OIS-P

OIS-P PC 3100/01 series

8 kbyte Communicators PC3141/03

System Description and Installation Manual

B 1030 200

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Reg. No. **B1030 200**
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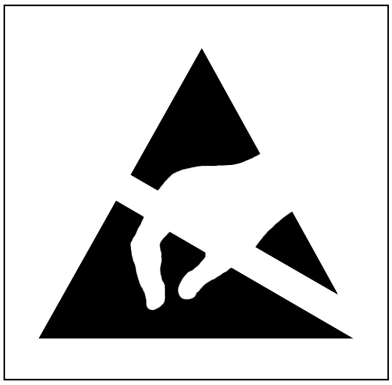

This product contains parts, that are sensitive against electrostatic discharges. Please heed the particular instructions for protection. Ground yourself before you touch the appliance.

FCC ID: PNTOIS-P3100

The 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

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Contents

1 System description

1.1 FCC Statements

The users manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The unit described in this document complies to FCC. It´s FCC ID is: PNTOIS-P3100

1.1 General

The Central Unit PC3141/03 is a product within the OIS-P PC3100/01 family. The unit will read and program the following 8 kbyte PC3100 Data Tags: PC3104/32A, PC 3104/22A and PC3105/00D. The contents in the Data Tags is however of an uncompatible format compared to the earlier PC3100/00 system.

PC3141/03 uses an external antenna to communicate to the Data Tags. This gives a high flexibility for antenna mounting.

The serial interface for the host is alternatively RS485, RS232 or CL interface. The protocol used is either the 3964R or the OIS-P communication protocol EUROX_4.

1.2 System components

Main components:

PC3141/03A	Central unit
PC3114/00A	Antenna
PC3114/01A	Antenna, long range
PC3104/32A	Data Tag, normal temperature, medium speed
PC3104/22A	Data Tag, normal temperature, high speed
PC3105/00D	Data Tag, heat resistant

Accessories:

PC3117/11A	Antenna cable with connectors, 10 m
PC3117/12A	Antenna connector set
PC3017/02A	Antenna cable on reel, 100 m
PC3117/13A	Antenna cable with connectors, length is to be specified 1–100 m.

Installation tools

PC3104/01A	Test Data Tag with LED indicators
PC3100/90A	PC test software

1.3 Mechanical description

The central unit consists of an enclosure with a CPU-board, a power supply and connection terminals.

The CPU-board is accessable (for switch settings etc) by opening the cover which is mounted with hinges. Connections of power, digital I/O and serial communication are done with connectors. There are four separate connectors, one for power, one for I/O, one for serial communication, one for a test terminal and one for the antenna.

The unit is equipped with mounting flanges in each corner.

1.4 EUROX_4-Software

1. 4.1 General

The software EUROX_4 in PC3141/03 is mainly compatible with earlier versions of software EUROX in OIS-P communicators PC3000 and the communicators PC3120.

The PC3141/03 with EUROX_4 software will communicate with 8 kbyte Data Tags PC3104/32A, PC3104/22A and PC3105/00D.

Detailed information is available in “ID System, PC 3100/01, System firmware EUROX_4 Programmers Manual”.

1.4.2 Commands

The following parameter types are referenced in the command list. The fixed number of characters is only necessary if the optional ‘,’ in the commands is not used:

bufno	0 - 4 hex
data	max 4 kbyte, 8 bit characters
destpos	000 - FFF hex or three ASCII characters ‘???’ represent end of buffer
filelen	000 - FFF hex
fileno	00 - FF hex
filetype	Any two ASCII characters
id addr	0 - FFFFFF hex (00 - FF if fixed length format)
reject previuos	‘0’ or ‘1’
len	000 - FFF hex or three ASCI characters ‘???’ represent end of buffer (not for RP)
offs	000 - FFF hex
prot	ASCII characters ‘WR’ or ‘RO’ (‘Write and Read’ or ‘ Read Only’)
srcpos	000 - FFF hex
I/O-value	‘0’, ‘1’ or ‘-’
EX mode	‘0’ multiple or ‘1’ single execution

Parameter dictionary

bufno	Buffer number
data	ASCII 8 bit characters
destpos	Start position in destination buffer
filelen	File length
fileno	File number
filetype	File type, any two ASCII characters. Use ‘?’ as wildcard in any or both positions
id addr	Data Tag address
reject previous	Reject previous Data Tag, 0 or 1 (1= reject)
len	Length, number of bytes
offs	Offset number of bytes
prot	File protection code
srcpos	Start position in source buffer
I/O-value	Output value, ‘0’ = off, ‘1’ = on and ‘-’ = no change
EX mode	Command buffer execution mode

Command list

The ‘,’ may be omitted. If ‘,’ is not used the parameter format has to be of a fixed length.

Moving data between Communicator buffer and Data Tag

Append to buffer	AB,<bufno>,<fileno>
Append to tag	AT,<bufno>,<fileno>
Load circulating file	LC,<bufno>,<fileno>
Load	LD,<bufno>,<fileno>
Load file part	LP,<bufno>,<fileno>, <offs>
Read	RD,<bufno>,<fileno>
Read file part	RP,<bufno>,<fileno>, <offs>,<len>
Read type	RT,<bufno>,<filetype>

Moving data between host and Communicator buffer

Buffer length	BL,<bufno>
Get buffer	GE,<bufno>
Put append	PA,<bufno>,<data>
Put	PU,<bufno>,<data>

Digital I/O

Read inputs	RI
Set outputs	SO,<I/O-value>,... <I/O-value> (6 values)

Command buffer

Define	DF
End define	EN
Execute	EX[,<EX mode>]

Maintaining files

Alter protection	AP,<fileno>,<prot>
Directory	DI,<bufno>,<filetype>
Format file	FM,<fileno>,<filelen>
Mark filetype	MK,<fileno>,<filetype> (wildcard not allowed)
Reset files	RF,<fileno>[,<fileno>]

Initiating Data Tag

Battery change	BC,<bufno>
Initiate	IN[,<id addr>]

Miscellaneous

Status request	ST
Get battery date	BD,<bufno>
Break	BR
Copy buffer to buffer	CO,<bufno>,<srcpos>, <len>,<bufno>,<destpos>
End Data Tag	EE
New Data Tag	NE,<reject previous>
Reset buffer	RB,<bufno>[,<bufno>]

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2 System performance

2.1 Communication speed

2.1.1 Data Tag communication

The data transmission speed between communicator and the Data Tag depends on the amount of data to read or write.

Table 2.a shows the minimum microwave communication time needed under ideal circumstances. If a disturbance would occur, the communicator will automatically initiate a retransmission of the data block (16 bytes).

	File size bytes			
	10	100	1000	4000
Write one file LD				
PC 3104/32A, PC3105/00D	0.14	0.16	0.39	1.2
PC 3104/22A	0.06	0.07	0.14	0.37
Read one file RD				
PC 3104/32A, PC3105/00D	0.12	0.14	0.32	0.95
PC 3104/22A	0.06	0.06	0.12	0.31

Table 2.a Communication time microwave link

2.1.2 Host communication times

The host communication can be up to 19.200 baud.

The table below displays the time required for communication between the Host computer and the Central Unit. The table presents the time required to transfer file data and commands (or responses to commands) and reaction time in the host computer. The host is assumed to react to command replies in 10 ms. Both this table and the Data Tag communication time table must be used to calculate the total time required at a OIS-P station, when conducting calculations on passage frequency.

Transfer speed	File size			
bits/sec	10	100	1000	4000
4800	0.16	0.34	2.3	8.5
9600	0.09	0.19	1.13	4.3
19200	0.06	0.11	0.58	2.2

Table 2.b Serial communication times host–central unit (EUROX_4 protocol/8/E/1). Send one file from the host to the control unit and start the writing into the tag.

Host to central unit	Central unit to host	Time included in table 2.b
PU, 0, <Data>	ACK	X
LD, 0, 2	ACK	X
ST	101	X
ST	_ _ _	
_ _ _	_ _ _	
ST	001	
NEXT FILE		

Table 2.c Communication sequence used for calculation of time values in table 2.b.

2.1.3 Total communication time

Point-to-point connection
The total time required for communication between the host system and the Data Tag is calculated by adding the Data Tag communication time (Table 2.a) to the host communication time (Table 2.b).

This will result in a total communication time based on the following conditions:

* The host has a response time of 10 ms.
* The OIS-P system is connected to the host in point-to-point connection.

