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AIR200
Reader Operation Manual

V10/07/06

July 2006 HRU/BUS

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1. Introduction

The reader module AIR200 for the PSION TEKLOGIX is a high quality component from AGRIDENT.

Together with the programmable PSION TEKLOGIX® -workabout PRO handheld computer you have a powerful mobile RF-ID-system which can easily adapt to your application.

Please read this manual carefully before using the system for the first time. The following descriptions will help you using the full efficiency of the system. A description of the protocols will give you some information for embedding the reader into your own application on the PSION TEKLOGIX® -workabout PRO to profit from all benefits and features the system offers to you.

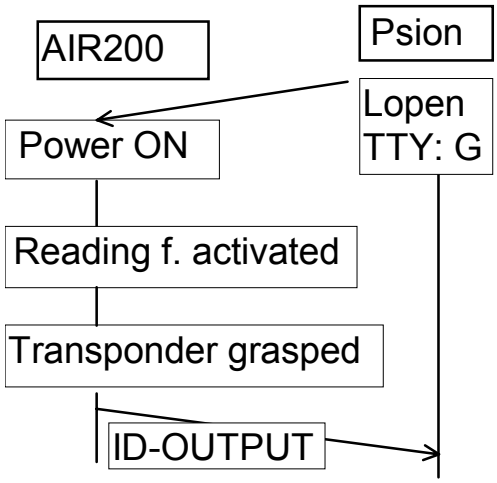
2. Operating Mode

The reader modules support two operating modes, selectable as per configuration.

2.1 Read Mode / Default Setting

The AIR200 reader modules are set to the read mode (default mode) by the manufacturer of the equipment. The reader module starts a reading cycle as soon as the supply voltage is applied (controlled by the PSION´s application software; LOPEN TTY:G). When a transponder is detected, the acquired and processed transponder data are ASCII coded as an „ID output“ and transferred to the serial interface. The ID output is repeated for as long as the transponder is located within the acquisition range.

The format of the ID output is described at chapter 5.3. The communication is unidirectional from the reader to the PSION®-workabout, with no response required. It is not required that the entire record of the reader module be implemented into the application software, when limited to the read mode. The ID output may be received as a simple ASCII string and the frame may be cut off.

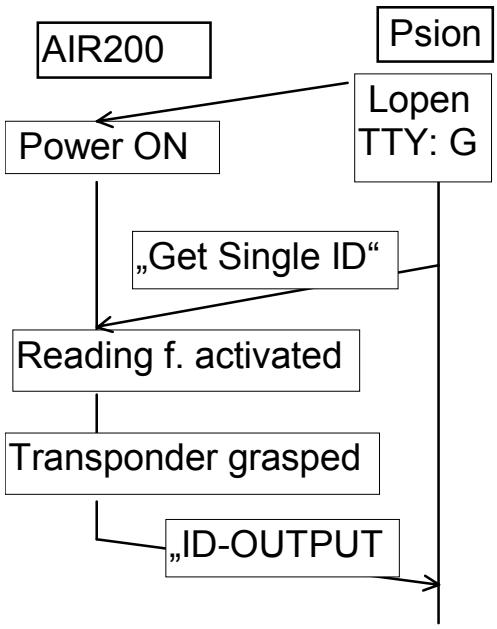


When receiving a command, the reading cycle is interrupted for processing of the command. Should the reader module be busy with an ID output, then the command will be neglected and must be repeated.

2.2 Request Mode

While the AIR200 operates as a mere data sensor in the Read Mode under chapter 4.1, it will also allow bi-directional communication with the PSION®-workabout in the Request Mode.

The WIN CE software may control the reading function. The „Get_Single_ID“ command will start a reading cycle based on the programmed configuration. The ID output of a recognized transponder will be transferred once to the interface in the respective format. The reading function terminates after such recognition of a transponder and transmission of the ID output or after expiration of a preset timeout.



The reading cycle is repeated when a new „Get_Single_ID“ command is transmitted.
In this mode, the interface record is a bi-directional one. In this context, the PSION®-workabout serves as a command transmitter and the reader module as a responding „partner“. The commands are confirmed by the receiver.
A change to the configuration (see chapter 2.7) will allow adoption of the following characteristics to the required application:

- Readable types of transponder, e.g. FDX only, will increase the reading speed.
- Reading characteristics, e.g. lower repeat rate of the ID output, if a transponder continues to stay within the acquisition range.
- Output format, e.g. binary output/Compact Coding reduces the space required for storing the IDs.

