uPASS

firmware guide

2016-03-23 | v4.4 | 5285658

CONTENT

1 INTRODUCTION ____ 4

2 UHF COMMUNICATION PROTOCOL ____ 5
2.1 DATA FORMAT ____ 5
2.2 MESSAGE FORMAT ____ 5

3 UPASS GENERIC MESSAGES ____ 6
3.1 EVENT MESSAGES ____ 6
3.1.1 POWERUP MESSAGE ____ 6
3.1.2 IDENTIFICATION EVENT MESSAGE ____ 6
3.2 COMMAND MESSAGES ____ 7
3.2.1 GET FIRMWARE VERSION (0101) ____ 7
3.2.2 SET SMILEY (0106) ____ 7
3.2.3 GET TEMPERATURE (010A) ____ 7
3.2.4 SET TESTMODE (0199) ____ 8
3.3 SETUP MESSAGES ____ 8
3.3.1 SETUP CUSTOM READ DATA (0102) ____ 8
3.3.2 SETUP EXTRA OUTPUT (010B) ____ 9
3.3.3 SETUP DECODE NEDAP XS (010D) ____ 10
3.3.4 SETUP AUTHENTICATION KEY (0155) ____ 10
3.3.5 SETUP IDENTIFICATION MESSAGE FORMAT (0203) ____ 11
3.3.6 SET REGISTER VALUE (0103) ____ 11
3.3.7 GET REGISTER VALUES (0104) ____ 11

4 UPASS REACH SPECIFIC ____ 12
4.1 SETUP MESSAGES ____ 12
4.1.1 SETUP LED CONTROL (0201) ____ 12

5 UPASS ACCESS SPECIFIC ____ 13
5.1 SETUP MESSAGES ____ 13
5.1.1 SETUP LED CONTROL (0201) ____ 13
5.1.2 SETUP ANTENNA CONTROL (0202) ____ 14

6 UPASS TARGET SPECIFIC ____ 15
6.1 EVENT MESSAGES ____ 15
6.1.1 IDENTIFICATION EVENT MESSAGE ____ 15
6.2 COMMAND MESSAGES ____ 15
6.2.1 SET RELAY (0106) ____ 15
6.2.2 GET TEMPERATURES (0315) ____ 16
6.3 SETUP MESSAGES ____ 17
6.3.1 SETUP AUTHENTICATION KEY (0155) ____ 17
6.3.2 SETUP LED CONTROL (0201) ____ 17
6.3.3 SETUP ANTENNA CONTROL (0202) ____ 18
6.3.4 SETUP ANTENNA CONFIGURATION (0314) ____ 18

7 UHF CONTROL REGISTERS ____ 19
7.1 REGISTER 41: OUTPUT POWER ____ 19
7.2 REGISTER 80: DETECTION FLAGS ____ 19
7.3 REGISTER 81: MAIN FREQUENCY SETTING ____ 19
7.4 REGISTER 82: AUX FREQUENCY SETTING ____ 19
7.5 REGISTER 83: Q-VALUE SELECTION SETTING ____ 20
7.6 REGISTER 85: Q-MAX ____ 20
7.7 REGISTER 86: COMMUNICATION FLAGS ____ 20
7.8 REGISTER 88: RF OFF TIME SETTING ____ 21
7.9 REGISTER 89: FREQUENCY REGION ____ 21
7.10 REGISTER 8A: SQUELCH ____ 21
7.11 REGISTER 8B: TAG HOLD TIME ____ 21
7.12 REGISTER 8C: BAUD RATE ____ 22
7.13 REGISTER 8D: VEHICLE HOLD TIME ____ 22

8 WIEGAND ____ 23
8.1 WIEGAND 26 (H10301) ____ 23
8.2 WIEGAND TIMING ____ 23

9 MAGSTRIPE ____ 24
9.1 MESSAGE FORMAT ____ 24
9.1.1 CHARACTER SET ____ 25
9.1.2 LRC CALCULATION ____ 25
9.2 TIMING ____ 26

A DISCLAIMER ____ 27

B DOCUMENT REVISION ____ 28

1 INTRODUCTION

This manual is intended for system integrators and software developers that want to interface to the NEDAP uPASS reader. The manual will describe the serial interface and the Magstripe and Wiegand details of the uPASS readers. This includes the uPASS Reach, uPASS Access and uPASS Target readers.

The commands in the manual are also used by the UHFTOOL. The UHFTOOL provides a graphical interface for configuring the uPASS readers. The UHFTOOL can be downloaded from the portal https://portal.nedapidentification.com.