If the serial interface response time in the host is significantly longer than the stipulated 10 ms, the additional time will have to be added three times.

Multidrop connection
In case OIS-P communicators are connected in a multidrop configuration, the following guidelines will apply for determining the total time required for moving data between Data Tag and host:

a/ If each Communicator's task is performed from start to finish, without delay due to host communication with other units, the total time required for moving data between Data Tag and host will be the same as for a point-to-point connected unit.

b/ However, if the system engineer designs the application software program in a way, that the process of moving data between Data Tag and host may be interrupted by host communication with other Communicators, an object must remain in front of an antenna for a longer time than in a point-to-point situation.

How much longer this required time will be, depends on how the system engineer has designed the application specific software in the host.

Example
Let's assume initial production requirements are to be written to a PC 3105/00D Data Tag at the start of a production line. The Data Tag is present (moving or stationary) in the communication zone for 10 seconds. 30 files with an average size of 100 bytes are to be written. The host communication baudrate can be chosen to satisfy the time requirements. The OIS-P is connected to the host in a point-to-point configuration and the response time for the host is less than 10 ms.

	Time required at different baud rates	
Sequence:	**9600:**	**19200:**
Host to central unit time (30 x 0.19/30 x 0.11)	5.7	3.3
Central unit to escort memory time 30 x 0.16	4.8	4.8
Total:	**10.5**	**8.1**

Table 2.c Example on total communication time.

Result:
The baudrate 19200 should be used for sufficient margins. A faster solution would be to use the command buffer. All data can be loaded into one buffer before the Data Tag arrives to the communication zone.
With a command buffer containing CO (Copy Buffer to Buffer) and LD (Load) there is no need for a communication to the host for every file.
The resulting time in the example above would be less than 5.0 s., i.e. a recommendable margin of a factor 2.

2.2 Communication area

The communication area for the antenna PC3114/00A (maximum 2 m distance) is shown in Figure 2.1. The diagram assumes a Data Tag temperature of -40°C - +40°C and a pitch and tilt angle of 0°. The antenna PC3114/01A has almost twice as long communication distance (Figure 2.2).

It is always recommended to only utilise 50 to 75% of the range in free space due to influences in the actual installation.

Figure 2.1 Communication area, PC3114/00A

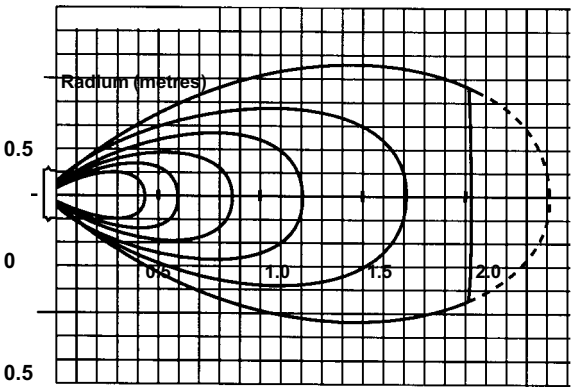


Figure 2.2 Communication area, PC3114/01A

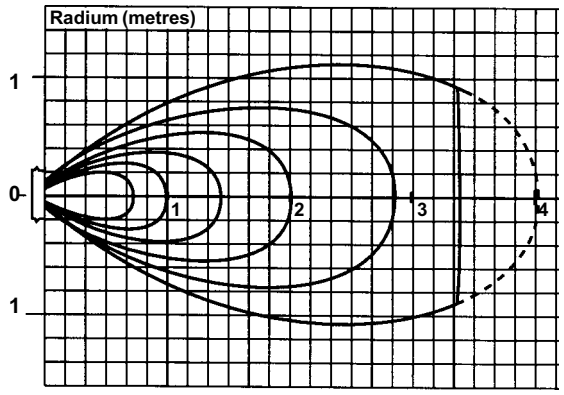
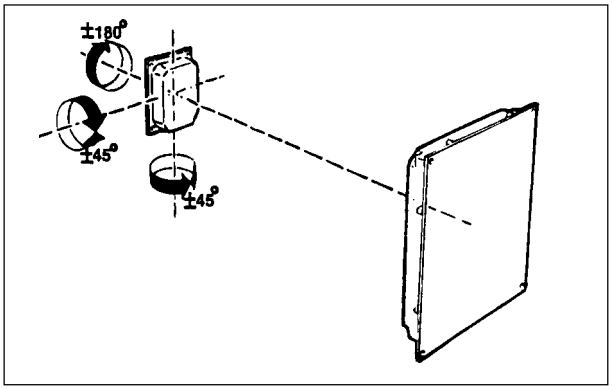


Figure 2.3 shows the allowed alignment between Data Tag and antenna.

Figure 2.3 Freedom of alignment.



2.3 Distance between Data Tags

Narrow antenna field

The data transmission frequency of 2,45 GHz offers many excellent characteristics, of which one is the ability to “focus” the microwaves on a desired area, much like a flash light throws out a narrow beam of light.

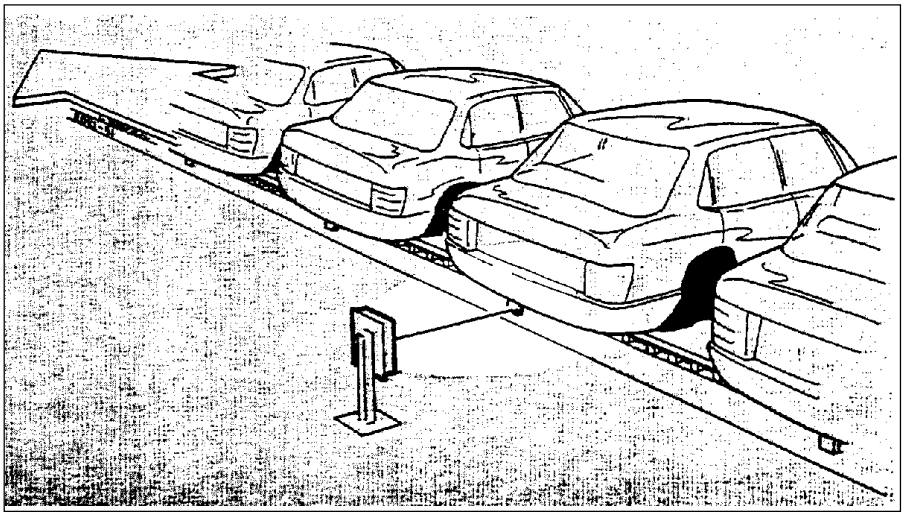


Figure 2.4 Focussing on the “right” object thanks to the narrow antenna field.

Data Tag ID-address

To further enhance installation flexibility and ensure optimum communication reliability, each Data Tag has a unique identity. The so called ID-address is factory programmed from a range of more than 16 million (2^{24}) ID-addresses. The unique ID-addresses will ensure that communication initiated with an Data Tag also can be finalized with the that particular Data Tag, even if another Data Tag would come in closer to the antenna. It is thus important that the ID-addresses remain unique even if the user reinitialises the tags. The system is, however, basically designed for one tag in the lobe and other situations should be avoided.

Distance between Data Tags

It is important that the Data Tag with which communication is to be established, returns the strongest signal to the antenna, as the Data Tag communication is initiated by OD or user command. To translate that into a minimum distance between Data Tags, an antenna lobe diagram must be studied.

The graph lines in figures 2.1 and 2.2 represent positions of similar signal strength in front of an antenna. The distance between two graph lines represent a signal strength difference of 3 dB.

The recommendations for how close Data Tags may be to each other at a communication point are:

1. Ensure at least **a 3 dB difference in signal strength** between the intended Data Tag and all other Data Tags, when communication starts. If a major difference in Data Tag exposure to foreign substances like paint etc can be expected, this difference should be added to the 3 dB mentioned above. Please refer to **section 3.3**.

2. The closer to each other the Data Tags must come, the shorter the communication distance should be. By reducing the communication distance, it is easier to maintain a significant difference in signal strength between the intended Data Tag straight in front of the antenna and not intended Data Tags.

   The closer Data Tags come to each other, the more important also the timing of object detect activation becomes. If objects come very close to each other, OD should be activated as the correct Data Tag is located straight in front of the antenna. This however means that part of the theoretical access range is lost. For communication with objects at standstill this means that the object stop position is more critical. For communica-tion with objects in motion, it means that the available communication time is reduced.

