pole status and track quantity								
Bit #	00	01	02	03	04	05	06	07
Function	pole status	reserved					track quantity	
Status	0: S pole 1: N pole (valid when track quantity>0)	0					00: quantity of tape track is 0 01: quantity of tape track is 1 10: quantity of tape track is 2 11: quantity of tape track is 3	

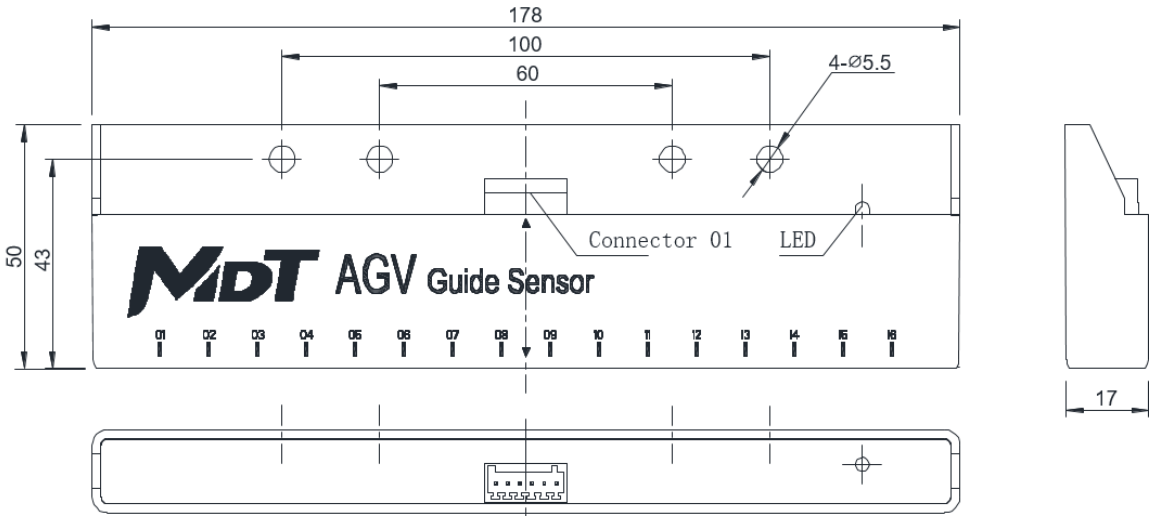
Point position	High byte								Low byte							
Bit #	00	01	02	03	04	05	06	07	00	01	02	03	04	05	06	07
Channel #	09	10	11	12	13	14	15	16	01	02	03	04	05	06	07	08
Bit Status	0: OFF 1: ON															

PIN CONFIGURATION



1- 24V
2- GND
3- 232_RX
4- 232_TX
5- 485_A
6- 485_B

DIMENSIONS (mm)



APPENDIX A:

Host software operation manual

Host software requires LabVIEW Run-Time Engine 2013 (not included)

Please download it from NI website or through the link below:

http://www.ni.com/download/labview-multicore-analysis-and-sparse-matrix-toolkit-2013/4033/en/

Download and Installation:

1. Download host software package from AGV-TMR25X4 page of MDT official website http://www.dowaytech.com/sensor/agv.html, then click the link in yellow circle on the screenshot below to start downloading.

2. Start host program

   Extract the downloaded file, and click the file of MDT in the extracted folder to start host program of AGV-TMR25X4.

Host interface setting and operation:

1. Select AGV-TMR25X4 from drop-down menu, then click Start button below to enter the RS-232 and RS-485 setting interface

2. Menu instruction

   2.1 System

   2.1.1 Demo: Enter product function demonstration interface

   2.2 Communication

   2.2.1 Serial Conn: Connect serial port for RS-232

   2.2.2 Serial Discon: Disconnect serial port for RS-232

2.3 Parameter

2.3.1 Read: Read parameters from sensor to computer

2.3.2 Write: Write parameters from computer to sensor

3. Main interface instruction

3.1 Serial port connection: Set connection parameter for RS-232

This table will update automatically by program. Default setting:

Port	Baud rate	Check	Slave address
(auto search)	115200	NO	01

3.2 RS232: Set RS-232 parameters: slave address, baud rate, check,

Operating mode: Choose sensor working in N/S pole, N pole, or S pole mode.

Click “Write” (see 2.3.2) after input, power off and restart sensor to activate setting.

3.3 RS485: Set RS-485 parameters: slave address, baud rate, check, and cyclic response

Click “Write” after input, power off and restart sensor to activate setting.

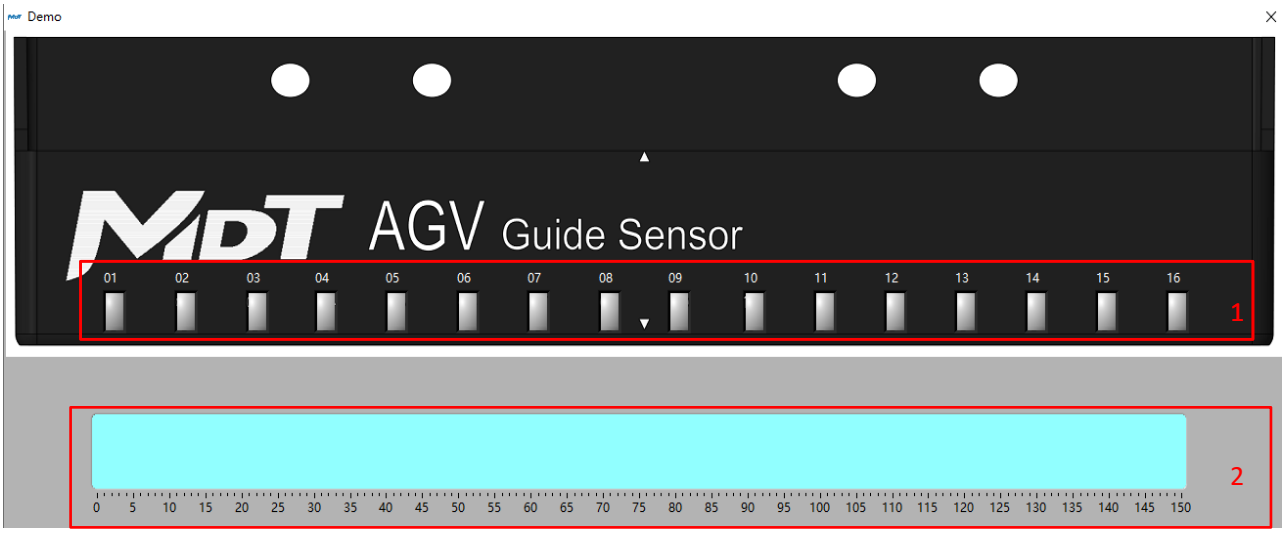
3.4 Sensor Parameter: Load current sensor parameter by clicking “Read”