The uPASS readers offers long range identification using the latest UHF technology and supports low-cost passive UHF tags.

For installation details refer to the NEDAP uPASS installation guides.

2 UHF COMMUNICATION PROTOCOL

For the uPASS Reach this protocol is used on the RS232, RS422 or USB interface when DIP-switch SW1-1 is ON.
For the uPASS Access this protocol is used on the RS485 and USB interface.
For the uPASS Target this protocol is used on the RS485, RS422, TCP/IP and USB interface.
Specifically the UHFTOOL software implements this protocol.

2.1 DATA FORMAT

Baud rate:	9600 (115200 for the uPASS Target)
Data bits:	8
Parity:	none
Stop bits:	1

2.2 MESSAGE FORMAT

The message format is according to the CR/LF protocol. ASCII control characters are reserved for message handling. The characters in the range from 0x32 to 0x127 hex are valid data characters.

Every message is terminated with a CR/LF sequence.

Syntax: LD [OD] <VD> [<OV>] $^{C}_{R}$ $^{L}_{F}$

Where:	LD	Literal data.
	[OD]	Optional literal data has "[]".
	<VD>	Non optional variable data has "<>".
	[<OV>]	Optional variable data has "[]" and "<>".
	$^{C}_{R}$	Carriage return character (13)
	$^{L}_{F}$	Linefeed character (10)

Most messages have a message identifier of 4 characters at the start of a message in the range 0x0001 - 0x0FFF. Numeral data is sent in ASCII encoded hex (185 = "B9") unless stated different.

Command messages that are sent to the reader will be executed by the reader and are followed by a reply message from the reader. The first digit of the reply message indicates if the message was successful. The next 3 digits contains the message identifier of the original command message.

First digit	Description
4	OK, message successfully executed.
5	Error, failed to execute message.
6	Error, unknown message identifier received.
8	OK, message successfully executed, Reply contains text field.

When the command is finished (successful or unsuccessful) the reader sends a "DONE" message.

3 UPASS GENERIC MESSAGES

In this chapter the generic messages of the uPASS readers are explained. Make sure to check for your uPASS reader if there are specific messages. If a message is in the generic part and in the reader specific part, the reader specific part should be used.

3.1 EVENT MESSAGES

3.1.1 POWERUP MESSAGE

Upon power up the reader will output a start-up message containing the firmware version.

"START NEDAP uPASS Reach v2.xx"
"START NEDAP uPASS Access v2.xx"
"START NEDAP uPASS Target v3.xx"

3.1.2 IDENTIFICATION EVENT MESSAGE

This is the message send from the uPASS reader if a tag is read. For the uPASS Target this message is different, this can be seen in the device specific part.

Note
The format of the identification event message can be customized since firmware version 2.51 (and newer). See chapter 3.3.5. Before version 2.51 the PREF was fixed to 4001.

Reply: [<PREF>][<AQ> <STAT> <FREQ>][<EL>][<EPC>][<DL>][<DATA>][<SUFF>]^{C_R} $_{L_F}$

Where:		
	PREF	Prefix of the identification message.
	AQ	Antenna (high nibble) and Q value (low nibble)
	STAT	Nedap use only (high 8 bit), RSSI level Q channel (4 bit, 2dB per step), RSSI level I channel (4 bit, 2dB per step), Nedap use only (low 16 bit)
	FREQ	Frequency
	EL	EPC length in bytes.
	EPC	EPC data.
	DL	Tag data length in bytes
	DATA	Tag data
	SUFF	Suffix of the identification message.

Example: 4001020FBDC0020E30003005FB63AC1F3681EC880468

3.2 COMMAND MESSAGES

3.2.1 GET FIRMWARE VERSION (0101)

Get firmware version. It is also possible to get the hardware version.

Syntax: 0101 [XX]

Reply: 4101 <MA> <MI> [HW]

Where:		
	XX	Also request the hardware revision
	MA	Version major
	MI	Version minor (decimal notation)
	HW	Hardware version 01 = uPASS Reach 02 = uPASS Access 03 = uPASS Target

Example:		
	0101	Request revision
	41010200	Reply firmware version 2.00
	010101	Request revision with hardware revision.
	4101025102	Reply firmware version 2.51 (uPASS Access)

3.2.2 SET SMILEY (0106)

Set smiley on or off. For the uPASS Reach this also controls the relay output.
The smiley is activated by this command or automatically upon identification. The automatic activation can be disabled. See register 86. For the uPASS Target this message is different, this can be seen in the device specific part

Syntax: 0106 <RR>

Reply: 4106

Where:		
	RR	00 = Smiley off 01 = Smiley on 02 = Smiley on and automatically off (using hold time register 8B).