3. Recommendation 1 and 2 above prevents that no communication with other Data Tags will occur, provided that the intended Data Tag is present and in operating order. For a better protection against communication with nearby Data Tags, these cannot be allowed within an area, corresponding to 2–5 times the size of the 0 dB graph line in **figure 2.1 and 2.2.**

Microwaves can, however, be influenced and reflected by metal and directed into unwanted areas, which has to be considered in the installation layout.

Should this description not cover your installation requirements or should you have any questions, please consult your OIS-P system specialist for advice.

2.4 Distance between antennas

To ensure that the antenna only communicates with the proper Data Tag the recommendations under section 2.3 must be followed.

To avoid interference between adjacent antennas, the Interlock function should be used. This means that two or more antennas avoid to communicate simultaneously. Since the microwave communication time is short, this Interlock will normally not influence the total communication time notably.
An Interlock function can also be realised by sequencing the commands in the host (PLC) to the different control units. Without Interlock the antennas should be separated 4–10 times the size of the 0 dB graph line in figure 2.1 and 2.2.

If for some reason the Interlock function can't be used there is a possibility to use frequency separated antennas. Please contact your OIS-P system specialist for advice.

3 Environmental influence

3.1 General

Since the OIS-P system is a vital part in a usually complex production process, where products of high value are manufactured, the highest priority has been set on maximizing communication reliability. This means that top performance must be guaranteed even under severe industrial environmental conditions.

The OIS-P technology has proven itself capable, during more than a decade in the automotive industry, where the environment at times can be testing; oils, water and other fluids have to be dealt with, as has electromagnetic fields from welding robots, paint layers, high temperatures, shock and vibration and much more.

In the following, the potentially influencing environmental factors and their consequences for the installation planning is described.

3.2 Metallic objects

Microwaves at 2.45 GHz have an excellent capability of penetrating through foreign substances, as described in section 3.3. However, like all electromagnetic waves, microwaves cannot penetrate through metallic objects.

Therefore, installations should be planned in such a way that metallic objects are not present between antenna and Data Tag when communication with an Data Tag is to take place. However, small metallic objects like metal shavings etc will not influence negatively on the communication. Further, both Antenna and Data Tags can be mounted directly onto metal surfaces.

Any system operating in the MHz range or higher, will have a communication range in which the signal strength varies, due to wave reflections.

To minimize this phenomenon, the PC3100 system features circular polarization, which suppresses microwaves reflected from metal surfaces an odd number of times. The suppression is equivalent to 6 dB or more.

To avoid the risk of negative interference from metal surfaces, one of the following situations should be established.

A. Communication with the Data Tag is performed in motion.
Any negative influence of reflections will result in a slightly longer communication time. This should be added to the communication time with a margin dependent on the actual case, normally a factor 2 (See section 2.1).

B. Communication is performed with the Data Tag at standstill.
Metal surfaces in positions where they could reflect microwaves from the antenna towards the Data Tag should be studied. Generally they should be at a position equivalent to a 6 dB lower signal strength than the Data Tag, to avoid negative influence. This can usually be achieved by reducing the distance between antenna and Data Tag.

Depending on reflections there may be points with stronger or weaker signals and the position of the antenna and/or the Data Tag should then be adjusted to achieve a strong signal. The distance between points with strong signal is normally 12.4 cm.

3.3 Foreign substances between antenna and Data Tag

Microwaves penetrate through many foreign, non-metallic substances with no or very little loss of signal strength. However, if the reduction in signal strength should be considerable, an appropriate reduction in communication distance is recommended as shown in table 3.a.

Substance	**Rec. signal strength adjustment (dB/mm)**	
	1st mm	**Thereafter**
Water	7	0.5
Oil	1	0.2
Grease	1	0.1
Regular car paint	1	Note 1
Metallic car paint	3	Note 2
Paper	0.02	0.02
Plastic	0 - 1	0 - 0.05
Snow	0 - 0.5	0 - 0.2
Ice	0.5	0.1

Table 3.a Recommended reduction of communication distance as a function of foreign substance layer thickness.

The signal strength adjustment will vary slightly, depending on the exact composition of the contamination, where it is applied etc.
Note 1: Layers beyond 1 mm not likely. Adjustment for 0.2 mm amounts to 0.5 dB.
Note 2: Layers beyond 1 mm not likely. Adjustment for 0.2 mm amounts to 1.5 dB.

How the recommended signal strength adjustment relates to the communication distance can be seen in diagrams in section 2.2.

3.4 Temperature

The antenna lobe diagrams in section 2 are valid for temperatures up to +40 °C.

If the ambient temperature increases or if the Data Tags are exposed to higher temperatures than +40 °C, this will result in a reduced signal strength and a corresponding increase by reduction of the communication distance should be ensured, as indicated in table 3.c below.

Product	**Recommended signal strength adjustment**		
	+40°C	**+70°C**	**+110°C**
Data Tag PC3104/32A,/22A	0 dB	2 dB	n/a
Data Tag PC3105/00D Note 3	0 dB	2 dB	4 dB

Table 3.b Recommended signal strength adjustment due to ambient temperature.
Note 3: The internal temperature must be calculated, which will be done by Baumer Ident on request.

How the recommended signal strength adjustment relates to the communication distance can be seen in diagrams in section 2.2.

Long term exposure of Data Tags to high temperatures should generally be avoided, as can be concluded from section 5.2.

3.5 Electromagnetic immunity

The PC3141 system has been EMC-tested according to the pr ETS 300339 which is required for the CE-marking. This assures trouble-free operation in demanding electromagnetical environments.

Electromagnetic interference in cables
By selecting a suitable communication interface, using specified cables and proper grounding, optimum communication reliability is ensured.

Electromagnetic interference on the microwave link
Industrial noise is typically present in the kHz and low MHz frequency band. The OIS-P system is only receptive for frequencies of 2,45 GHz +/- 5%, so typical industrial noise will not affect the microwave communication.

Transients from spot-welding equipment or from switching on other welding equipment, soldering machines and fluorescent lighting fixtures may produce short pulses around 2,45 GHz. However, since the OIS-P system, if interfered, will continue

communication from the point of interference, rather than having to retransmit an entire message, such short transients would merely increase the required communication time by a small fraction.

If strong microwave fields from for instance industrial microwave dryers can be suspected, an on-site survey by a OIS-P specialist should be carried out to determine proper installation procedures.

3.6. Conclusions on environmental influence

As shown, the OIS-P PC3141 system is highly unsensitive to the typical industrial environment. Still, common sense must be used when planning an installation and some general rules of thumb can be established.

1. It is recommended that installation is planned in such a way, that communication at maximum specified distance and maximum specified misalignment is avoided at the same time. Thereby the access range becomes longer, thus making object positioning less critical and the communication capacity higher.

2. To establish if a reduction of the communication distance should be considered, the following table will be of help. By adding the recommended dB signal strength increase for the factors that apply for your particular installation and comparing the total with diagrams in section 2.2, a general understanding of a suitable decrease in communication distance is received.

Aspect	**Rec. signal strength adjustment**
Metal in/close to the comm. lobe (section 3.2)	
- Communication in motion	0 dB
- Communication at standstill	0 - 6 dB
Foreign substances between Data Tag and antenna (section 3.3)	0 - 3 dB
Temperature (section 3.4)	
- Data Tag below +40 °C	0 dB
- Data Tag at +70 °C	2 dB
- Data Tag at +110 °C	4 dB
Electromagnetic interference (section 3.5)	0 dB

Table 3.c Summary on environmental influence on communication distance.

Electromagnetic interference and metal in the communication area when reading in motion, will not require a reduction of the communication distance. This will only result in a slightly longer communication time, which should be added to the data from the table 2.1.

3. To finally define the optimum communication distance, on-site testing is recommended. This is especially important when there is plenty of metal in the communication area and communicating is performed at standstill, as table 3.c indicates.

   On-site testing is facilitated by the installation tools available.

4 Health aspects

4.1 Emitted power levels

The only emitted power worth mention is the emission at the data transmission frequency 2,45 GHz. As can be seen from the graph below, the emitted power is far below all known international health standards.