2.3 Description of Record

The following description for record contains the complete information required for integration of the AIR200 into an application software.

2.3.1 Data Transmission

Asynchronous semi-duplex transmission: 9600 baud, 1 start bit, 8 data bits, No Parity, 1 stop bit via TTL port of the PSION®-workabout, TTL level negated.

2.3.2 Frame configuration

All messages are packed into frames, the frame is configured as follows:

STX	DestrAdr	Source Adr	Message	CRC 8	ETX

The messages may be commands from the PSION®-workabout or replies or ID outputs from the reader module. For the following description of messages please note that they should be considered as a frame segment.

2.3.3 Stuffing Byte

Data bytes may be differentiate from the control characters STX, ETX DLE (0x02, 0x03, 0x10) is possible, if required, by using an upstream DLE stuffing byte (0x10, Esc character).

2.3.4 Addresses

Adr for PSION®-workabout:	const. 0x F0
Adr for reader module AIR200	const. 0x F3
Adr for broadcast:	const. ox FF

2.3.5 CRC

The check sum is computed automatically according to the CCITT-CRC-8 Polynom $x^8 + x^4 + x^3 + x^2 + 1$ thru all bytes of the frame up to (but excluding) the checksum itself. the stuffing character possibly used in front of the checksum must also be included in the checksum computation. For the transmission form the DHP 101/102 to the PSION®-workabout there will always be a DLE added in front of the CRC. The following formula may be used to compute the checksum:

/* CalcCRC8(): Computes the CCITT-CRC-8 of the indicated character, the starting value will be the indicated CRC value. The function must be called up, for every byte of the string, using the value of the preceding call as a starting value. The starting value of the first call is always 0x00.

```
static char CalcCRC8 ( char CRC, char character )
 {      unsigned char Count;
        for ( Count = 0; Count < 8; ++ Count )
        {       if ( (CRC & 0x01)  ^  (character & 0x01) !=  0 )
                {       CRC ^=  0x70;
                        CRC >> = 1;
                        CRC |= 0x80;
                }
                else
                {       CRC >>= 1;
                        CRC &=  0x7F;
                }
                Zeichen  >>=  1;
        }
        return ( CRC );
 }
```

2.4 Commands and Acknowledgements

The following commands are supported by the reader module (to be transmitted in the „Message“ segment of a frame).

Command	Coding	Additional Data	Function
Get_Single_Id	0x22	-	Start a reading cycle in the Requ_ Mode. Autom. shut- down after acquisition process
Set_Config	0x28	cfg_new	Adopt new Configuration
Get_Config	0x29	-	Show present Configuration
Reset_All	0x18	-	Default-Configuration into EEPROM
Get_Version	0x09	-	Show Reader and Software version
Get_SNR	0x0A	-	Show Reader serial number

Get_ Single_ID:
Starts a reading cycle in the Request Mode. The reading cycle will be interrupted after acquisition of a transponder or after timeout. Response in the Read Mode is by means of a NACK.

Byte position in the Message segment	Value	Meaning	Remarks
0	0x22	Get_Single_ID	Starts a reading cycle in the Request_Mode

Frame:

STX	FF	F0	22	DLE**	CRC 8	ETX

DLE**: if required

Set_Config:
Programs a configuration register using the new values as follows:

Byte position in the Message segment	Value	Meaning	Remarks
0	0x28	Set_Cfg	Programming of new config. data
1	xx	Cfg_Adr	Address of the config. register
2	yy	Cfg	New content of the config. register

Frame:

STX	FF	F0	28	xx	yy	DLE**	CRC 8	ETX

Get_Config:
Reads the content of a configuration register

Byte position in the Message segment	Value	Meaning	Remarks
0	0x29	Get_Cfg	Show current configuration data on interface
1		Cfg_Adr	Address of the config. register

Frame:

STX	FF	F0	29	32	DLE**	CRC 8	ETX

Reset_All:
Recovers the Read Mode (Default) overwriting all configuration registers