Example:		
	010602	Set Smiley on and automatically off.

3.2.3 GET TEMPERATURE (010A)

Get reader temperature.

Syntax: 010A

Reply: 410A <TTTT>

Where:		
	TTTT	Temperature in °C =((((TTTT * 1.5)/4095) - 0.986) / 0.00335.

Example:		
	410A0BBB	Response temperature = 34 °C

3.2.4 SET TESTMODE (0199)

Set the uPASS reader in test mode. A reader in test mode will:

- Send "TEST" every 700ms over the active serial connection.
- Send a test signal on the Magstripe/Wiegand interface.
- The front LED will blink/change color.

Syntax:	0199 <TM>	
Reply:	4199	
Where:	TM	00 = Test mode off 01 = Test mode on
Example	019901	Set test mode on.

3.3 SETUP MESSAGES

3.3.1 SETUP CUSTOM READ DATA (0102)

Setup which tags to select and what to read from these tags. When reading Nedap tags no additional specification is required. If no parameter is specified, the current settings are returned. Passwords are not returned.

Syntax:	0102 [<FF>][<RB>][<AA>][<LL>][<SB>][<PP>][<ML>][<MMMMMMMM>][<AAAAAAAA>][<KKKKKKKK>]	
Reply:	4102 <FF> <RB> <AA> <LL> <SB> <PP> <ML> <MMMMMMMM>	
Where:	FF	Read mode; 00 = No data (only get EPC numbers). +80 = Read data enable. +40 = Select mask enable. +20 = Verify kill password enable. (Not available for uPASS Target) +10 = Send access password enable. (Not available for uPASS Target) +08 = Enable authentication of EPC Gen2v2 tags. (Not available for uPASS Target) +04 = Enable diversify, used if tag have a unique key based on a master key. (Not available for uPASS Target)
	RB	Read data memory bank: 0 = RES, 1 = EPC, 2 = TID, 3 = USER, 4 = NEDAP (search only for Nedap tags), 6 = NEDAP DUAL-ID (search for Nedap vehicle-id tags and driver-id tags, this feature has been introduced in firmware version 2.29).
	AA	Read start (word) address.
	LL	Read data number of words (0 = read all).
	SB	Select memory bank (0 = RES, 1 = EPC, 2 = TID, 3 = USER)
	PP	Select mask offset in bits.
	ML	Select mask bit length.
	MMMMMMMM	Select mask (left aligned, trailing zeroes).
	AAAAAAAA	Access password.

	KKKKKKKK	Kill password. Used for verification, if enabled in read mode.
Example:	010200	Read only EPC numbers. No custom data.

3.3.2 SETUP EXTRA OUTPUT (010B)

Configure the generation of extra Wiegand or Magstripe output for EPC tags which are not programmed by Nedap.

See uPASS Wiegand output Application Note for more information.

Syntax: 010B [<MM>][<FF>][<BL>][<OO>][<CL>][<V0V1V2V3>]

Reply: 410b [<MM>][<FF>][<BL>][<OO>][<CL>][<V0V1V2V3>]

Where:	MM	Mode; 00 = No extra output 01 = Wiegand output 02 = Magstripe output
	FF	Flags; +01 = Add parity (Wiegand) or add Start, Stop and LRC (Magstripe) +02 = Add Post- and Preamble (Magstripe) +04 = Convert binary to decimal (Magstripe) +20 = Place constant data after instead of before (Wiegand and Magstripe) +40 = Use custom read data instead of EPC (Wiegand and Magstripe) +80 = Left aligned read (Wiegand and Magstripe)
	BL	Number of data bits (Wiegand and Magstripe)
	OO	Read offset in bits (Wiegand and Magstripe)
	CL	The constant data length in bits (Wiegand and Magstripe)
	V0V1V2V3	Constant data bytes 0 .. 3 (Wiegand and Magstripe)
Example:	010B01002008	Send Wiegand with 32 bit EPC code with an offset of 8 bits

3.3.3 SETUP DECODE NEDAP XS (010D)

Enable decoding NEDAP XS tags. Especially for decoding the EPC number on tags that are programmed in the NEDAP XS format.

See uPASS decode Nedap XS Application Note for more information.

Syntax: 010D [<MM>]

Reply: 410D <MM> <CCCC> <DDDD> <GGGG>

Where:

MM	Decode mode; 00=Do not decode NEDAP XS. Put data on RFMOD output or send to TRANSIT compatible processor. +01 = Enable decode NEDAP XS. +02 = Output tag number in decimal (otherwise in hex) +04 = Output customer code. +08 = Enable only tags with matching customer code. +10 = Allow other tag formats.
CCCC	Reader's customer code CF.
DDDD	Reader's customer code DF.
GGGG	Reader's customer code GF.