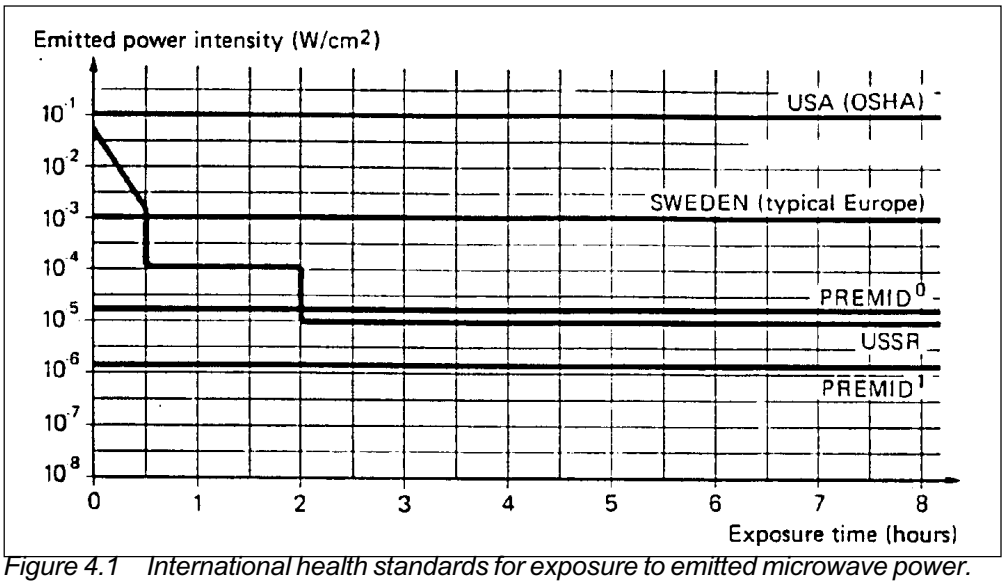


Figure 4.1 International health standards for exposure to emitted microwave power. Radiation density for PC3114/00A at a distance of 0 and 1 meters.

The distance from the antenna in the graph is defined straight out from the antenna surface, where the intensity is the highest.

4.2 Health and safety cautions

Normal caution is required when removing the central unit's cover. Humans beings have to keep a safety distance of 20 cm to the antenna.

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5 Maintenance aspects

5.1 General

The PC3141 OIS-P system is basically a maintenance-free system. Once correctly installed, it will deliver many years of trouble-free operation.

In important processes, the user usually collects and evaluates communication reliability statistics on a regular basis. These statistics can be retrieved from the OIS-P communicator as described in section 7.4 or can be collected at the user control system level.

5.2 Battery life

General
In order to obtain communication distances in the meter range, high data speed and still comply to international telecommunications and health standards, the Data Tags must be equipped with a battery.

To get maximum life out of the batteries, the OIS-P Data Tags are of semi-passive type. The majority of the time, the Data Tags are **passive** and only consuming a few µA. Only during communication, which typically is ended in a fraction of a second, will they be **active** with an increased current consumption.

The batteries chosen are long-life lithium batteries, whose life expectancy depend on the amount of data communication, the data transmission speed of the Data Tag and the ambient temperature in which it is used. If the ambient temperature is high, the battery life will be somewhat reduced. Long term exposure to high temperatures should therefore be avoided.

However, for most industrial applications, the battery life will be longer than 6 to 8 years, as specified on the Data Tag data sheets.

Battery-low alarm
The remaining battery capacity is automatically monitored every time communication is established with an Data Tag. When “battery-low” status is reported to the user control system, the remaining battery capacity is 5% and the Data Tag should be taken out and receive a new battery.

Note: Battery low indication is not reliable in sub-zero °C temperatures. If battery-low indication is received in temperatures below freezing, no adequate conclusion can be made from this.

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6 Installation

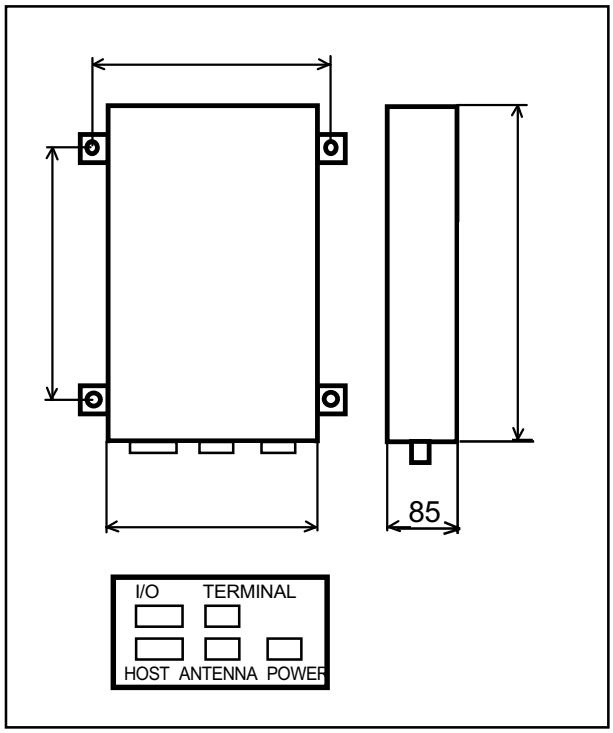
6.1 Mechanical installation

The communicator should be mounted by means of the four mounting flanges (Diam 8,5 mm) in the corners of the unit. See Figure 6.1. Use mounting screws with diam. 8 mm.

Warning

The antenna must be installed at least 20 cm of persons off.

Figure 6.1 Mechanical dimensions PC 3141/03



6.2 Electrical connection

6.2.1 Power supply and object detect

The unit should be connected to power supply 24 VDC.
An active OD-signal should be represented by a 24VDC voltage on the OD input. There are totally 6 digital inputs and 6 digital outputs available.

The connection is done to POWER and I/O, see Figure 6.2, 6.3 and 6.4. POWER is a male 9 pin D-Sub 9 connector. Use cable connector D-Sub 9 female.

Figure 6.2 Power and I/O connection

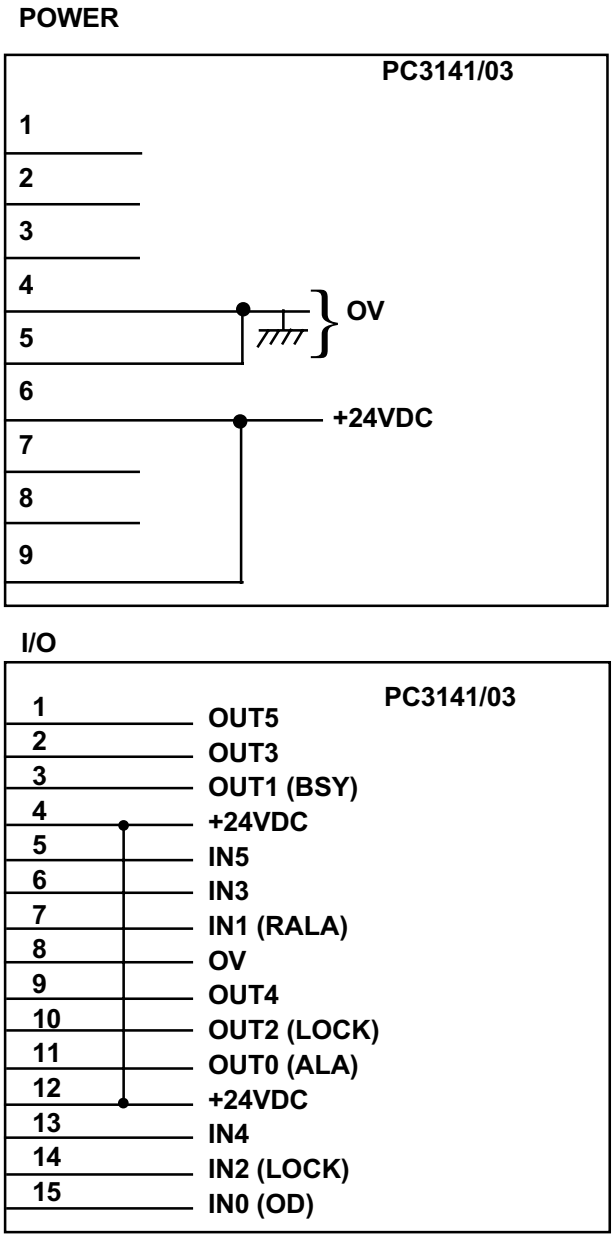


Figure 6.3 Interface circuit, input

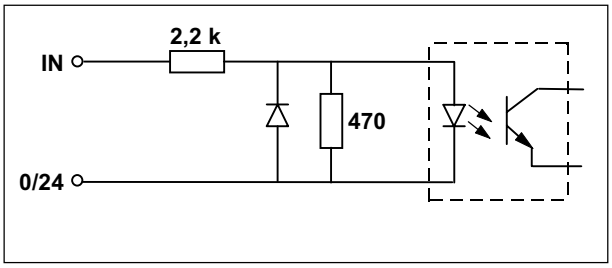
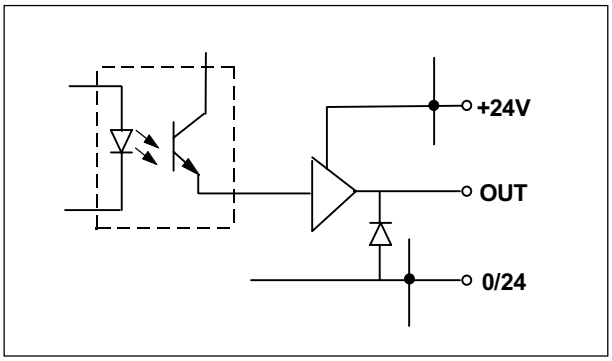


