



PSM INSTRUMENTATION LTD

# **Ict 1000 & RFM Series**

## **Network Manual**

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Doc Ref: Man 052e 31/10/2013



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## 1.0 Intended Use

The RFM 1 & 4 units provide convenient termination points for the ICT Transmitter. They provide connections for power and digital signal cabling, and “pass through” connections for simple multi-drop network creation.

When partnered with PSM,s RFM-ISR units, a network with intrinsic safety compliance, can also be provided.

## 2.0 Safety Instructions

To prevent any damage to the device or any injury to the user it is essential that you read the information in this document and observe all applicable national standards and safety requirements.

This document is provided to help establish the safe and efficient operation of the network, but compliance with local regulations are the responsibility of the installer.

### 2.1 Symbol Convention

The following symbols are used to highlight information that must be followed to ensure the safe and efficient operation.



A hazard indicates actions or procedures which, if not performed correctly may result in personal injury or cause damage to the instrument or associated instruments and invalidate safety certification



A warning indicates actions or procedures which, if not performed correctly may result in damage to the instrument.



A caution indicates actions or procedures if not performed correctly may cause incorrect function or loss of information



Information on Statutory directives and standards

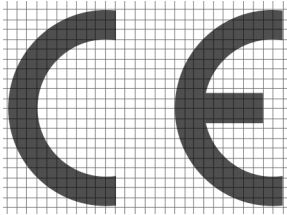
## 3.0 Scope of Delivery

A network arrangement may contain various instrumentation types. Refer to the individual manuals for each instrument for full and specific installation and set up instructions

## 4.0 Certification



PSM's continual commitment to product improvement and customer satisfaction, means the instrument described in this manual has met and exceeds the following requirements



### **EMC Directive 2004/108/EC**

- BS EN 61326-1:2006
- BS EN 61326-2-3:2006
- BS EN 61000-6-2:2005
- BS EN 61000-6-4:2007

### **Low Voltage Directive 73/23/EEC**

- BS EN 61010-1:2001

### **ATEX Directive 94/9/EC**

- EN 60079-0:2006
- EN 60079-11:2007

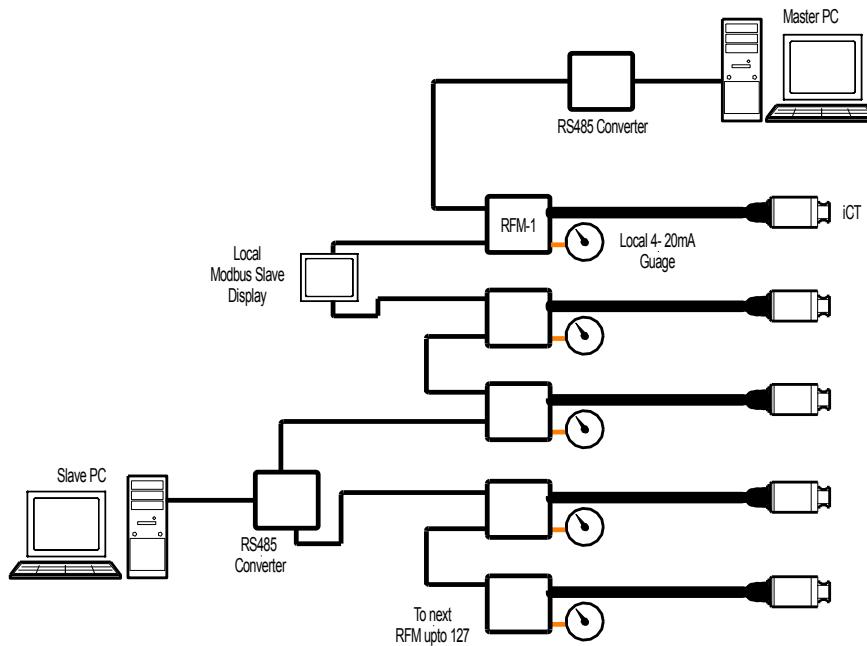
### **Marine Environment**

Environmental testing as required for Marine Type Approval laid out in IACS Unified requirement E10 and the relevant sections of IEC945.

## 5.0 Network Installation

Overview of a typical network (Safe Area application)

An ict and RFM network employs standard RS485 interconnection and can be installed in various configurations, Following are the principles that must be applied.



## 5.1 Network Operation

Network Protocol is Modbus RTU

A network can only operate with one MASTER.

The MASTER controls the network by interrogating each connected ict in sequence and then sending the appropriate information to be displayed on any SLAVE displays also on the network.

Only RS485 Modbus devices, with matching communications settings, can be used on the network.

## 5.2 Modbus ID

Each device installed on the same network must be set to a unique Modbus ID. This includes the Master device, ict's, Local digital display's, and any Slave PC's, all must be different.

PSM recommends that configuration of each units ID is done "offline" i.e. before it is connected to the network. Connecting more than one unit with the same ID will result in bus contentions and loss of communication.

## 5.3 Power Supply

The power supply should be rated for continuous operation and rated appropriately for the current consumption of the entire network.

Maximum current consumption of an ict is 23mA. i.e. 23mA multiplied by the number of ict on network will give maximum ict current consumption for the network.

23mA takes account of local gauges when connected through the RFM-1. When the ict is used in Digital only mode, i.e. it's 4-20mA signal is disabled then current consumption is lower, at 4mA maximum.

The maximum consumption of any other devices connected on the network and powered from the 24V DC supply must also be included in the calculation

Where a complete network solution has been provided by PSM the appropriate power supply would be supplied or recommended.

## 5.4 Network Cabling

Industry standards recommend that the total communications loop cabling should not exceed 1200 Metre.