Example:

010D01	Decode NEDAP XS tags.
010D05	Decode NEDAP XS tags + output customer code.
010D09	Decode NEDAP XS tags + verify customer code.

3.3.4 SETUP AUTHENTICATION KEY (0155)

Set the authentication master key. This key is used by the reader to check the authenticity of EPC Gen2v2 (example: NXP UCODE DNA) UHF tag. Is only used if UHF tag are used that aren't provided by Nedap. For the uPASS Target this message is different, this can be seen in the device specific part.

Syntax: 0155 <KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK>

Reply: 4155

Where: KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK The 128 bit key

Example: 0155A66DDF2280D7F4E3C343609D9D01AD3C

3.3.5 SETUP IDENTIFICATION MESSAGE FORMAT (0203)

Setup the identification event message format. This feature has been introduced in firmware version 2.51.

Syntax: 0203 [<FF>][<LL>][<OO>][<PP>][<P0P1P2P3>][<SS>] [<S0S1S2S3>]

Reply: 4203 <FF> <LL> <OO> <PP> <P0P1P2P3> <SS> <S0S1S2S3>

Where:		
	FF	Flags +80 = left aligned +40 = send custom read data +04 = do not transmit CR/LF +02 = do not transmit tag status +01 = do not transmit data length
	LL	number of tag data bytes (0=all).
	OO	tag data offset in bytes.
	PP	number of prefix bytes.
	P0P1P2P3	prefix bytes 0 .. 3.
	SS	number of suffix bytes.
	S0S1S2S3	suffix bytes 0 .. 3.

Example: 020300000004343030310000000000 Setup default format (prefix "4001")

3.3.6 SET REGISTER VALUE (0103)

Setup a register value.

Syntax: 0103 <RR> <XX> [<YY>]

Reply: 4103

Where:		
	RR	Register number. Check chapter 6 for detailed register descriptions.
	XX	Register value (minimal 1 byte required).
	YY	Some registers have a multiple byte value.

Example: 01038121C0 Set the value of register 81 to 8640

3.3.7 GET REGISTER VALUES (0104)

Get register value(s).

Syntax: 0104 [<RR>]

Reply: 4104 [<RR> <XX>][<YY>]

Where:		
	RR	Register number. Check chapter 6 for detailed register descriptions. When no register is specified, all registers are returned.
	XX	Register value (minimal 1 byte).
	YY	Some registers have a multiple byte value.

Example: 010481 Get the value of register 81.

4 UPASS REACH SPECIFIC

4.1 SETUP MESSAGES

4.1.1 SETUP LED CONTROL (0201)

This command isn't available for the uPASS Reach.

5 UPASS ACCESS SPECIFIC

5.1 SETUP MESSAGES

5.1.1 SETUP LED CONTROL (0201)

Setup uPASS Access LED control settings.

Syntax: 0201 [<MM>][<GG>][<RR>][<BB>][<ZZ>]

Reply: 4201 <MM> <GG> <RR> <BB> <ZZ>

Where:	MM	Mode; 00 = Remote control (follow digital inputs) 01 = Automatic 80 = Command Control (all off) +01 = Command Control (LED green) +02 = Command Control (LED red) +04 = Command Control (LED blue) +08 = Command Control (buzzer)
	GG	Green LED function: Remote control mode; +01 = LED on when input UL active +80 = LED on when input NA active +02 = LED on when inputs UL+NA both active. +40 = LED on when inputs UL+NA both inactive. LED function in Automatic mode; +01 = LED on upon identification +80 = LED on when idle
	RR	Red LED function: Remote control mode; +01 = LED on when input UL active +80 = LED on when input NA active +02 = LED on when inputs UL+NA both active. +40 = LED on when inputs UL+NA both inactive. LED function in Automatic mode; +01 = LED on upon identification +80 = LED on when idle
	BB	Blue LED function: Remote control mode; +01 = LED on when input UL active +80 = LED on when input NA active +02 = LED on when inputs UL+NA both active. +40 = LED on when inputs UL+NA both inactive. LED function in Automatic mode; +01 = LED on upon identification +80 = LED on when idle
	ZZ	Buzzer auto function. In remote control mode, the buzzer will follow the BUZZER input. +01 = Beep upon identification.
Example:	020101018000	Setup automatic mode (idle=red, active=green)
	020100018042	Setup remote control mode (UL=green, NA=red, otherwise blue)

5.1.2 SETUP ANTENNA CONTROL (0202)

Setup uPASS Access antenna control settings.