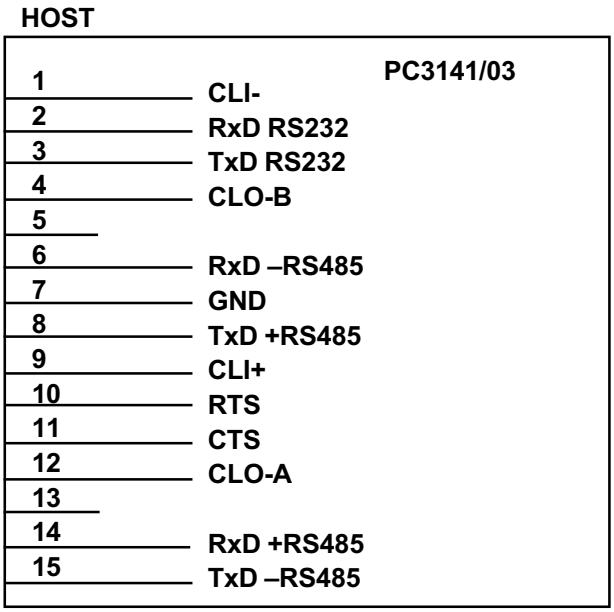
Figure 6.4 Interface circuit, output



6.2.2 Serial communication (HOST)

The serial interface is RS232, RS485 or passive current loop. The connection is done to HOST, see Figure 6.5. HOST is male 15 pin D-Sub connector. Use cable connector D-Sub 15 female.

Figure 6.5 Serial connection



For RS485 and current loop connection also see figure 6.6, 6.7, 6.8.

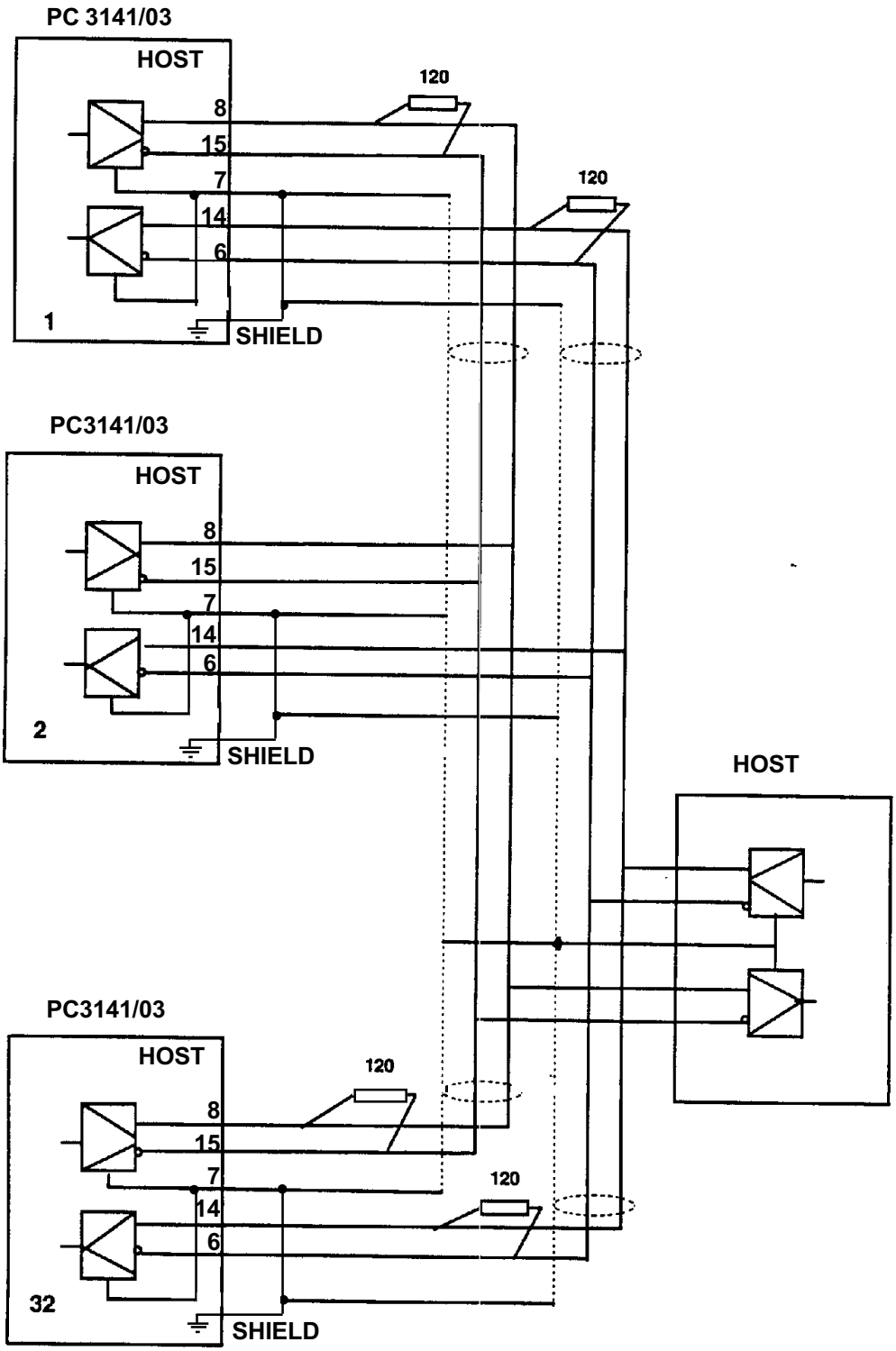


Figure 6.6 RS485 multidrop configuration

Figure 6.7 Current loop passive transmitter

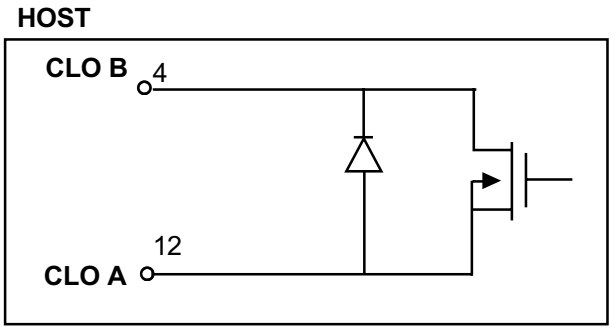
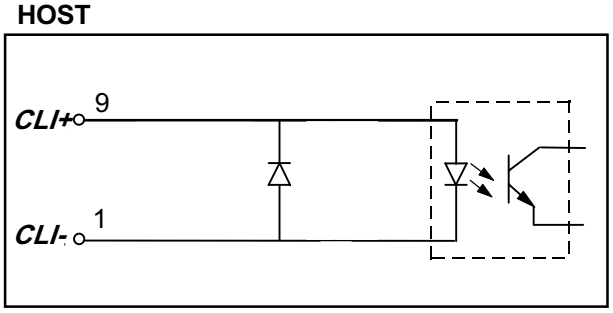


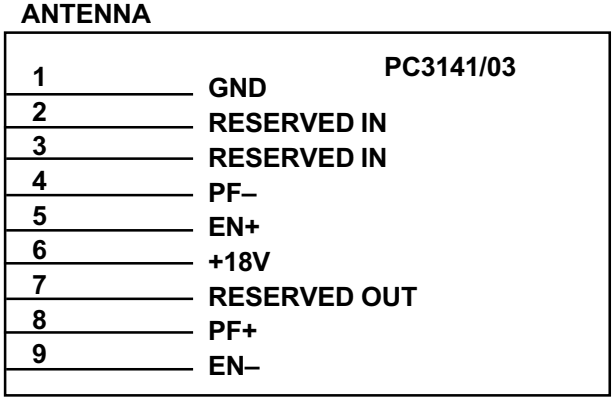
Figure 6.8 Current loop passive receiver



6.2.3 Antenna connection

The central unit PC3141/03A uses a separate antenna conntected to ANTENNA according to figure 6.9. ANTENNA is a D-Sub 9 female connector.

