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Data Sheet

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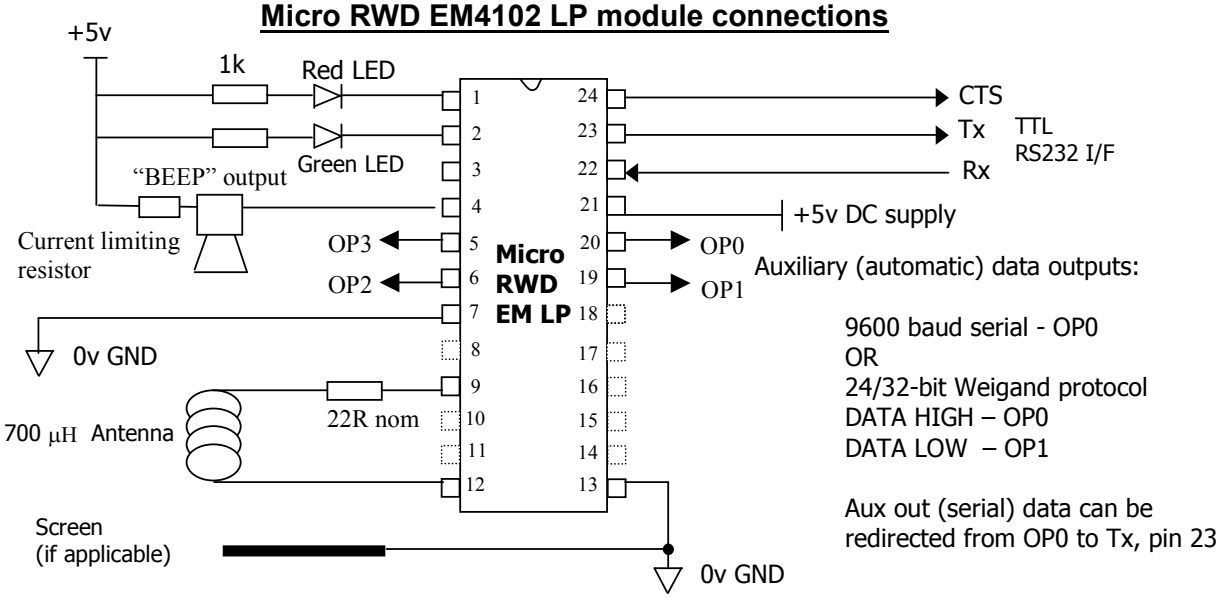
Micro RWD EM4102 Low Power Version
(with auxiliary data outputs)

The MicroRWD EM4102 (Low Power) version is a complete reader and tag acceptance solution for 125kHz EM Marin EM4102 (and Microchip MCRF200/123) derived RF transponders. The solution is entirely housed within a 24-pin DIL package and only needs a 700µH antenna connected and a 5v DC supply to be a fully featured RFID Reader system. The MicroRWD EM4102 LP version behaves in the same manner as the standard reader except that it has an **active, average current consumption of around 100µA (micro Amps)** with 1 second polling rate. As with other RWD modules, all commands and data response are via a simple TTL level RS232 interface. The RWD module also has output pins for indicator LEDs, high-current outputs for driving external loads and a programmable "BEEP" output for external sounders. In addition, the RWD EM4012 LP version has **auxiliary data outputs on the OP0 / OP1 pins** that can be programmed to automatically output the UID (serial number) as **asynchronous 9600 baud** serial or **Weigand protocol Data High / Data Low signals**. All these features can be configured and turned ON/OFF by setting RWD EEPROM parameters. The diagram below shows the pin out configuration for the RWD EM4102 LP module.

Micro RWD EM4102 LP module connections



With the ultra-low-power current consumption and the additional auxiliary data output features, this one of the most compact and flexible reader systems available.

The EM4102 based transponders provide 64 bits of read-only memory. This memory contains a header bit sequence and parity bits that are decoded to give 40-bits (5 bytes) of user data. This 5-byte Unique Identifier (UID) or serial number can be read using the READ TAG (ASCII "R", 0x52 Hex) command.

Data is only accepted from the EM4102 transponder if the memory parity bits are valid. This configuration ensures that the integrity of user data is maintained.
The EM4102 transponder type is widely used throughout the world in its base form and also in many fully compatible derivative forms. The Microchip MCRF200/123 transponder has the same modulation and timing characteristics as the EM4102 types but has a 16-byte read-only memory. MCRF200/123 Reader mode can be selected by setting the appropriate RWD EEPROM parameters.

Auxiliary Data Output

The Micro RWD EM4102 LP version uses the least significant 4-bytes of the 5-byte UID (serial number) to create a 32-bit data frame. The first byte of the 5-byte EM4102 data is ignored. The data frame can then be output as asynchronous 9600 baud serial data on OP0 pin or as 24 / 32 bit Weigand protocol with parity bits attached (making 26 or 34 bits of data) on OP0 / OP1 pins.

An RWD EEPROM parameter can redirect the serial auxiliary output on OP0 to the main TX output (pin 23). This is to allow both bi-directional command/data communication and the uni-directional auxiliary serial data output with the same 3-wire RS232 interface. Note that when the auxiliary serial output has been redirected to TX pin, there will be NO acknowledgement or data response to commands.