Syntax: 0202 <MM>

Reply: 4202 <MM>

Where:	MM	Mode; 00 = automatic select the horizontal and vertical antenna polarization. 01 = vertical only 02 = horizontal only

Example: 020200 Setup automatic antenna mode (horizontal + vertical).

6 UPASS TARGET SPECIFIC

6.1 EVENT MESSAGES

6.1.1 IDENTIFICATION EVENT MESSAGE

Upon identification the reader will output a message containing the following information:

Reply: [<PREF>][80 <AC> <PH> <RSSI>][<EL>][<EPC>][<DL>][<DATA>][<SUFF>]$^{C}_{R}$ $^{L}_{F}$

Where:		
	PREF	Prefix of the identification message.
	AC	Antenna channel
	PH	Phase
	RSSI	RSSI signal strength.
	EL	EPC length in bytes.
	EPC	EPC data.
	DL	Tag data length in bytes
	DATA	Tag data
	SUFF	Suffix of the identification message.

Example: 400180164200060E300020120105813111000 1030094

6.2 COMMAND MESSAGES

6.2.1 SET RELAY (0106)

Manually set the relay of the uPASS Target reader on or off. It is also possible to set the relay on and have it automatically set off. The automatic off time is determined by register 8B (hold time), see chapter 7.11.

Syntax: 0106 <RR>

Reply: 4106

Where:		
	RR	00 = Relay off. 01 = Relay on. 02 = Relay on and automatically off

Example:		
	010602	Set relay on and automatically off.

6.2.2 GET TEMPERATURES (0315)

Get temperature of different reader components.

Syntax:	010A <CC>	
Reply:	410A <TTTT>	
Where:	CC	The requested temperature measurement: 1 = Control board ambient temperature. 2 = UHF reader ambient temperature. 3 = UHF reader power amplifier temperature. 4 = UHF reader transceiver temperature.
	TTTT	Temperature in 0.1 °C
Example:	031501	Request control board ambient temperature
	431500FA	Response temperature = 25 °C

6.3 SETUP MESSAGES

6.3.1 SETUP AUTHENTICATION KEY (0155)

Not available in the uPASS Target.

6.3.2 SETUP LED CONTROL (0201)

Setup uPASS Access LED control settings.

Syntax: 0201 [<MM>][<GG>][<RR>][<BB>][00][<GD>][<RD>][<BD>]

Reply: 4201 <MM> <GG> <RR> <BB> 00 <GD> <RD> <BD>

Where:	MM	Mode; 00 = Remote control (follow digital inputs) 01 = Automatic 80 = Command Control (all off) +01 = Command Control (LED green) +02 = Command Control (LED red) +04 = Command Control (LED blue) +08 = Command Control (buzzer)
	GG	Green LED function: Remote control mode; +01 = LED on when input UL active +80 = LED on when input NA active +02 = LED on when inputs UL+NA both active. +40 = LED on when inputs UL+NA both inactive. LED function in Automatic mode; +01 = LED on upon identification +80 = LED on when idle
	RR	Red LED function: Remote control mode; +01 = LED on when input UL active +80 = LED on when input NA active +02 = LED on when inputs UL+NA both active. +40 = LED on when inputs UL+NA both inactive. LED function in Automatic mode; +01 = LED on upon identification +80 = LED on when idle
	BB	Blue LED function: Remote control mode; +01 = LED on when input UL active +80 = LED on when input NA active +02 = LED on when inputs UL+NA both active. +40 = LED on when inputs UL+NA both inactive. LED function in Automatic mode; +01 = LED on upon identification +80 = LED on when idle
	GD	Green LED dimming value (0 - 64)
	RD	Red LED dimming value (0 - 64)
	BD	Blue LED dimming value (0 - 64)
Example:	020101018000	Setup automatic mode (idle=red, active=green)
	020100018042	Setup remote control mode (UL=green, NA=red, otherwise blue)

6.3.3 SETUP ANTENNA CONTROL (0202)

Setup uPASS Target antenna selection.

Syntax: 0202 <MM>

Reply: 4202 <MM>

Where:		
	MM	Mode; 00 = Use internal and external antenna 01 = Use internal antenna only 02 = Use external antenna only

Example: 020201 Setup usage of the internal antenna only.

6.3.4 SETUP ANTENNA CONFIGURATION (0314)

Configure or read the configuration of an antenna. Make sure to comply with the regulations in your area.