Byte position in the Message segment	Value	Meaning	Remarks
0	0x18	Reset_All	Set configuration data to de-fault values

Frame:

STX	FF	F0	18	DLE*	CRC 8	ETX

Get_ Version
Show the Reader and Software Version

Byte position in the Message segment	Value	Meaning	Remarks
0	0x09	Get_Version	Show version

Frame:

STX	FF	F0	09	DLE*	CRC 8	ETX

*DLE if required

Get_ SNR:
Show Reader serial number

Byte position in the Message segment	Value	Meaning	Remarks
0	0x0A	Get_SNR	Show serial number

Frame:

STX	FF	F0	0A	DLE*	CRC 8	ETX

Acknowledgements
the following acknowledgements are used by the Reader (transmitted in the „Message“ segment of a frame):

Acknowledgements	Code	Arguments	Remarks
ACK	0x06	cmd	last cmd was successfully performed
NAK	0x15	cmd	couldn´t perform last cmd
Frame Error	0x08		receive damaged frame

ACK:
Correctly received data and processed commands are acknowledged by means of an ACK

Byte position in the Message segment	Value	Meaning	Remarks
0	0x06	ACK	Command was successfully performed
1		Cmd	Command to which this ACK relates
2 and greater		Data	additional data, if applicable

Frame:

STX	F0	F3	06	Cmd	Data 0	..	Data n	DLE	CRC 8	ETX

Example:
Content of the Data field:
after the Get_Version command: DHP101V1.05“ (ASCII)
after the Get_SNR command: 000023 (ASCII)

NACK:
No correct data received, unknown commands or „not able to process commands“ results in a NACK

Byte position in the Message segment	Value	Meaning	Remarks
0	0x15	NACK	Unable to process command
1		Command	Command to which this NACK relates
2		Error	Error Code, e.g. 01=unknown command

Frame:

STX	F0	F3	15	Cmd	01	DLE	CRC 8	ETX

2.5 ID Output

After recognition of a transponder, the related ID is transmitted according to the pre-set format as an Output ID.

Message	Code	Arguments	Remarks
ID_Output	0x23	ID	ID received follows in the frame

Frame:

STX	F0	F3	23	ID 0	.....	ID n	DLE	CRC 8	ETX

Due to the different lengths (depending on type of transponder and on output format) an interlaced string is used as an ID output structure. This list contains the ID field with the transponder identification and the „type“ field with the transponder type.

Construction of the ID output:

Byte position in the Message segment	Value	Meaning	Remarks
0	0x23	ID Output	Identification: This is an ID Output
1	Ptr1		Length of the ID field incl. Ptr 1
2	ID Field	ID Field	Data of length „n Bytes“
2+n	Ptr2		Length of the Type Field incl. Ptr2
3+n	Type Field	Type Field	Data of length „m Bytes“
3+n+m	0x00		0-Ptr as a termination mark

Message (ID):

23	Ptr1	ID field 0	.	ID Field n	Ptr2	Type Field 0	..	Type Field M	00

2.6 Output formats for the ID Field

The output format is defined by the configuration of the Cfg_Format“ Register by means of a „Set_Config“ command. The following formats are supported:

Output Format	Value of Cfg Format	Fmt_ Deziso	Fmt_ Bin	Fmt_ Raw Data	Remarks	Bytes for ISO	Bytes for 4002
ASCII (default)	0x01	1	0	0	ID field is ASCII coded for FDX-B and HDX ID and Country Code I.A.W. ISO 11784 for H 4002 data	16	10
Com-pact Coding (binary)	0x03	1	1	0	ID field is binary coded for FDX-B and DDX: ID and Country Code I.A.W. ISO 11784 for H 4002 data	8	5
Trans. Byte Struct.	0x02	0	1	0	Data I.A.W. ISO are binary coded for FDX and HDX: Data (ID, Country Code, reserv. data field, Animalflag) + CRC + Trailer for H 4002 correspond to „Compact Coding“	13	5
Transp. „Raw Data“	0x06 or 0x07	don´t care	1	1	Raw Data: binary coded for FDX-B: 128 bit raw data for HDX: 104 bit raw data (w/o header, prebits) for H 4002 64 bit raw data	16 HDX: 13	8

2.6.1 ASCII Output (Default Setting)

The ID output comprised of ID and Country Code as per ISO is transferred in the ASCII format. Transponders with invalid CRC or parity bits are rejected. The reserved data field, CRC and Trailer are not transferred under this format.