Figure 6.9 Antenna connection



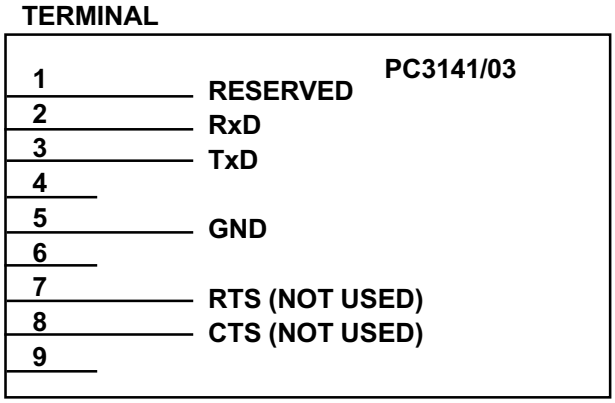
For order codes of antenna connection cables, see section 1.2.

The connection to the antenna must be done with a shielded cable.

6.2.4 Test terminal

The test terminal is connected to TERMINAL, see Figure 6.10. TERMINAL is a male 9 pin D-Sub connector.1500AO. Use cable connector D-Sub 9 female.

Figure 6.10 Test terminal connection



When the test terminal is not connected, the contact must be protected with the cover.

This connection is only intended for test purpose and is not optoisolated. This means that it should be used with care, e.g. with a short, shielded cable and should not be permanently connected.

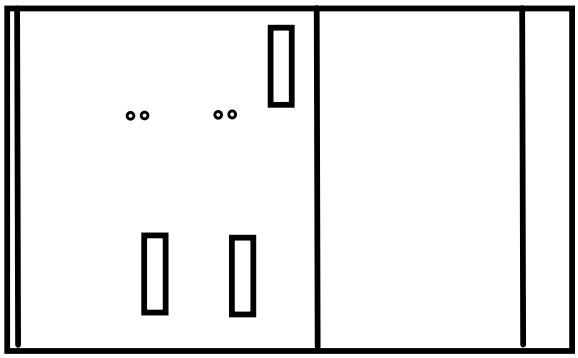
The terminal can also be used to examine the list of the most recent error codes, host communication messages and to test the communicator to a Data Tag.

7 Installation and trouble-shooting

7.1 Communicator Set-Up

The Set-Up of selectable communicator functions is done by opening the cover of the unit. This will reveal the CPU4-board that contains DIL-switches as in Figure 7.1 below.

Figure 7.1 CPU4 board lay-out



The CPU-4 board has 3 sets of DIL switches which are used to set functional options.

SW1:1
On: Object detect to be used (default)

SW1:2
On: Status to be sent automatically
Off: (default)

SW1:3
On: Extended I/O (5 inputs and 6 outputs available)
Off: (default)

SW1:4
On: Timeout option used (4 s) (default)

SW1:5
On: Delayed response (50 ms)
Off: (default)

SW1:6
On: High priority commands allowed (AP)
Off (default)

SW1:7
Off

SW1:8
Off

The use of SW2 is depending on the used communication protocol.

SW 2:8

Off: Eurox protocol used
On: 3964 R protocol used

If EUROX protocol is used:

SW2:1-5:
Communicator address

Addr	2:5	2:4	2:3	2:2	2:1
0*	Off	Off	Off	Off	Off
1	Off	Off	Off	Off	On
2	Off	Off	Off	On	Off
3	Off	Off	Off	On	On
4	Off	Off	On	Off	Off
5	Off	Off	On	Off	On
6	Off	Off	On	On	Off
7	Off	Off	On	On	On
8	Off	On	Off	Off	Off
9	Off	On	Off	Off	On
:	Off	On	Off	On	Off
;	Off	On	Off	On	On
<	Off	On	On	Off	Off
=	Off	On	On	Off	On
>	Off	On	On	On	Off
?	Off	On	On	On	On
@	On	Off	Off	Off	Off
A	On	Off	Off	Off	On
B	On	Off	Off	On	Off
C	On	Off	Off	On	On
D	On	Off	On	Off	Off
E	On	Off	On	Off	On
F	On	Off	On	On	Off
G	On	Off	On	On	On
H	On	On	Off	Off	Off
I	On	On	Off	Off	On
J	On	On	Off	On	Off
K	On	On	Off	On	On
L	On	On	On	Off	Off
M	On	On	On	Off	On
N	On	On	On	On	Off
O	On	On	On	On	On

If 3964R protocol is used:
SW2:1-3:
Block length:

Block length	2:3	2:2	2:1
16*	Off	Off	Off
32	Off	Off	On
64	Off	On	Off
128	Off	On	On
256	On	Off	Off
512	On	Off	On
1024	On	On	Off
252	On	On	On

SW2:4,5:
Character timeout:

Character timeout ms	2:5	2:4
220*	Off	Off
330	Off	On
440	On	Off
550	On	On

SW2:6,7:
Acknowledge timeout:

Acknowledge timeout s	2:7	2:6
2*	Off	Off
3	Off	On
4	On	Off
5	On	On

*Default

SW3:1

On Host 8 bits data (default)
Off 7 bits data

SW3:2

On Host Even parity (default)
Off Odd parity

SW3:3

On Parity bit used (default)

SW3:4

On Host 2 stop bits.
Off 1 stop bit (default)

SW3:5

On Host CTS signal is used.
Off: (default)

SW3:6-8:

Host baudrate:

Baud	SW3:8	SW3:7	SW3:6
150	Off	Off	Off
300	Off	Off	On
600	Off	On	Off
1200	Off	On	On
2400	On	Off	Off
4800	On	Off	On
9600*	On	On	Off
19200**	On	On	On

* Default
** Not for current loop

WT3, WT4 jumpers

WT3 present = long INTERLOCK
WT4 present = short INTERLOCK
Default is no jumper.

After any change of DIL switch or jumper settings, the communicator must be reset (power on).

7.2 Test methods and error codes

The status of the Central Unit can be observed by:

– Test terminal. A PC with a terminal emulating software can be connected to the connector TERMINAL of the PC3141/03. Here the list of the most recent error codes as well as the host communication can be observed. See below.
– LEDs on the CPU and power board show the present status on data communication and power supply.

The error code on the TERMINAL consists of 2 characters CH0 and CH1. The meaning of this code is more described in the Programmers' Manual.

CH0 Central Unit Operation status
The value 3 means that an error has been detected.

CH1 Error codes
0 Illegal file number
1 File overflow
2 Data buffer overflow
3 File protection alarm
4 High priority alarm
5 Not used, reserved for future use
6 Invalid data
7 Data Tag test failed
8 Data Tag unreadable
9 File unreadable
A Object detect alarm
B Object detect alarm, no command
C Not used
D Data Tag communication timeout
E Not used
F Initialized (“power on”)

7.3 PC program for communication test

The PC3100 product range includes a menu driven PC program for the EUROX_4 protocol PC 3100/ 90A, (CMD3120) which allows communication with the OIS-P system from an IBM compatible PC/XT/ AT personal computer, operating on DOS and having at least one serial port, configurable as “COM1” or “COM2”.

The program features three modes:

High level: Commands can be issued in a very simple way, such as “read file”, “write to file” etc. Basic system functionality is easily executed, to get acquainted with the system or for basic installation testing.

Low level: Commands are entered in low-level language, exactly as they are described in the Programmer’s Manual. The entire command list can be executed, offering, for instance the programmer, a hands-on possibility to get acquanted with the full range of user commands and command parameters.

Verifier level: Allows verification of execution reliability for user-definable communication tasks.