3.5 Status bar: Current connection status of sensor

4. Demo instruction

Enter demonstration interface by clicking “Demo” (see 2.1.1)

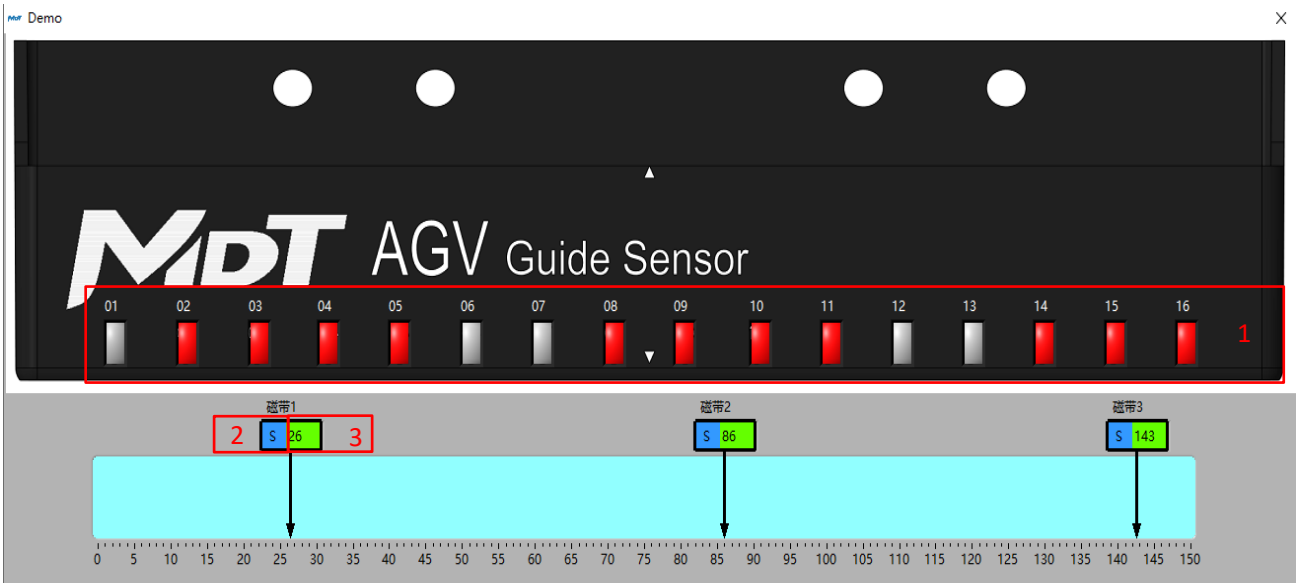
4.1 Static status (no magnetic tape detected):



Note

Status of (1) 16 detection channel and (2) 1~150 mm absolute position

4.2 Dynamic status (3 tapes detected)



Note

1. 16 channels status
2. current pole of the magnetic tape
3. absolute position of 3 tape tracks

APPENDIX B:

CRC check function

CRC16 table: high byte

```
const u8 CRC16HiTable[]=
{
  0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
  0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
  0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
  0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
  0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
  0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
  0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
  0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
  0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
  0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
  0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
  0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
  0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
  0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
  0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
  0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
  0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
  0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
  0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
  0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
  0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
  0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
  0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
  0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
  0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
  0x80, 0x41, 0x00, 0xC1, 0x81, 0x40
};
```

CRC16 table: low byte

```
const u8 CRC16LoTable[]=
{
  0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06,
  0x07, 0xC7, 0x05, 0xC5, 0xC4, 0x04, 0xCC, 0x0C, 0x0D, 0xCD,
  0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,
  0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A,
  0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC, 0x14, 0xD4,
  0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,
  0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3,
  0xF2, 0x32, 0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4,
  0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,
  0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29,
  0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF, 0x2D, 0xED,
  0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
  0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60,
  0x61, 0xA1, 0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67,
  0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,
  0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68,
  0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE, 0x7E,
  0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
  0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71,
  0x70, 0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92,
  0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,
  0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B,
  0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B,
  0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
  0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42,
  0x43, 0x83, 0x41, 0x81, 0x80, 0x40
};
```

```
u16 mc_check_crc16(u8 *buf,u16 len)                    //CRC16 calculation
{
    u8 index;
    u16 check16=0;
    u8 crc_low=0XFF;
    u8 crc_high=0XFF;
    while(len--)
    {
        index=crc_high^(*buf++);
        crc_high=crc_low^CRC16HiTable[index];
        crc_low=CRC16LoTable[index];
    }
    check16 +=crc_high;
    check16 <<=8;
    check16+=crc_low;
    return check16;
}
```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