- **FDX-B and HDX Transponders:**
  16 ASCII coded characters (16 Bytes), MSDigit first.

Cty_ ASCII_Char_3	...	Cty_ ASCII_Char_0	ID_ ASCII_Char_12	...	ID_ ASCII_Char_0

Cty_ASCII_Char_n: The number „n“ byte of the Country Code according to ISO (consists of 4 digits 0-9) coded in ASCII.

ID_ASCII_Char_n: Number „n“ byte of the ID code (consists of 12 digits 0-9) coded in ASCII.

- **H 4002 transponders and compatibles:**
  10 ASCII coded characters (10 Bytes) MSDigit first.

ASCII_Char_9	...	...	...	ASCII_Char_0

ASCII_Char_n: Number „n“ byte of the ID code (consists of 10 digits 0-9) coded in ASCII.

2.6.2 Compact Coding Output

The ID Output comprised of the ID and the Country Code is tranferred in the binary format. ID outputs with an invalid CRC or parity bit will be rejected. The reserved data field, CRC and Trailer are not transferred under this format.

- **FDX-B and HDX transponders:**
  16 BCD coded numbers (8 Bytes), MSDigit first

Cty_BCD_3 : Cty_BCD_2	Cty_BCD_1 : Cty_BCD_0	ID_BCD_11 : ID_BCD_10	...	ID_BCD_1 : ID_BCD_0

Cty_BCD_n: The number „n“ half-byte of the Country Code according to ISO (consists of 4 digits 0-9) coded in BCD.
ID_BCD_n: Number „n“ half-byte of the ID code (consists of 12 digits 0-9) coded in BCD.

- **H 4002 transponders and compatibles:**
  10 hex-coded numbers (5 Bytes), MSDigit first

Hex_9 : Hex_8	...	...	...	Hex_1 : Hex_0

Hex_n: The number „n“ half-byte of the ID Code (consists of 10 hexa-digits 0-9) coded in BCD.

2.6.3 Transponder Byte Structure Output

The useful data from ISO - FDX-B/HDX transponders (ID, Country Code, reserved data field, Animal Flag) are outputted in a bibary format according to the sequence of receipt, including the CRC and trailer.The LSBit of an output Byte is the Bit first received by the transponder.
ID outputs with an invalid CRC according to ISO will be rejected.

- **FDX-B and HDX transponders:**
  13 Bytes

ID_ Byte_0	..	ID_ Byte_7	CRC_ Byte_0	CRC_ Byte_1	Trail_ Byte_0	..	Trail_ Byte_2

ID_Byte_n: Number „n“ Byte of the Bit structure according to ISO (consists of 64 bit), binary coded with reserved data field.
CRC_Byte_n: Number „n“ Byte of the CRC according to ISO (consists of two Byte), binary coded,
Trail_Byte_n: Number „n“ Byte of the Trailer according to ISO (consists of 3 Byte), binary coded.

- **H 4002 transponder and compatibles:**
  in conformance with the „Compact Coding“ format.

2.6.4 Raw Data Output

The complete set of raw data from a transponder are outputted in a binary format, in the sequence of receipt. The LSBit of an outputted Byte is the first bit received from the transponder.
For ISO transponders, the useful data (ID, Countra Code, reserve data field, Animal Flag) CRC and Trailer are included. For FDX-B transponders, the header and control bits are included.

ID Outputs with an invalid CRC according to ISO (or an incorrect parity bit for H 4002) are not rejected, which allows reading of transponders with a different structure. (for HDX only in case the header is identical). the absence of error check will also lead to an output of data received with bit errors.