For normal command and data response using the Windows application, the serial auxiliary output MUST be directed to the OP0 pin.

The auxiliary data outputs on OP0 / OP1 are **AUTOMATIC** and if enabled, occur when a card enters the RF field for the first time. The "beep" output signal delay, the data source and byte order for the auxiliary output and the various Weigand protocol options are all controlled by programmable RWD EEPROM parameters (see page 10). A zero data length parameter effectively turns the auxiliary outputs OFF (factory default set to asynchronous serial output of UID-serial number from OP0 with NO "beep" output).

In this manner the MicroRWD EM4102 LP can be used in a battery powered application (<100μA average current consumption) and automatically output a 4-byte serial number WITHOUT any commands having to be sent to the module. In addition, the "Green" LED output or the BEEP output can be used as a control signal to "interrupt" the host computer or microcontroller just before the automatic data is transmitted.

NOTE that the "BEEP" output (RWD pin 4) idles in a high state and is an open drain output so it "sinks" current. External loads can be connected between the supply rail and pin 4 with a series resistor to ensure "sink" current does not exceed 25ma.

MicroRWD EM4102 LP operation

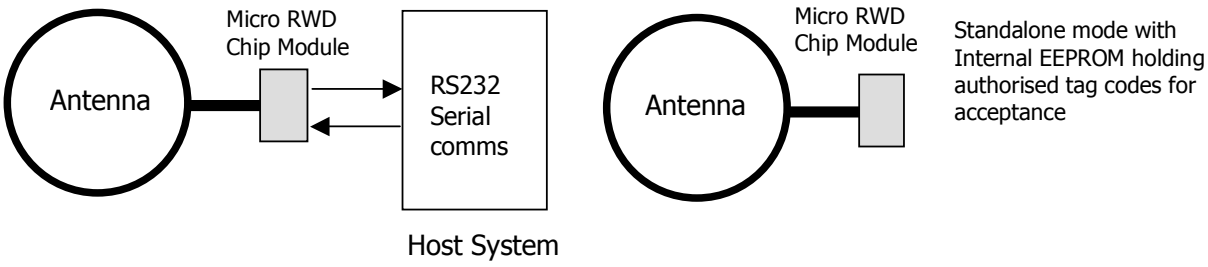
The MicroRWD is essentially a proximity system and a Read range of up to 20cm can be achieved. The unique AST (Adaptive Sampling) feature allows the RWD to continually adjust and re-tune the sampling to allow for inductive changes in the RF field, an essential feature for real-world reliability and robust operation.

The communication protocol with the tags can achieve 2k bits/second of data transfer and the total time to read the 40 bit data is less than 40ms.

The MicroRWD can be easily integrated into almost any application; when power (5v DC) is first applied to the board the red and green LEDs flash once to indicate successful power-up. The device can also check for broken or shorted antenna and can even detect very badly tuned antennas; these problems are indicated by the red LED flashing continuously until the fault has been rectified.

The MicroRWD will normally have the red LED lit until a valid card or tag is brought into the RF field. If the tag is accepted as valid then the green LED is turned ON (and Red OFF) and the output drives (OP2, OP3) are switched on. These outputs can be connected together to give up to 50ma of drive current for operating an external load etc. If the auxiliary output features are enabled then the UID (serial number) is transmitted as serial data or Weigand protocol data on OP0, OP1 pins.
If the Beep delay is set then the "BEEP" output (pin 4) is pulsed ON/OFF. With auxiliary output features turned OFF, the RWD responds to host commands on the TTL serial interface at 9600 baud, 8 bits, 1 stop, no parity, as usual.

The Micro RWD has two basic modes of operation:-



Remote mode (connected to a host computer or microcontroller) and Standalone mode.

1) Remote mode involves connecting to a host serial interface. This is where the stored list of authorised identity codes can be empty, effectively authorising any EM4102 transponder for subsequent read operations. A simple serial protocol allows a host system to communicate with the Micro RWD in order to program new authorised identity codes, change configurations and perform read operations from the tag itself.

2) Standalone mode is where the EM4102 tag identity codes are checked against a stored list of authorised codes. If an identity code is matched, the output drives and Green LED are enabled. **In this case identity codes are taken as the least significant 4-bytes of the EM4102 five byte sequence, The most significant first byte (byte 0) is ignored.** This is to allow use of any commercially supplied EM4102 transponders where least significant bytes are incremented. Effectively standalone mode occurs when there is no host system communicating with the Micro RWD.

Supported transponder types

The Micro RWD EM4102 version is designed to read data from EM Marin EM4001/EM4102 transponder types and compatible read-only tags with the correct header, data and parity bit structure (direct ASK modulation, Manchester coded with data rate of RF/64).

The operation of the Micro RWD and EM4102 transponders is described in more detail at the end of this document.

In Microchip MCRF200/123 Reader mode the RWD supports the MCRF200/123 read-only transponder with 16-byte memory, 0x802A header and direct ASK modulation, Manchester coded with data rate of RF/64.