Syntax: 0314 <AP> [<PPLL>] [<DDTT> <IICC>]

Reply: 4314 <AP> <PPLL> <DDTT> <IICC>

Where:		
	AP	The antenna to set or get read configuration. 00 = Internal antenna 01 = External antenna
	PPLL	The power level of the antenna in 0,1dBm. Must be less than 30dBm.
	DDTT	The dwell time (maximum antenna on time) for each inventory in 1ms. 0ms means no dwell time and the inventory cycles is used.
	IICC	Inventory cycles for each inventory. If set to 0 the dell time is used. Both cannot be 0.

Example:		
	031400012C	Configure the internal antenna with a 30dBm power level. Leave the dwell time and inventory cycles untouched

7 UHF CONTROL REGISTERS

This chapter explains the register settings of the uPASS readers. The registers 01 to 1F, 40, 42, and 84 are for Nedap usage only and aren't explained in this document.

7.1 REGISTER 41: OUTPUT POWER

Set the output power weakening of the antenna in dB (0x08 = 6dB, 0x10 = 12dB, 0x00 - 0x07 = 0dB - 7dB)
This register is only available for the uPASS Access and uPASS Reach. Make sure to comply with the regulations in your area. Don't set this setting lower than the default.

Default: 0x02 (2 dB) (Reach)
0x03 (3 dB) (Access)

7.2 REGISTER 80: DETECTION FLAGS

Various detection mode enable flags.

Default: 0x7A (Use select + Random off + Power on + Run + Hop)

Bits	Function	Comment
7	Always on	1=keep power on, 0=switch power off after identification round (Not available for the uPASS Target)
6	Hop	1=enable frequency hopping (FHSS), 0=disable
5	Run	1=run, 0=stop
4	Power on	1=power on, 0=power off
3	Random off	1=random RF off time, 0=fixed RF off time (see also register 88)
2	-	reserved for future use
1	Use select	1=use SL bit, 0=use session bit
0	Aux	0=main frequency, 1=aux frequency (controlled by reader when FHSS enabled) (Not available for the uPASS Target)

7.3 REGISTER 81: MAIN FREQUENCY SETTING

Main frequency setting (2 byte hex value).

Default: 0x21D1 (865,7MHz)

7.4 REGISTER 82: AUX FREQUENCY SETTING

Auxiliary frequency setting (2 byte hex value). Only available in the uPASS Reach or uPASS Access.

Default: 0x21D1 (865,7MHz)

7.5 REGISTER 83: Q-VALUE SELECTION SETTING

Q-value selection setting. Used to select the number of timeslots. Automatic Q-value selection can be enabled. This will increase the number of timeslots when more tag collisions are detected. Likewise the number of timeslots are decreased when no tag collisions are detected.

Default: 0x02 (number of timeslots is 4)

Bits	Function	Comment
7	Automatic	0=fixed Q-value 1=automatic Q-value selection.
6	-	Reserved for future use.
5	-	Reserved for future use.
4	-	Reserved for future use.
3	Q-value	Q-value in range from 0 to 15. Number of timeslots is 2^Q. For example when Q=4, then the number of timeslots is $2^4 = 16$.
2		
1		
0		

7.6 REGISTER 85: Q-MAX

Maximum Q-value when using automatic Q-value selection. See register 83 above.

Default: 0x04 (max 16 timeslots)

7.7 REGISTER 86: COMMUNICATION FLAGS

Various communication mode enable flags.

Default: 0xFF

Bits	Function	Comment
7	Relay activation	1=Enable automatic smiley/relay activation upon identification, 0=Disable.
6	-	reserved for future use
5	Vehicle output	1=Enable vehicle-id output, 0=disable vehicle-id output.
4	Hold time repeat	1=No repeat, 0=Repeat id-events using hold time interval. See register 8B.
3	-	Nedap usage only
2	-	Nedap usage only
1	Repeat serial	1=Fast repeat serial id-events, 0=same repeat as Wiegand/Magstripe.
0	Serial id-event	1=Enable serial id-events (4001 messages), 0=Disable.

7.8 REGISTER 88: RF OFF TIME SETTING

RF off time in milliseconds. After every inventory round the RF field is switched off for this time period. When 'random off' is enabled, this setting (+100ms) specifies the maximum time. A random time period is chosen between 100ms and maximum. See also register 80.

Default: 0x0064 (100ms) (Target and Reach)
0x00C8 (200ms) (Access)

7.9 REGISTER 89: FREQUENCY REGION

Frequency region of the uPASS reader. This is only a read-only register and cannot be changed.

