

SOLID PROTOCOL INTERFACE CONTROL DESCRIPTION

Revision Record:

Date	Description	Written by	Rev.
12/01/2005	Initial release	Eyal Katz	1.00
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1. SCOPE

The purpose of this document is to provide the specific definitions for Solid Protocol i.e. ICD (Interface Control Document). The following proprietary protocol is based on RS232 or RS485 layer and it's implemented on SmartScan25 and SmartScan50. The basic concept is a Master Slave configuration i.e. The SmartScan unit will send data only upon a specific Master request.

2. GENERAL CONFIGURATION

- **Communication configuration:**

The SmartScan unit has the following constant definitions for the RS232 or RS485 layer:

Baud Rate:	9600
Start Bit:	1
Data Bits:	8
Parity:	none
Stop Bit:	1
Comm. Type:	RS232 or Rs485 (Manufacture configuration)

Thus any External Master application must use the same definitions. It is important to check the factory (Manufacturer) configuration with the technical support department for each unit.

- RS485 infrastructure enables the user to work in multi-drop configuration. In this case there is one master and up to 10 available slaves that are addressed by the Master. The SmartScan, as a slave must be configured to function on RS485 comm. by specific manufacturer adaptations and the user must configure the specific address for the unit. RS232 is a point to point application i.e. One master and one slave.
- The master application can be any software implementation base on any platform such as PC.
- There are 4 types of specific command that can be sent by the Master application.
- Each command will be responded by the SmartScan Unit (slave).
- The SmartScan units that are sent through the Solid Protocol are in the Metric system and Celsius Temperature.

Diagram of Solid protocol over RS485 configuration

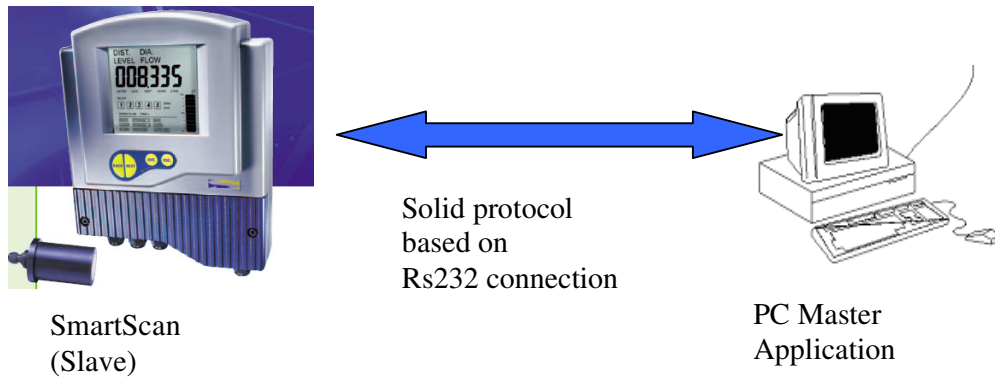
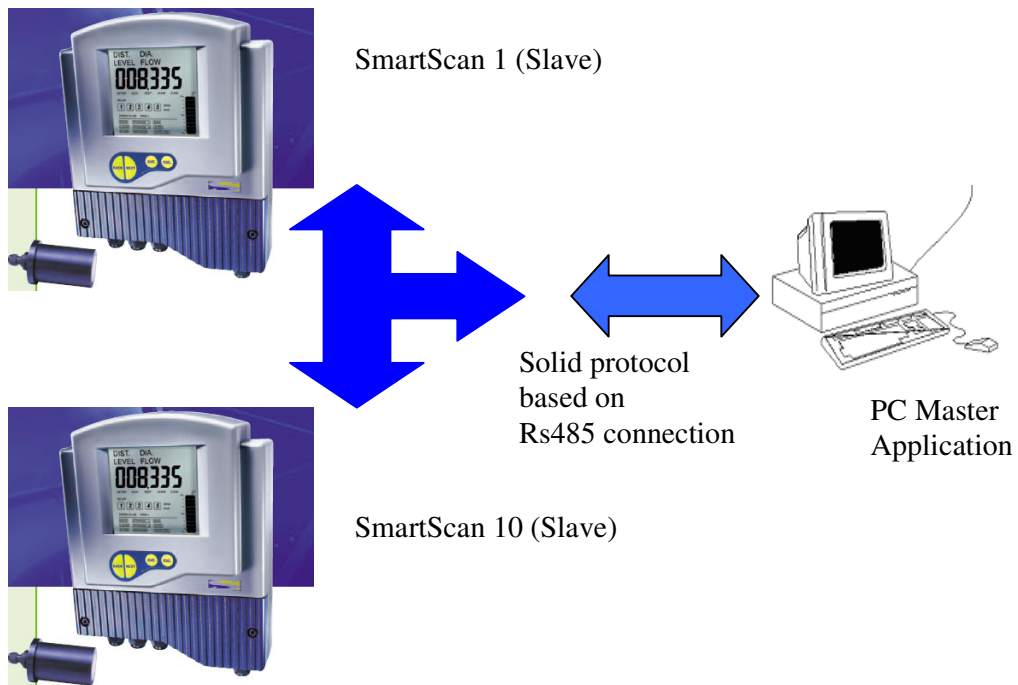


Diagram of Solid protocol over RS485 configuration



3. MASTER DATA REQUEST FORMAT

The following message structure is sent from the External Master to the SmartScan device via RS232/RS485 connection.