Note that to maintain compatibility with other RWD systems the identification codes used for the Auxiliary outputs are 4-byte (32-bit) value:
Bytes 1-4 of EM4102 memory (least significant 4-bytes, ignoring first byte)
Bytes 12-15 of MCRF200/123 memory (least significant 4-bytes)

Serial Interface

This is a basic implementation of RS232. The Micro RWD does not support buffered interrupt driven input so it must control a BUSY (CTS) line to inhibit communications from the host when it is fully occupied with card communication. It is assumed that the host (such as a PC) can buffer received data. This CTS signal must be connected to the host computer communication port to allow "hardware handshaking" or the host driver software must check the CTS signal and only send commands/data when it is in a LOW state. The CTS signal is pulsed LOW for a 6ms period each polling cycle. The host computer must wait for this LOW signal and then send the command and data.
The CTS line remains in a LOW state while the command and data bytes are being received. After the last byte of data the CTS signal "times out" for 6ms and returns HIGH.
This 6ms "window" every polling cycle allows the host computer to send a single command and associated data to the RWD. Please note that only one command and it's corresponding data bytes can be sent during a CTS LOW period, the command and data bytes must be sent with no gaps between, if there is a pause of more than 6ms between bytes then "time out" occurs, the CTS line returns high and the command fails (flagged as RS232 error). The CTS signal idles in this HIGH state (to inhibit host communication) until the next polling cycle begins.

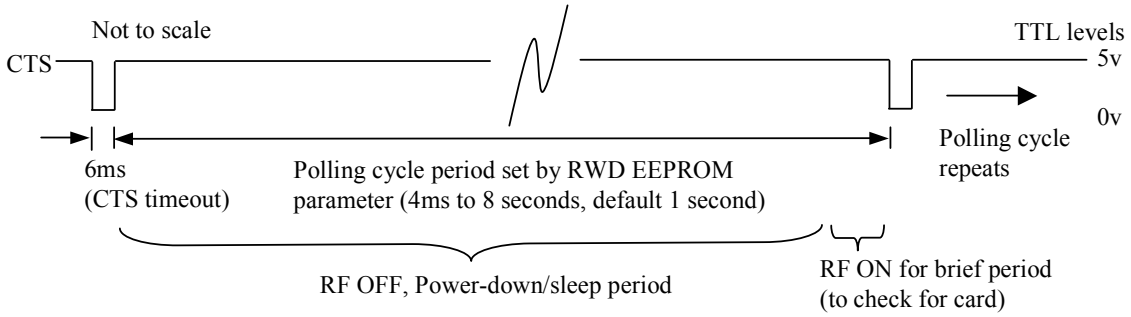
The communication baud rate is 9600 baud, 8 bits, 1 stop, no parity. The RWD Tx, Rx and CTS signals are all TTL level and can be converted to +/-10v RS232 levels using a level converter device such as the MAX202 (note the inversion of the TTL levels).

The Micro RWD EM4102 LP (low-power) version has been specifically designed to operate with very low average power consumption but still remain responsive to cards entering and leaving the field and be able to read large amounts of data as quickly as possible.

THE RWD HAS THREE POLLING STATES:

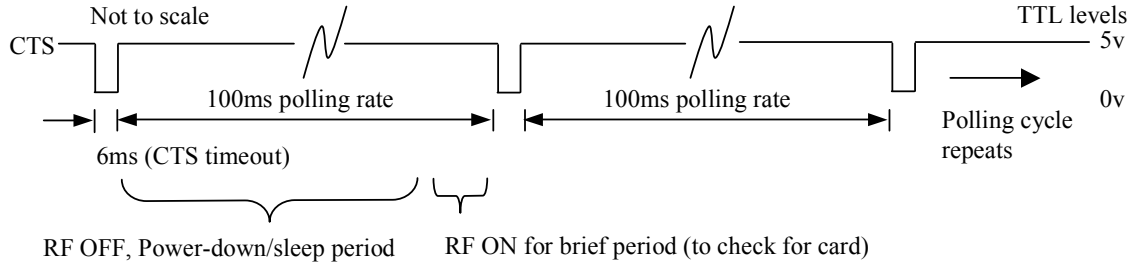
1) **NO card present and NO host commands received.**

Polling cycle rate (time between subsequent CTS low periods) is determined by the "polling rate" parameter stored in the RWD EEPROM memory. This is typically set to a long period (0 to 8 seconds, default setting 260mS) and is the primary means to reduce average power consumption. This is because most of the polling cycle period is spent in a power-down/sleep mode.



2) **EM4102 card in field, NO host commands received**.

When a card is detected in the field the polling rate changes to approximately 100ms (between CTS low periods). This is to ensure that the RWD can respond quickly to the card leaving the field and a new card being presented.