- **FDX-B transponders, 16 Bytes:**
  Useful data (starting with Byte 0), CRC and Trailer (with control bits each), Header,

Byte_0	...	...	...	Byte_15

Byte_n: Number „n“ Byte of the ID Code

- **HDX- transponders, 13 Bytes:**
  Useful data CRC and Trailer without Header (01111110)

Byte_0	...	...	...	Byte_13

Byte_n_ Number „n“ Byte of the ID Code

- **H 4002 transponders and compatibles:**
  8 Bytes: with Header and Parity Bits

Byte_0	...	...	...	Byte_7

Byte_n: Number „n“ Byte of the ID Code (Byte 0= Header)

2.6.5 ID Type Field

The “type field“ designates the type of transponder. The „ID type“ field output takes place in the ASCII Mode with 2 ASCII characters, or else with a Byte (binary).

Transponder Type	Value	Remarks
HDX	01	HDX transponder according to ISO
H 4002	02	applies also to compatibles (H 4001/3/4...no electrical difference)
FDX-B	05	FDX-B transponders according to ISO
unknown	7F	non-decodable data
no transponder	FF	no transponder within the active field

If a „Get single ID“ is interrupted in the Request Mode due to timeout, then an empty „ID Output“ without ID Field is outputted, with ID Field Type „FF“.

2.7 Optional Configurations

This chapter describes the use of the configuration register. The configuration commands enable the purposeful configuring of the DHP 101/102 Reader Module according to the desired application.

Register	Cfg_Adr	Bit No. (0...7) of Register: Name	Meaning of the Bit when set to „1“	Def.-Value
Cfg_ mode	0x31		Operating Mode	0x00
		1: Mode-Requ	Request Mode: After switch-on wait for command (otherwise „Read Mode“)	
Cfg_ Format	0x32		Format of the ID Output	0x01
		0: Fmt_Deziso	Decoding of the trans-ponder data for FDX-B I.A.W. ISO 11784 (otherwise: output Trans-ponder Byte Structure)	1
		1: Fmt_Bin	Output is binary (otherwise ASCII)	0
		2: Fmt_Raw_Data	Output Raw Data w/o CRC or Parity Check (otherwise done only if check is OK)	0
Cfg_Rf	0x33		Configuration of the RF Interface	0x0E
		1: Rf_FDXB_on	FDXB Reception activated (otherwise (FDXB and H4002 Reception off-line)	1
		2: Rf_HDX_on	HDX Reception activated (otherwise HDX Reception off-line)	1
		3: Rf_H4002_on	H4002 Reception activated (only if FDX-B is active, otherwise offline	1
Cfg_ Timeout	0x34		Read function switch-off time for a „Get_Single_ID in the Request Mode if no ID was received until then: Time=Register Value x appr. 50 ms (Register Value 0x00also yields appr. 50 ms)	0x00
Cfg_ Delay time	0x35		Waiting Time for Repeat of ID Output already transmitted in the Read Mode: Time= Register Value x appr. 50 ms (Register Value 0x00 means no repeat of same ID)	0x01
Cfg_IO Function	0x37		External Antenna	0x00
		0: external antenna on	External Antenna activated (otherwise external antenna deactivated)	0

The Configuration Register *Cfg_Mode* defines the Read- or Request Mode.

The *Cfg_Format* Configuration Register is used for setting the output format of the transponder ID.

The *Cfg_RF* determines the type of transponder to be read.

The Configuration Register *Cfg_Timeout* defines the switch-off time for a reading cycle in the Request Mode.

By means of the Configuration Register *Cfg_Delaytime*, you may determine the repeat rate for the same ID Output.

The *Cfg_IOFunction* determines whether the external antenna is activated or not.

The configuration data are stored in an EEPROM and are preserved also after power shut down.

If a „Set_Conf“ command is applied to a non-defined register, the system will respond with a NACK message. Non-defined bits within a configuration register will be suppressed.

2.7.1 Activation of the external antenna

In order to activate the external antenna, the 'Set_Config' request has to be used.
The following command sequence has to be send to the AIR200:

Request:

STX	DST	SRC	CMD	ADR	CFG	CRC 8	ETX
0x02	0xFF	0xF0	0x28	0x37	0x01	0x73	0x03

ADR: Address of the configuration register (in this example 0x37 => IOFunction)
CFG: Configuration data to program into selected configuration register (in this example 0x01 => external antenna activated)

Answer:

STX	DST	SRC	ACK	CMD	DLE	CRC 8	ETX
0x02	0xF0	0x01	0x06	0x28	0x10	0x1C	0x03

Save the current configuration by sending 'Save_Config' request:

Request:

STX	DST	SRC	CMD	CRC 8	ETX
0x02	0xFF	0xF0	0x2A	0xC9	0x03

Answer:

STX	DST	SRC	ACK	CMD	DLE	CRC 8	ETX
0x02	0xF0	0x01	0x06	0x2A	0x10	0x4B	0x03

2.8 Examples of ID -Messages

2.8.1 ISO-FDX-B and HDX

a) ASCII Output

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Re-mark	ID	Len1	ID 16 Byte																DLE	Len2	Type		NUL
Ascii	'#'	11	'0'	'9'	'8'	'0'	'0'	'0'	'0'	'0'	'0'	'0'	'0'	'9'	'9'	'7'	'0'	'8'	10	03	'0'	'5'	00

b) Compact Coding Output

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Re-mark	ID	Len1	ID 8 Byte								DLE	Len2	Type	NUL
Bin	23	09	09	80	00	00	00	09	97	08	10	02	05	00

c) Transponder Byte Structure Output

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Re-mark	ID	Len1	13 Byte													DLE	Len2	Type	NUL
Bin	23	0E	7C	85	01	00	00	F5	00	80	0F	F0	81	C4	A2	10	02	05	00
			8 Databytes + ID, Country, reserv. Data Animal flag								CRC		Trailer						

d) Transponder Raw Data Output for FDX-B Transponder

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Re-mark	ID	Len1	Raw Data incl. Header, Yield Data ,CRC, Trailer (+Controllbits) = 128 Bits																DLE	Len2	Type	NUL
Bin	23	11	7C	0B	07	04	08	B0	3E	40	C0	0F	E1	07	26	2E	1A	80	10	02	05	00

e) Transponder Raw Data Output for HDX Transponder corresponds to (c) for this type of Transponder)

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Re-mark	ID	Len1	Raw Data incl. Header, Yield Data ,CRC, Trailer = 104 Bits													DLE	Len2	Type	NUL
Bin	23	0E	2F	A7	0F	00	80	F5	00	80	A2	04	7E	00	01	10	02	01	00
			8 Data Bytes + ID, Country, reserv. Data, Animal flag								CRC		Trailer or Stopbyte						

2.8.2 H 4002 and Compatibles

a) ASCII Output

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Re-mark	ID	Len1	ID 10 Byte										DLE	Len2	Type		NUL
Ascii	'#'	0B	'0'	'4'	'6'	'0'	'2'	'0'	'9'	'B'	'2'	'E'	10	03	'0'	'2'	00

b) Compact Coding Output

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12
Re-mark	ID	Len1	ID 5 Byte						DLE	Len2	DLE	Type	NUL
Hex	23	06	04	60	09	A8	F1	39	10	02	10	02	00

c) Transponder Raw Data Output

Pos	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Re-mark	ID	Len1	Raw-ID incl. Header, Data, Trailer = 64 Bits								DLE	Len 2	DLE	Type	NUL
Bin	23	09	FF	81	34	80	82	D4	E9	3D	10	02	10	02	00

3. FCC digital device limitations

Radio and Television Interference

This equipment has been tested and found to comply with the limits for a digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and television reception.

Caution! Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

4. CANADIAN RADIO EMISSIONS REQUIREMENTS

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques de la class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

*

Industry Canada:
Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

This device has been designed to operate with the antennas listed below, and having a maximum gain of 1.8 dB. Antennas not included in this list or having a gain greater than 1.8 dB are strictly prohibited for use with this device. The required antenna impedance is 2.8 ohms.
- Stick Antenna AEA080
- Stick Antenna AEA120

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

5. CE MARKING

Hereby, Agrident BV declares that this equipment, if used according to the instructions, is in compliance with the essential requirements and other relevant provisions of the RTTE Directive 1999/5/EC. For use in all countries of the EU.

To obtain a copy, contact Agrident BV and request the “Declaration of Conformity” document for Multi-technology readers.

Agrident BV
mail@agrident.com

In case of alteration of the product, not agreed to by us, this declaration will lose its validity.

This symbol indicates proof of conformity to applicable European Economic Community Council directives and harmonized standards published in the official journal of the European Communities.

CE

6. Trouble shooting

For any problem please contact us:

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