The user can enter a sequence of low-level commands including possible time-delays, to resemble a typical communication task and situation. The entered sequence is executed repeatedly, when Object detect is indicated “active” to the central unit. Communication reliability statistics and measured execution time (maximum, average and minimum) is continously stored and displayed.

7.4 Built-in communication reliability statistics

The PC3141/03 central units have a built-in statistics function, which keeps a count on the system’s communication reliability. The statistics count is initiated as soon as power is connected to the system and a command is received.

These communication statistics are available by connecting a VT100 (19200 baud, 7 bits, even parity, one stopbit) compatible terminal to the Terminal ports RS232 interface. The accumulated status of four different communication parameters is displayed simultaneously:

- **Successful microwave commands**
- **Unsuccessful microwave commands**
- **Successful microwave operations**
- **Unsuccessful microwave operations**

Definitions: **Microwave commands** are user commands that request communication with an Data Tag.

The execution of every microwave command requires a number of **microwave operations**.

- Every **unsuccessful microwave command** verifies that a user request for any reason was not executed, i.e. a reading or a writing task was not performed. An investigation of the Data Tag and/or Communicator in question should be undertaken.

- An **unsuccessful microwave operation** does not verify that any communication between user system and Data Tag has failed. It only states that a greater number of microwave operations that the theoretical minimum was needed to execute the requested communication task. The installation should however be made and verified in such a way that the number of unsuccessful microwave operations are as insignificant as possible compared to the successful ones. This way, a highly reliable communication point is ensured.

The stored **statistics will be erased** as power to the central unit is shut off. A new statistics count will automatically start when the power is switched on again.

All counters are limited to 65 535 (then restart from 0).

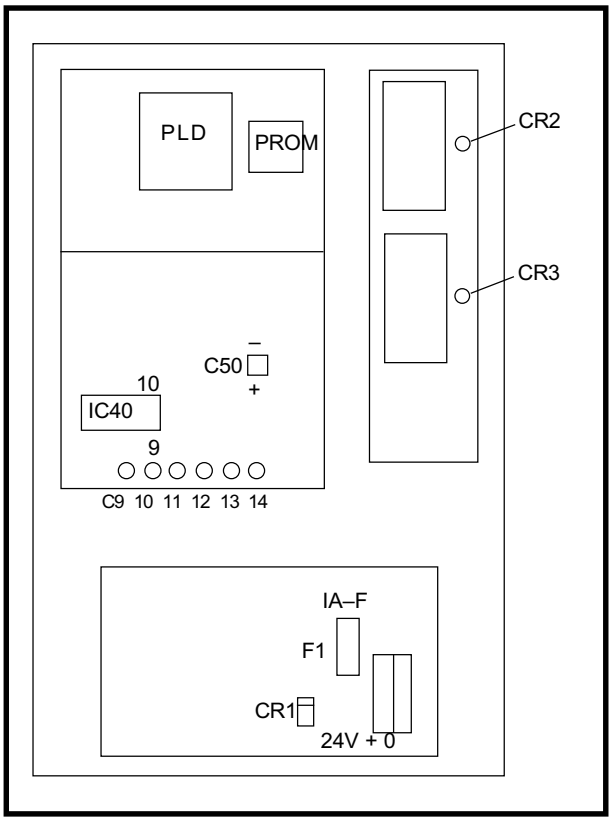
7.5 Internal inspections and tests

7.5.1 General

If the investigations in the previous sections is not sufficient to find the cause of a problem or if the communicator does not operate at all an internal inspection is required to find out if there is a connection error or if any main part of the communicator fails.

The Figure 7.3 shows an internal view of the communicator. The main parts are the Connector Board (down), the CPU Board (left) and the Power Board (right).

Figure 7.3



7.5.2 Connector Board and fuse

The power to the unit is supplied via the connector (down right), the protection diode CR1 and the fuse F1.

The type of fuse is: Fast 1 A, 5 mm * 20 mm.

7.5.3 LED indications

The positions of the internal LED's are shown in Figure 7.3.

CR2 and CR3 show the power status and CR9 to CR14 show the status of the host and antenna communication.

LED	Description
CR2	Electronics supply voltage OK
CR3	Antenna voltage OK
CR9	CPU is running
CR10	Object detect is active
CR11	Host receive signal
CR12	Host transmit signal
CR13	Antenna transmit signal
CR14	Antenna receive signal

Table 7.a

7.5.4 Power Board

The power board contains power supplies for the internal electronics, the antenna and the host communication current loop transmitter.

Figure 7.4 and 7.5 show the recommended measuring points and table 7.b the specified voltage values.