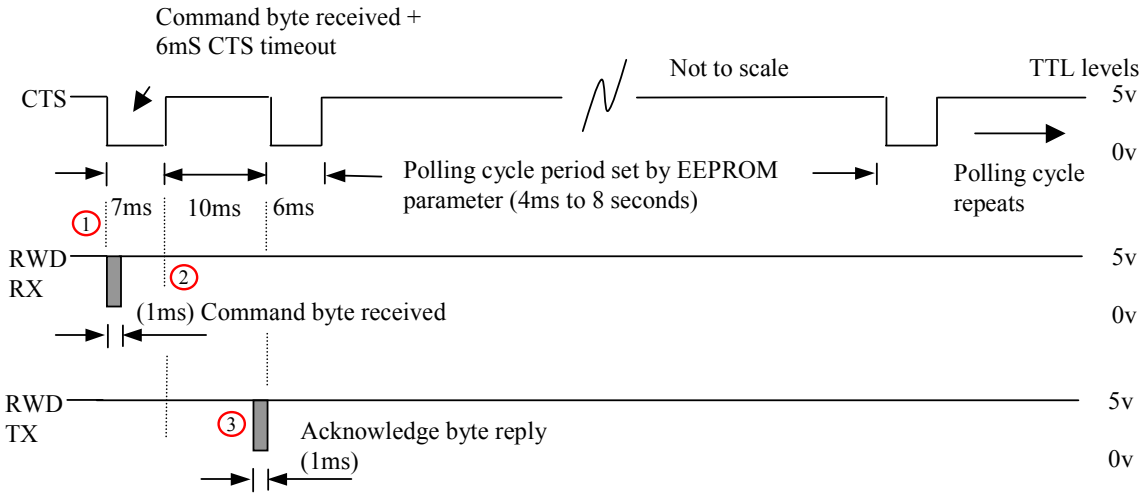


3) **Host commands received and processed.**

When the RWD receives commands from the host computer, the polling rate increases to allow a quick response to the command. This means that commands such as READ TAG can be repeated quickly with no polling delay (sleep period) between cycles.

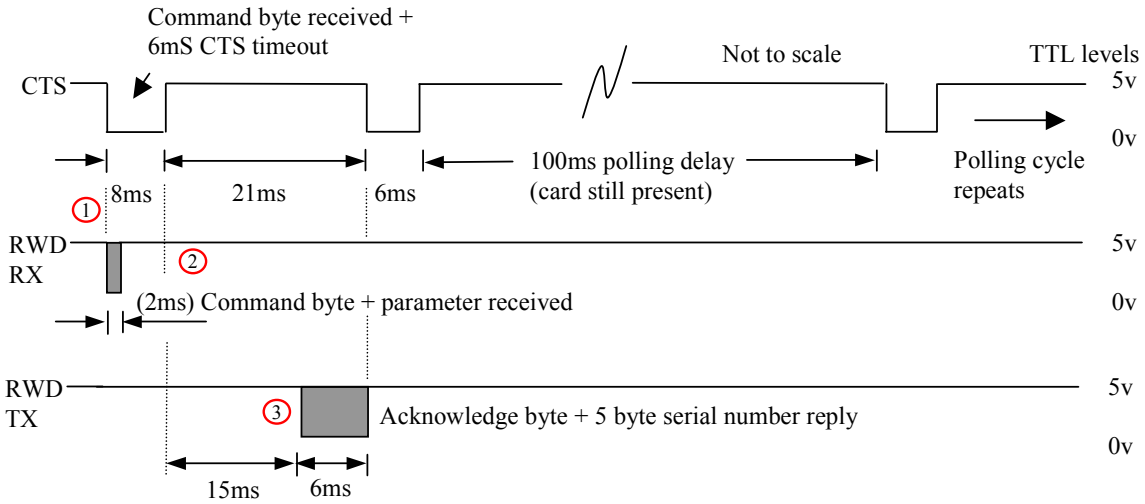
Example a) NO card present, single STATUS (0x53) command received.

Note: at 9600 baud serial communication rate, a single byte is received or transmitted in approximately 1mS (104µS per bit). If no commands follow then the polling rate reverts back to the stored parameter value as in (1).



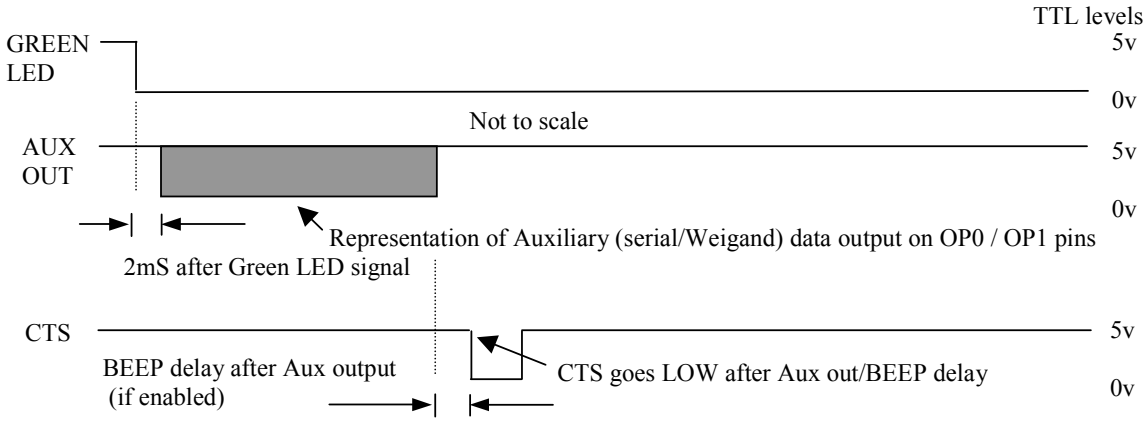
1. Host waits for CTS falling edge then sends command byte.
2. RWD processes command, RF turned ON for brief period to check if card present.
3. RWD then replies with acknowledge byte (+ data).

Example b) EM4102 card in field, READ TAG (0x53 0x00) command received.



Auxiliary output and BEEP delay timing (if options are enabled)

EM4102 card in field for first time, Auxiliary output enabled and BEEP delay set. Green LED signal can be used as an interrupt signal to the host to indicate that auxiliary data will follow.