The following data is requested by the following message:

Num	Field description	Number of Bytes	Byte Value
1.	Start symbol	1 byte	”!”
2.	Target Device Address	2 byte	Variable
3.	Sensors Addresses	1 byte	0 – Sensor Number 1 1 – Sensor Number 2 2 – Sensor Number 3
4.	Protocol Version	1 byte	“2”
5.	Data Size	2 bytes	Variable
6.	Parameter Type	2 bytes	Variable
7.	Data	Depend on Data Size (2 bytes minimum)	Variable
8.	Checksum	2 – Bytes	This is the sum of all the bytes from the start Symbol until the Checksum (not included)
9.	End symbol	1 byte	CR (Carriage Return)

Remarks:

For details please refer to section 5.0 below.

4. SLAVE DATA REPLY FORMAT

The following message structure is sent from the SmartScan to the Master application as a response to the master request.

Num	Field description	Number of Bytes	Byte Value
1.	Start symbol	1 byte	"!"
2.	Target Device Address	2 byte	Variable
3.	Sensors Addresses	1 byte	0 – Sensor Number 1 1 – Sensor Number 2 2 – Sensor Number 3
4.	Protocol Version	1 byte	"2"
5.	Data Size	2 bytes	Variable
6.	Parameter Type	2 bytes	Variable
7.	Data	Depend on Data Size) 2 bytes minimum	Variable
8.	Device Status (indicates a problem with the unit)	1 byte	Variable
9.	Checksum of the all bytes to allow error detection	2 bytes	This is the sum of all the bytes from the start Symbol until the Checksum (not included)
10.	End symbol		CR (Carriage Return)

Remarks:

For details please refer to section 5.0 below.

5. DETAILED FIELD DESCRIPTION

The following field description refers for the message request (section 3 above) and responds (section 4 above).

1. Parameter Type and Data

Parameter Type Value	Field Description	Number of associated Data Bytes	Units and Resolution Of Data bytes
1	Distance	6 bytes	Meter (resolution of millimeters)
4	Temperature	3 bytes	Celsius
6	Tank height	6 bytes	Meter (resolution of millimeters)
9	Level	6 bytes	Meter (resolution of millimeters)

2. Device Status

Indicates on a problem with the unit:

- 0 - OK
- 1 - Tank Full
- 2 - Tank Empty
- 3 - Noise
- 4 - Sensor is working at noise conditions

3. Protocol Version

Protocol Version - "2"

4. Checksum

The checksum is based on the sum of all the bytes from the start Symbol until the Checksum (not included).

5. Target Device Address

Should contain the same value as was configured to the inquired SmartScan device (The Master can inquire up to 10 devices).

The Device Address in the Target is configured via Distributor Menu program 4. (Values range is 0-9).

6. Sensors Addresses

For Single Sensor application always use the 0 value.

6. EXAMPLES

1. Master request command for Distance

<u>Byte Num</u>	<u>Value</u>	<u>Description</u>
(1)	"!"	Start symbol
(2)	"08"	Target Device Address
(3)	"1"	Sensors Addresses
(4)	"2"	Protocol Version
(5)	"02"	Data Size
(6)	"01"	Parameter Type
(7)	"00"	Data
(8)	"14"	Checksum
(9)	CR	End symbol

2. SmartScan (Slave) Response with Distance

This example is for distance of 3000 mm.

<u>Byte Num</u>	<u>Value</u>	<u>Description</u>
(1)	"!"	Start symbol
(2)	"08"	Target Device Address
(3)	"1"	Sensors Addresses
(4)	"2"	Protocol Version
(5)	"06"	Data Size
(6)	"01"	Parameter Type
(7)	"003000"	Data
(8)	"0"	Device Status
(9)	"21"	Checksum
(10)	CR	End symbol

3. Checksum calculation example

The following example calculate the checksum for the above Smart Response

CHECKSUM =

$$(0+8+1 \text{ (Target Device Address and Sensors Addresses)}) + (2 \text{ (Protocol Version)}) + (0+6 \text{ (Data Size)}) + (0+1 \text{ (Parameter Type)}) + (0+0+3+0+0+0 \text{ (Data)}) + (0 \text{ (Device Status)}) = \mathbf{21}$$