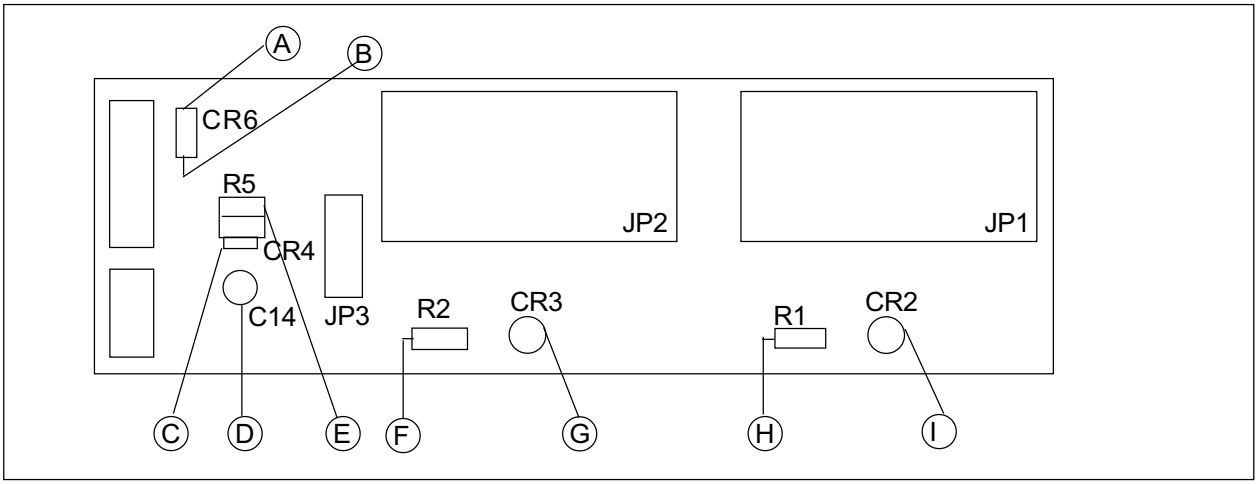


Figure 7.4

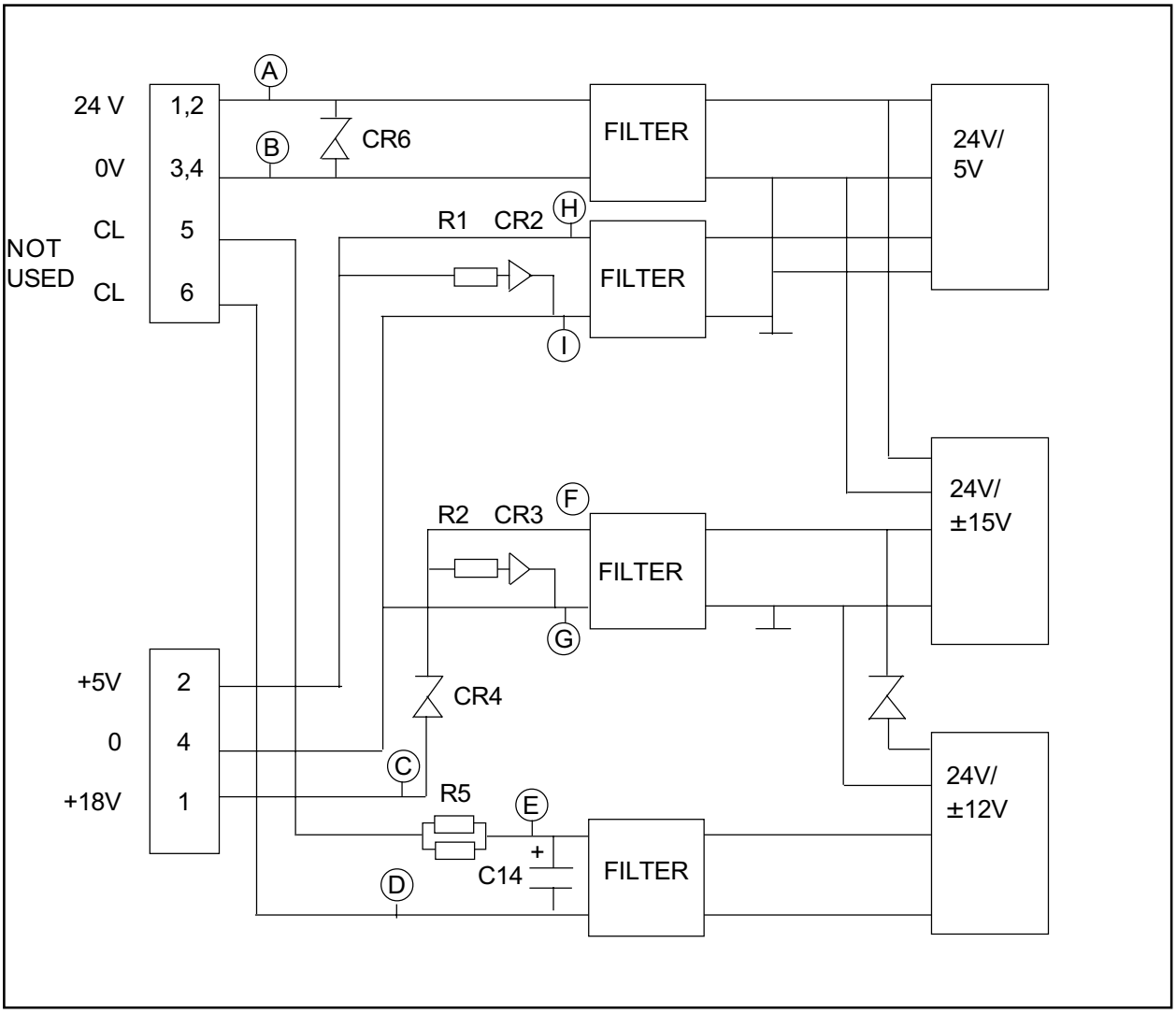


Figure 7.5

Points	Description	Voltage value
A - B	External supply	+24 V
C - G	Antenna voltage	+18V +/- 0,5 V (with antenna connected)
E - D	Not used	+24V +5/-2V
F -G	Antenna supply	+ 30V +/- 0,5V
H - I	Electronics supply	+5V +/- 0,1 V

Table 7.b

Figure 7.6 shows the power supply connection circuit with the protection diode CR1 and the fuse F1.

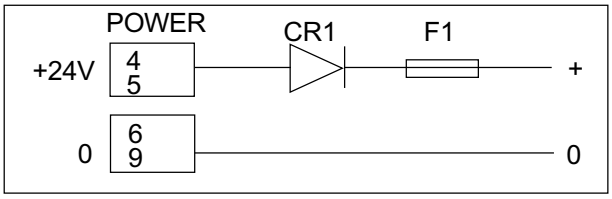


Fig 7.6

7.5.5 CPU Board

The Figure 7.3 shows the CPU Board in the upper left corner.

The upper part of the figure shows the position of the PROM and PLD which may have to be replaced in the case of a system upgrade.

The Figure 7.3 also shows two voltage measuring points:

- Insulated external I/O supply: measure 24V between IC40:9 and IC40:10 (if this voltage is connected).
- CPU supply voltage: measure 5 V between C50 + and C50 -

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8 Technical Data

8.1 Communication parameters

Compatibility
Compatible with 8 kbyte Data Tags PC3104/32A,/22A and PC3105/00D. Data Tag format not compatible with earlier PC3100/00.

Communication range
Depending on antenna type used, 0 to 2 meter for PC3114/00A and 0 to 4 m for PC3114/01A in free space, see figure 2.1. It is always recommended to only utilise 50 to 75% of the range in free space due to influences in the actual installation.

Communication speed
(Antenna to tag)
See table in chapter 2.

Communication protocol
EUROX_4
3964R

8.2 Mechanical specification

Weight
3,8 kg

Size
300 x 200 x 85 mm

Casing material
Steel

Casing integrity
IP41
IP65 with extra protection for connectors ref. IEC 529

Colour
Grey

Mounting
by means of 4 mounting flanges for M8 bolts.

8.3 Electrical specification

Power supply
18 to 36 VDC

Power consumption
10 W maximum (operation)
Startup current 6 times higher
6 W maximum (idle mode)

Digital inputs
24 V AC or DC, 15 mA, optoisolated.

Digital outputs
24 V DC, 60mA, optoisolated.

Interfaces
Host (optoisolated)
RS 232 (150-19200 baud)
RS 485 (150-19200 baud)
Current loop (20 mA) passive (4800,9600 baud)
Terminal (not optoisolated)
RS232 19200 baud 7 bit, Even parity, 1 stopbit

Connectors
One connector for power (D Sub 9 male)
One connector for serial communication (D Sub 15 male)
One connector for test terminal (D Sub 9 male)
One connector for antenna (D Sub 9 female)
One connector for digital I/O (D Sub 15 female)

Frequency
2,45 GHz

Emitted power intensity
Max 25 µW/cm^2 at 0 cm distance from the unit.
Max 1,5 µW/cm^2 at 100 cm distance from the unit, for PC3114/00A.
Max 4 µW/cm^2 at 100 cm distance from the unit, for PC3114/01A.

8.4 Cable specifications

Host connection cable

Depending of the interface chosen the cable with the following specification must be used :

Common data :

Max AWG	24 AWG
Min copper area	0.22 mm^2
Design	Twisted pairs, **Note 1**
Shielding	Per pair
Nominal impedance	100 Ohm
Maximum diameter	12 mm
Minimum diameter	8 mm
Number of wires	2 x 2 (twisted pairs) **Note 1**
Voltage rating	150 V

Cable for **current loop** interface

Maximum length	1000 m
Nominal capacitance between conductors	28.5 pF/m
Recommended cable type	**Belden 9184**

Cable for **RS-485** interface

Maximum length	1200 m
Nominal capacitance between conductors	50 pF/m
Recommended cable type	**Belden 9729**

Cable for **RS-232-C** interface

Maximum length	15 m

Note 1. For RS232: 5 separate wires.

Antenna cable

The connection to the antenna must be done with a shielded cable. Available Premid Antenna cables and connectors are listed under “accessories” in section 1.2 Cable specification is as follows:

Common data :

Max AWG	24 AWG
Min copper area	0.22 mm^2
Maximum diameter	8,5 mm
Minimum diameter	7,8 mm
Design	Twisted pairs
Impedance +/- 20%	120 Ohm
Shielding	Common
Temperature rating	70°C
Voltage rating	30 V
Nominal capacitance between conductors	50 nF/1000m
DCR of conductors	80 Ohm/1000 m
Number of wires	4 twisted pairs. **Note**
Maximum cable length	100 m
Cable type	Belden 9831, DUE 4404 (DUE 7065), Pirelli, Dataflex 55
Recommended cable	PC 3017/02A

Note: Two pairs for power supply must be connected in parallel to achieve the following specification:

Total DC resistance	max 8 ohm (loop)
DC resistance	max 40 ohm/Km
Copper area	min 0,44mm^2

Terminal cable

For connection of the terminal a cable with the following specification must be used :

Max AWG	24 AWG
Min copper area	0.22 mm^2
Shielding	Common
Maximum diameter	12.0 mm
Minimum diameter	8 mm
Maximum length	3 m
Number of wires	3

Digital inputs/outputs cable

Max AWG	24 AWG
Min copper area	0.22 mm^2
Maximum diameter	12.0 mm
Minimum diameter	8 mm
Maximum length	100 m
Shielding	Common

Other parameters as the cable length, number of pairs, DC resistance etc. must be chosen according to the application requirements.

All cables.
Metal housing connected to shield and ferrite close to Central Unit is required.

8.5 Environmental specification

Temperature range

-40 to +70 °C (storage)
+5 to +40 °C (operating)

Vibration

Sine: ±0.35 mm 10-60 Hz,
1g 60-150 Hz
in ± 3 axis.
Ref.: IEC 68-2-6 Test Fc

EMC

According to pr ETS 300339 including:

Emission	EN550022, class B
Immunity	ENV 50141 80-1000 MHz
	3V, AM 80% at 400 Hz
EFT/burst	IEC 801-4 2 kV
ESD test	IEC 801-2 4/8 kV

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Notes

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