Summary of Polling rates and command timing

Three polling rates:

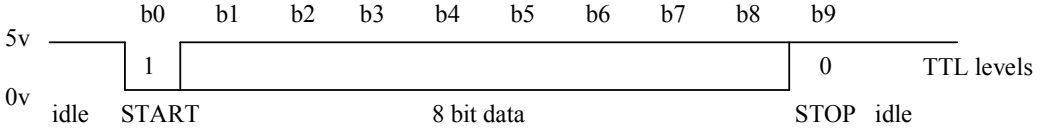
1) NO card and NO commands: Polling rate determined by Polling rate parameter in RWD EEPROM (0 to 8 seconds, default setting 260mS)
2) Card present but NO commands: 100ms polling delay between CTS pulses.
3) Command (and parameters) received: 10ms polling delay to next CTS pulse.

For lowest power consumption, the Polling rate parameter in EEPROM is typically set to a long period (> 1 second). Auxiliary output (if enabled) occurs after Green LED signal and before CTS.

Host communication software must be able to handle the three polling rates.

Note that Auxiliary outputs (and "BEEP" output) should be turned OFF if standard RS232 command interface is being used to ensure minimum power consumption and no additional delays occur in the polling loop.

Transmitted or Received data byte, 9600 baud, 8 bit, 1 stop, No parity (104 µS per bit)



Host Driver software

Communication with the MicroRWD module is via the TTL level RS232 interface (9600 baud, 8 bit, 1 stop bit, no parity) and uses the CTS line for hardware handshaking. The Windows applications (supplied with the Evaluation kit) can be used to communicate with the module or the user can write their own application on a PC or a microcontroller. Please note that the host software must be able to handle the three distinct polling rates (different periods between CTS pulses). The following basic communication algorithm can be used:-

Typical host computer "pseudo" driver code

```
if (Green LED ON (pin 2 = 0))                  // Optional check for valid tag in field
{
   if (CTS = 0)          // Wait for CTS = 0 (RWD ready to receive command / data)
   {
            // CTS times out after 6ms so command and all parameters must be sent with
            // no gaps otherwise CTS times out and goes HIGH.
            // For example, send READ TAG command (with dummy page no.) (0x52  0x00)

            SEND_BYTE( 0x52);              // Send command
            SEND_BYTE( 0x00);              // Send argument 1

            // RWD sets CTS = 1 after last parameter received. RWD module processes
            // command, turns on RF for short period, waits then  sends reply.

            GET_REPLY( );            // Get Acknowledge byte + data
            // Response to READ command is 0xC0 (no tag) or 0xD6 + five bytes of DATA.
   }
}
```

Command Protocol

The following commands are supported. The corresponding acknowledge code should be read back by the host and decoded to confirm that the command was received and actioned correctly. The serial bit protocol is 9600 baud, 8 bits, 1 stop, no parity (lsb transmitted first). The status flags returned in the Acknowledge byte are as follows:

```
 b7  b6  b5  b4  b3 b2 b1 b0
 1   1   1   1   1  1  1  1
         |   |   |  |  |   EEPROM error (Internal EEPROM write error)
         |   |   |  |  Tag OK (Tag identity code matched to list and authentication successful)
         |   |   |  Rx OK  (Tag communications and acknowledgement OK)
         |   |   RS232  error (Host serial communications error)
         |   RELAY (OP2, OP3) Enabled flag
        HTRC (or Antenna fault) error flag
```

Note that bits 6 and 7 are fixed 1's so that an acknowledge code of D6 (Hex) would generally indicate no errors with a matched (or authorised) Tag present.
Note also that only the relevant flags are set after each command as indicated in the following specification.

Read EM4102 Tag

Command to read 5 bytes of data from EM4102 memory array. If the read was successful, indicated by acknowledge status flags then five bytes of tag data follow.

	B7							B0	
Command:	0	1	0	1	0	0	1	0	(0x52)
Argument1:	x	x	x	x	x	x	x	x	(Dummy Page number e.g 00)
Acknowledge:	1	1	F	F	F	F	F	X	(F = Status flags)

Data only follows if read was successful

Reply1:	D D D D D D D D	(D = msb data read from EM4102)
Reply2:	D D D D D D D D	
Reply3:	D D D D D D D D	
Reply4:	D D D D D D D D	
Reply5:	D D D D D D D D	(D = lsb data read from EM4102)

Note that for the Read Tag command, if an error flag has been set in the Acknowledge code then there will be NO following data.

Tag_STATUS

Command to return Tag status.
The acknowledge byte flags indicate general Tag status.

	B7							B0	
Command:	0	1	0	1	0	0	1	1	(0x53)
Acknowledge:	1	1	F	F	F	F	F	X	(F = Status flags)

Message

Command to return product and firmware identifier string to host.

	B7							B0	
Command:	0	1	1	1	1	0	1	0	(0x7A)

Reply: “c IDE RD MC200/H400x (SECM200C_WAX_LP V1.xx) DD/MM/YY” 0x00

Returned string identifies author, product descriptor, project name, firmware version number and date of last software change. Note that the string is always NULL terminated. The string begins with a unique lower case character that can be used to identify a particular version of Micro RWD.