Default: 0x00 ETSI
0x01 FCC
0x02 Brazil
0x03 China, Singapore, Thailand
0x04 Australia
0x05 Israel
0x06 Japan (old 950 MHz)
0x07 Korea
0x08 New Zealand
0x09 Japan
0x0A Malaysia
0x0B Taiwan
0x0C Vietnam
0x0D Philippines
0x0E Russia
0x0F Russia 1F (only 866.9MHz)

7.10 REGISTER 8A: SQUELCH

Squelch setting. RSSI threshold. Only tags which return a higher RSSI level will be identified. Higher squelch levels will result in a shorter read range.

Default: 0x00 (Squelch disabled)

7.11 REGISTER 8B: TAG HOLD TIME

Hold time. The hold time causes the smiley/relay to stay activated for at least the specified time. When during the hold time the same tag is identified again, the reader will not generate a new Wiegand or Magstripe event.
When the hold time has expired, the reader optionally repeats its identification event. This feature must be enabled with bit 4 in register 86.
For serial communication (RS422, RS232, USB and TCP/IP) it is possible to send identification event every time (ignore hold time) with bit 1 in register 86.

Default: 0x0A (1 sec)

7.12 REGISTER 8C: BAUD RATE

Baud rate of the serial communication channels.

Options are:

- 0 = 1200 Baud
- 1 = 2400 Baud
- 2 = 9600 Baud
- 3 = 19200 Baud
- 4 = 38400 Baud
- 5 = 57600 Baud
- 6 = 115200 Baud

Default: 0x02 (9600 Baud) (Access and Reach)
0x06 (115200 Baud) (Target)

7.13 REGISTER 8D: VEHICLE HOLD TIME

Vehicle hold time. Introduced in firmware version 2.29.
Used in NEDAP DUAL-ID mode, see the Read-data command in chapter 3.3.1.
In dual-id mode the uPASS searches for vehicle-id tags. When a vehicle-id tag is found, the reader searches 'vehicle-hold-time' seconds for driver-id tags.

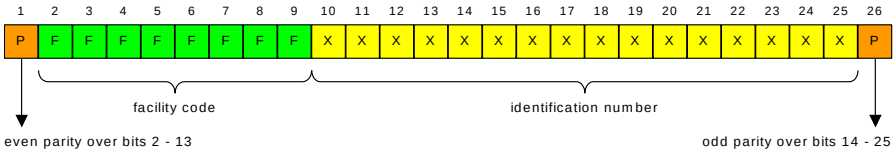
Default: 0x32 (5 sec)

8 WIEGAND

The Wiegand protocol is based upon the Wiegand effect card readers. The protocol is widely used in access control applications. The Wiegand interface uses 3 wires, one of which is a common ground and 2 of which are called DATA-0 and DATA-1. When no data is being sent, both DATA-0 and DATA-1 are pulled up to the "high" voltage level (+5 VDC). When a 0 is sent the DATA-0 wire is pulled to a low voltage (0V) while the DATA1 wire stays at a high voltage. When a 1 is sent the DATA-1 wire is pulled to a low voltage while DATA-0 stays at a high voltage.

8.1 WIEGAND 26 (H10301)

Wiegand 26 is the industry standard format. It consists of a leading parity bit, 8 facility code bits, 16 bits identification number and a trailing parity bit. The facility code and id-number are transmitted with the most significant bit first. The total number of bits is 1+8+16+1 = 26.
The leading parity bit is even calculated over the succeeding 12 bits. The trailing parity bit is odd calculated over preceding 12 bits.



8.2 WIEGAND TIMING

In the figure below the Wiegand protocol timing is specified.

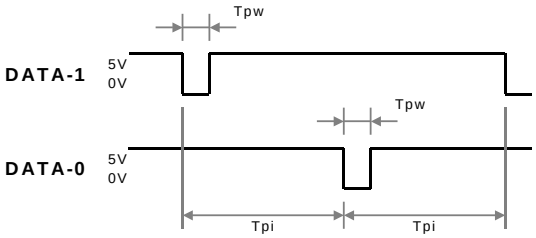


Figure 1: Wiegand protocol timing

Timing constants:

Tpi	Pulse interval time	1msec
Tpw	Pulse width time	50µsec

9 MAGSTRIPE

The Magstripe ISO 7811/2 protocol is a Clock and Data protocol implemented according to the standard ISO 7811/2 track 2 with ABA format, which is often used in magnetic stripe readers.

The data information of the message is included between start-sentinel and end-sentinel. After the end-sentinel the LRC is sent (Longitudinal Redundancy Check) to check the received data. The contained data is in BCD notation.