Program EEPROM

The Micro RWD has internal EEPROM memory for storing system parameters such as polling rate and authorised identity codes (serial numbers). This command sequence allows individual bytes of the EEPROM to be programmed with new data. The data is internally read back after programming to verify successful operation. Note that due to the fundamental nature of these system parameters, incorrect data may render the system temporarily inoperable.

	B7							B0	
Command:	0	1	0	1	0	0	0	0	(Ascii "P", 0x50)
Argument1:	N	N	N	N	N	N	N	N	(N = EEPROM memory location 0 - 255)
Argument2:	D	D	D	D	D	D	D	D	(D = data to write to EEPROM)
Acknowledge:	1	X	X	X	F	X	X	F	(F = Status flags)

Internal EEPROM memory map

Polling delay parameter values (EEPROM location 0):

Parameter 0 value	**Polling Delay SLEEP Period**
0x00	0 mS
0x10	8 mS
0x20	16 mS
0x30	32 mS
0x40	65 mS
0x50	132 mS
0x60	**262 mS**
0x70	524 mS
0x80	1 second
0x90	2 seconds
0xA0	4 seconds
0xB0	8 seconds

Polling delay can be set from 0 to 8 seconds to give complete control over current consumption and battery life.

Byte 0: Polling Delay (SLEEP / Power down) period (Default = 0x60 = approx 260mS)

Byte 1: RF ON/OFF lock byte, (0x55 = RF ON (default), anything else = OFF)

Byte 2: Reserved (Checksum)

Byte 3: EM4102 / MRF200 Reader mode, (0x00 = MCRF200, 0x01 = EM4102 (default)

Byte 4: Aux data output: 0x00 = OFF (NO output from OP0 / OP1),
0x01 = 24 (26) bit, Weigand on OP0 / OP1
0x02 = 32 (34) bit, Weigand on OP0 / OP1.
0x03 = 9600 baud serial from OP0 (default)

Byte 5: Weigand parity option, 0x00 = no parity (default)
0x01 = Even / Odd parity attached

Byte 6: Aux data byte order plain or reversed, 0x00 = plain data as read (default)
0x01 = byte order reversed

Byte 7: "Beep" delay parameter (x 40 mS) Default = 0x00 (OFF)

Byte 8: Aux out (serial data) redirection (OP0 - pin 20 or Tx – pin 23)
0x00 = Serial aux output from OP0 pin (default)
0x01 = Serial aux output from main Tx pin

Byte 9: Reserved
Byte 10: Reserved
Byte 11: Reserved

Start of authorised card codes. List is terminated with FF FF FF FF sequence.
List is regarded as empty (all identity codes valid) if first code sequence in list is (FF FF FF FF).
List can hold up to 60 identity codes (serial numbers)

Byte 12: 0xFF Empty list
Byte 13: 0xFF
Byte 14: 0xFF
Byte 15: 0xFF

Byte 16: (MSB) Tag identity code
Byte 17:
Byte 18:
Byte 19: (LSB)

Byte 20: (MSB) Tag identity code
Byte 21:
Byte 22:
Byte 23: (LSB)
-
-
-
-
Byte 255: Last Internal EEPROM location

Note that the default RWD EEPROM setting above are different to the standard version. In particular the polling delay parameter must be valid value (as shown in the table above), other values will give undefined results.

Default RWD EEPROM parameter settings:

Byte 0: 0x60,	260mS Polling delay / SLEEP period
Byte 1: 0x55	RF ON
Byte 2: Reserved	
Byte 3: 0x01	EM4102 Reader mode
Byte 4: 0x03,	Aux data output as 9600 baud serial on OP0
Byte 5: 0x00	Weigand NO parity option, only used if Byte 4 = 0x01 / 02
Byte 6: 0x00	Aux data "plain" as read from card (byte order NOT reversed)
Byte 7: 0x00	"Beep" output delay OFF
Byte 8: 0x00	Aux output (serial data) directed to OP0 pin.

Addition Notes for Commands

NOTE also that for the "READ TAG" command, if an error flag has been set in the Acknowledge code then there will be NO following data.

NOTE that the serial communication uses hardware handshaking to inhibit the host from sending the Micro RWD commands while Card communication is in progress. The serial communication system and protocol allows for a 6ms 'window' every Card polling cycle indicated by the CTS/BUSY line being low. During this 'window' the host must assert the first start bit and start transmitting data. The CTS/BUSY goes high again 6ms after the last stop bit is received. NOTE that only one command sequence is handled at a time. The period between the CTS pulses (polling delay) can have three rates depending on whether a card is present or not and if commands are being received by the RWD

NOTE that the commands and parameters must be sent to the RWD with no gaps otherwise communication timeout occurs and the RWD enters the polling delay period (the command string would then be incomplete and an RS232 error is flagged).

NOTE that the MicroRWD EM4102 LP version performs fast polling cycles as long as there are commands to be processed. As soon as the commands stop being sent or the gap between sending commands is too long then timeout occurs and the polling delay increases to 100ms (if the card is still present) or the typically longer period (as set by EEPROM parameter) if there is no card. This is to allow repeated commands to be handled quickly such as for a "complete card read" where repeated Read Block commands are sent to the RWD.

Commands sent infrequently will have the full polling delay between each CTS/BUSY period.

Method of Operation

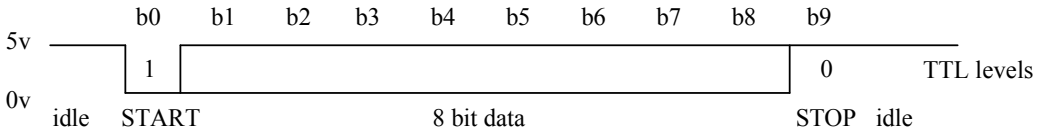
The Micro RWD reader only allows full communication with EM4102 transponders if an initial level of security has been passed. The system works by reading the tag memory, stripping off the various parity bits to give the five-byte user memory. Bytes 1 to 4 of the EM4102 five-byte sequence are then taken as a four byte serial number (identity code). The most significant byte (byte 0) is ignored. The Micro RWD internal EEPROM is then checked to see if this serial number is stored in the authorisation list located from byte 12 onwards. If the tag serial number is matched to a serial number stored in the Micro RWD or the list is empty then the tag has passed the validation test. If the Micro RWD has FF FF FF FF (hex) stored at EEPROM locations 12 to 15 then the list is treated as empty and all EM4102 tags are accepted through the validation test.

Full communication is only allowed if this initial security check has been passed (or the Micro RWD authorisation list is empty).

Auxiliary Asynchronous Serial output

If selected, data can be automatically output from the **OP0 or main TX** pin as 4-bytes of data transmitted asynchronously at 9600 baud, 8-bits, 1 stop-bit, no parity. The base data is the least significant 4-bytes (bytes 1–4) of the EM4102 tag data or the least significant 4-bytes (bytes 12-15) of the MCRF200/123 16-byte memory.

Data bytes transmitted at 9600 baud, 8-bits, 1-stop bit, No parity (104 µS per bit)



Auxiliary Weigand Output Protocol

If selected, data can be automatically output from the OP0 / OP1 pins as Data HIGH and Data LOW signals according to the Weigand protocol.
The Weigand protocol (24 bit data length) can be made up of a leading even parity bit (for b0 - b11), 24 bits of data (from transponder data) and a trailing odd parity bit (for b12- b23) creating a 26-bit output stream. The 32-bit mode has the same format except least significant four bytes of block data are used to form the data sequence. The parity bits are included or omitted and the byte order is reversed according to the EEPROM parameter settings.

For Example:-

Mifare block data (least significant 4 bytes): 0x04 60 22 12

(reversed byte option would use 0x12 22 60 04 as base data)

Weigand 26 bit sequence:- E (b0 --------- b11) (b12 -------- b23) O

E (0 4 6 0 2 2) O

1 0000 0100 0110 0000 0010 0010 1

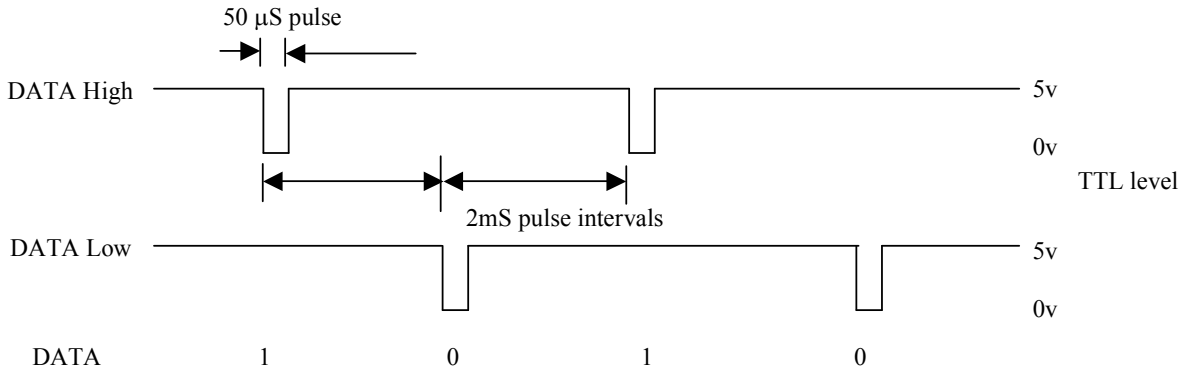
Where E is EVEN parity bit for bit 0 to 11 and O is ODD parity bit for bits 12 to 23

The base data for the Weigand output is the least significant 4-bytes of the EM4102 or MCRF200/123 tag data. EM4102 or MCRF200/123 Reader mode selection is by means of an RWD EEPROM parameter. In addition, parameters control whether the base data byte order is reversed or if parity bits are added before output.

The complete data frame is output whenever the tag is within the RWD's antenna field and the tag has been validated. This output is independent of the normal TTL serial interface which responds to received commands and replies with the data as requested.

The physical Weigand protocol is asynchronously transmitted as 50 µS LOW pulses on the appropriate DATA low or DATA high pins. These pulses are separated by 2mS periods. The Weigand sequence is output a single time whenever a valid tag enters the RF field for the first time. (NO Weigand output if AUX OUTPUT parameter is ZERO/OFF).

Weigand Protocol Timing Diagram



Micro RWD EM4102 LP (low-power) specification

The MicroRWD EM4102 LOW-POWER version is a complete RFID Reader for 125kHz EM4102 and compatible transponder types. The module is pin-compatible and virtually identical in operation and features to the "standard" version (NOTE differences in EEPROM parameters and the three polling rates).