The Magstripe protocol uses three TTL-level wire outputs.

9.1 MESSAGE FORMAT

The reader sends a message when a transponder is identified. For every transmitted character in the event message an odd parity bit is calculated.

Therefore each character contains 5 bits. The least significant bit is transmitted first, finally the parity bit is transmitted. After the end-sentinel the LRC is transmitted. Magstripe ISO 7811/2 message format.

Syntax: [B] [<CP>] <DATA> [<CS>] [<ES> <CH>]

Where:	B	Start-sentinel
	CP	Constant prefix
	DATA	- The identification data for Nedap Magstripe programmed cards. - For not Nedap programmed cards the EPC number of the card.
	CS	Constant suffix
	ES	End-sentinel
	CH	Longitudinal Redundancy Check (LRC)
Example:	B123456F3	Message with start- and end-sentinel, LRC and the identification data 123456.

9.1.1 CHARACTER SET

HEX	BIN	Description
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
A	1010	Reserved for hardware control purposes
B	1011	Start-sentinel
C	1100	Reserved
D	1101	Separator
E	1110	Reserved for hardware control purposes
F	1111	End-sentinel

9.1.2 LRC CALCULATION

The LRC is the vertical even parity over all data bits including start-, and end-sentinel. The LRC is calculated to XOR the value with the previous XOR result. In the example below the LRC is calculated on a data message 123456:

HEX	PAR	BIN	LRC	Description
B	0	1011	B	Start-sentinel
1	0	0001	A	Data
2	0	0010	8	Data
3	1	0011	B	Data
4	0	0100	F	Data
5	1	0101	A	Data
6	1	0110	C	Data
F	1	1111	3	End-sentinel

LRC = (B ⊕ 1 ⊕ 2 ⊕ 3 ⊕ 4 ⊕ 5 ⊕ 6 ⊕ F) = 3.

9.2 TIMING

In the figure below the timing for one Magstripe character is specified. Each bit consists out of one period low (220µsec) and two periods high (440µsec). The bit times have an accuracy of 10 percent. The data-signal RDP is valid and stable on the falling edge of the clock-signal RCP.

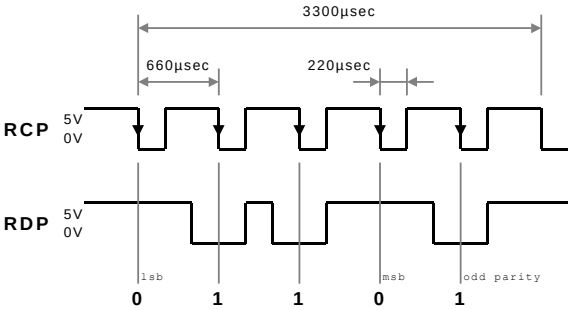


Figure 2: Magstripe protocol timing one character

Timing constants:

Clock period	660µsec
Clock high	440µsec
Clock low	220µsec
Data preamble	11msec
Data postamble	11msec

The CLS card loaded signal will be active (=low) during the complete transmission. Before and after the data 16 clock pulses are generated (postamble and preamble). The number of data characters is determined by the tag.
Below is an example of a complete Magstripe event.

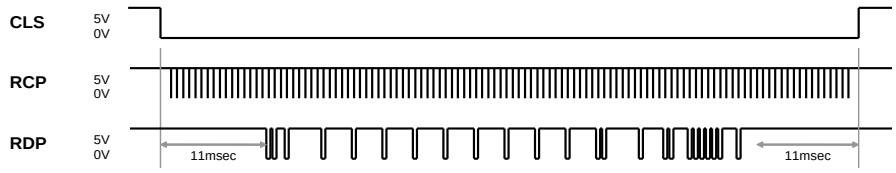


Figure 3: Example Magstripe event

A DISCLAIMER

This information is furnished for guidance, and with no guarantee as to its accuracy or completeness; its publication conveys no license under any patent or other right, nor does the publisher assume liability for any consequence of its use; specifications and availability of goods mentioned in it are subject to change without notice; it is not to be reproduced in any way, in whole or in part, without the written consent of the publisher.

B DOCUMENT REVISION

Version	Date	Comment
4.4	2016-03-16	• Updated frequency regions
4.3	2016-03-10	• Fixed default setting register 80
4.2	2016-01-21	• Added uPASS Target get temperatures (0315) command .
4.1	2016-01-14	• Added uPASS Target documentation • Added Wiegand and Magstripe documentation • Restructured the documentation
4.0	11-02-2014	• Layout adjusted to new corporate style