However the LOW-POWER version uses a different specification microcontroller offering lower voltage operation and is designed to be powered from four alkaline battery cells. During the Polling Delay period the microcontroller enters SLEEP mode with the RF device in hard power-down mode to reduce the current consumption to a very low level.

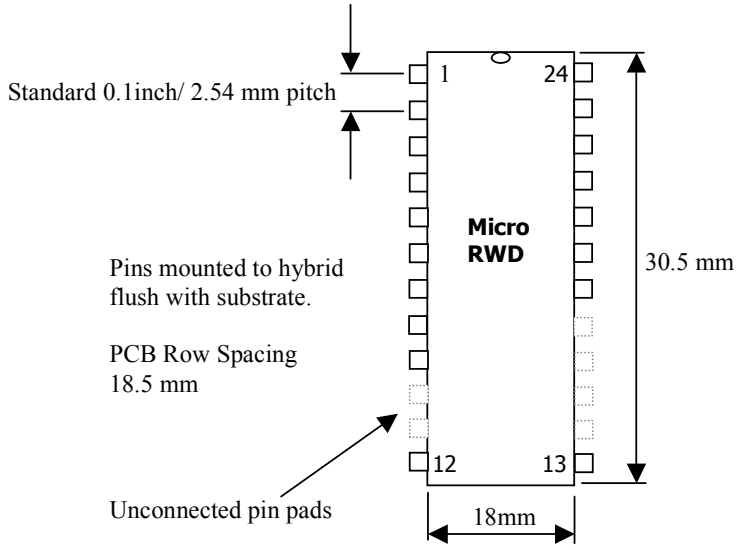
The module wakes up after the polling delay period and the process repeats. The RWD-MIFARE "low-power" Windows applications can be used to configure the parameters and read/write data.

Parameter	Typical Value
Supply Voltage (performance optimised for 5 volt operation)	4 – 6 volts DC (operation from 4 x alkaline cells)
Operating temperature	-40 deg C to + 85 deg C
AVERAGE current consumption. (1 second polling)	**100 µA**
Active period for RF AND host communication (each polling cycle).	Up to 40 mS
Peak antenna voltage (optimum tuning)	100 volts peak
Peak antenna current (optimum tuning) for short period each polling cycle (up to 10 mS burst)	150 mA
Polling Delay (SLEEP / Power-down mode)	4 mS to 8 seconds
Current consumption during Polling delay / SLEEP	Less than 20 µA
Current consumption during RF ON each polling cycle	Less than 20mA
Maximum data rate (between card and RWD)	4k baud
Range (dependent on antenna dimensions and tuning)	Up to 150mm
Auxiliary output drives	Up to 25mA
Serial Interface	TTL level RS232
Serial Communication Parameters	9600 baud, 8 data bits, no parity, 1 stop bit protocol with CTS handshake

Basic electrical specification with LEDs pins and auxiliary outputs NOT connected.
Note that the MicroRWD EM4102 LOW-POWER version is designed for optimum performance and range at 5-volt operation. Performance will be reduced at maximum and minimum operating voltage.

During the "Polling Delay" SLEEP/Power-down period the logic levels on the RWD pins remain active and so for minimum current consumption, the LEDs and the auxiliary output drives must be disconnected (and the Beep output delay set to zero).

Micro RWD EM4102 module dimensions and pinout



PINOUT DESCRIPTION

Pin Name	DIP No.	I/O Type	Buffer Type	Description
LED1	1	O	TTL	Red LED connection. 25ma max sink current
LED2	2	O	TTL	Green LED connection. 25ma max sink current
RESET	3	I	ST	Reset pin internally pulled high. Active low. Normally not connected
BEEP	4	O	TTL	BEEP output pin (active LOW), 25ma max sink current
OP3	5	O	TTL	Auxiliary output drive. 25ma max sink current.
OP2	6	O	TTL	Auxiliary output drive. 25ma max sink current.
GND	7	P	-	Ground reference for logic and analogue pins
-	8	-	-	Not connected
AN1	9	P	AN	Antenna connection. 1 (connected to antenna coil)
-	10	-	-	Not connected
-	11	-	-	Not connected
AN2	12	P	AN	Antenna connection 2 (connected to antenna coil)
GND	13	P	-	Ground reference for logic and analogue pins.
-	14	-	-	Not connected
-	15	-	-	Not connected
-	16	-	-	Not connected
-	17	-	-	Not connected
-	18	-	-	Not connected
OP1	19	O	TTL	Auxiliary output drive. 25ma max sink current.
OP0	20	O	TTL	Auxiliary output drive. 25ma max sink current.
VCC	21	P	-	+5v Positive supply
RX	22	I	TTL	Serial communication Receive line. 9600 baud, 8 bit, 1 stop, no parity
TX	23	O	TTL	Serial communication Transmit line
CTS	24	O	TTL	Serial communication CTS handshake. RX enabled when CTS low and disabled when high.

(I/O = Input/Output, AN = Antenna output, P = Power, ST = Schmitt Trigger input, TTL = TTL logic I/O)

No responsibility is taken for the method of integration or final use of Micro RWD

More information on the Micro RWD and other products can be found at the Internet web site:

http://www.ibtechnology.co.uk

Or alternatively contact IB Technology by email at:

sales@ibtechnology.co.uk