This figure includes the ict cable. For example:

2 x ict with 80 metres cable + 3 x ict with 25 metres cable

Total ict cable is 235 metres, leaving 965 metres for connection between all other devices.

Both Power (24V DC) and data (RS485) may be run in the same overall cable but the data conductors must be twisted pair configuration. Power conductors may be twisted or an untwisted pair and the cable must have an overall braided screen.

PSM also recommends a minimum conductor size 0.5mm and stranding to BS6360/IEC60228 class 5.

## 5.5 Termination Resistors

120 Ohm Termination resistors are used to prevent unwanted reflections of data signals. Where reflections are present they can distort the valid signals and cause communications failure.

This resistor is connected between the A & B conductors. The need for termination resistors will vary from network to network depending upon other factors. It is suggested that initially they are not used and the quality of communication on the network is first established.

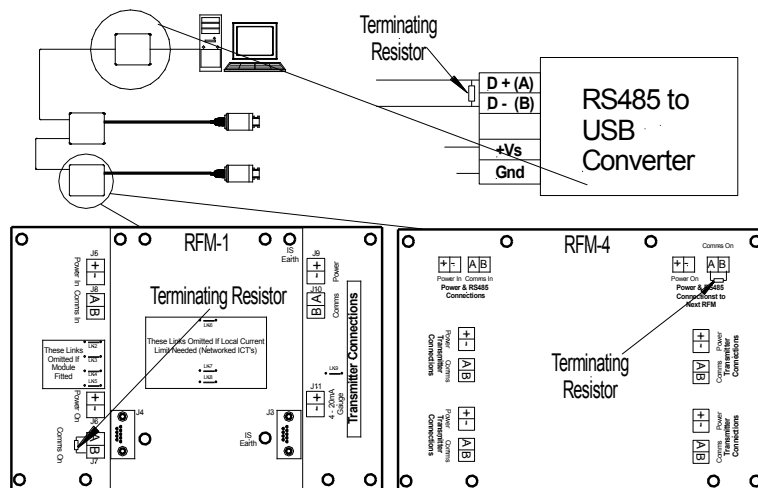
The ict configuration utility provided free of Charge by PSM includes functions to test the quality of communication / network performance. Refer to **PSM Manual MAN 053** For further information

If poor network performance is experienced then a terminating resistor should first be added to the receiving end (Master end) of the network and re-tested. If performance is still poor add a further resistor at the extreme end of the network.

**Note:** RS485 is a point to point multi-drop configuration and as such does not need to be configured as a "loop". However, cabling the network so that it forms a complete loop where both "ends" terminate at the master device (or safety barrier as appropriate) so that it forms a loop may be preferred in some cases as it provides redundancy for connections meaning a single break in the cable does not result in partial or full loss of communications

When a network is installed as a complete loop and poor network performance is experienced add one at the receiving end.

Please contact PSM or Agent for further advice. if the performance remains poor after all of the above steps.





## 6.0 Electromagnetic Compatibility

To maintain compliance with the EMC standards this instrument has been tested to the below information should be followed.

- The termination enclosure **MUST** be earthed
- The ict body **MUST** be earthed
- The overall braid for both the ict cable and the Signal / power cable **MUST** be terminated in the entry gland of the termination enclosure

## 7.0 Intrinsically Safe Installations

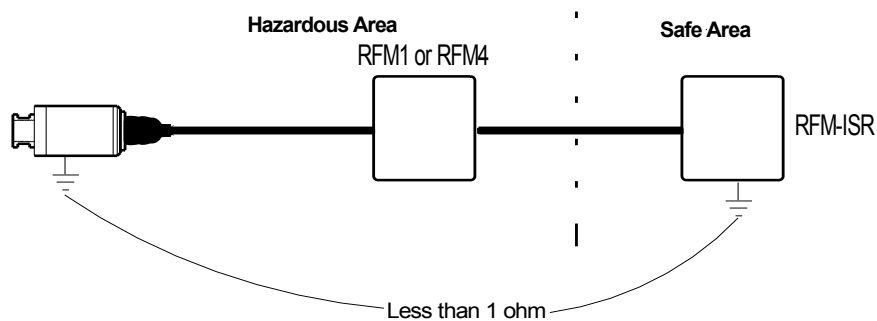
The intrinsically safe version of the ict is covered by the following certification for use in hazardous areas.

### Approval Certification

**Certificate number**      ITS09ATEX26339X - ict  
   ITS09ATEX26414X - RFMIS-R Barrier  
   ITS09ATEX27051X - RFM Termination Unit

Refer to individual manuals for specific details regarding certification

ict - MAN049  
RFMIS-R Barrier - MAN072  
RFM 1 - MAN050  
RFM 4 - MAN073



### Installation Requirements

- The following standard should be followed when carrying out a hazardous area installation. **60079 Part 14**
- Shall be connected to a dedicated IS Earth or to the Equipotential Bonding System, which shall extend over the entire area of the installation

Intrinsically Safe devices protect lives and property. PSM Instrumentations Equipment has been designed with **NO** user replaceable parts.

**Strictly No Modifications or user repairs are allowed**

If any problems occur with the equipment contact PSM Instrumentation or Agent

## 7.1 Intrinsically Safe Installations



The following guidance **MUST** be followed to ensure the correct operation and safe use of an Intrinsically Safe Installation.

### **RFM Termination**

To enable networks of multiple ict's, the RFM provides local current limiting of the ict. To configure this ensure appropriate links are removed within the RFM unit

Refer to specific product Manuals for details of the links

- **RFM 1 - MAN050**
- **RFM 4 - MAN073**

### **Network**

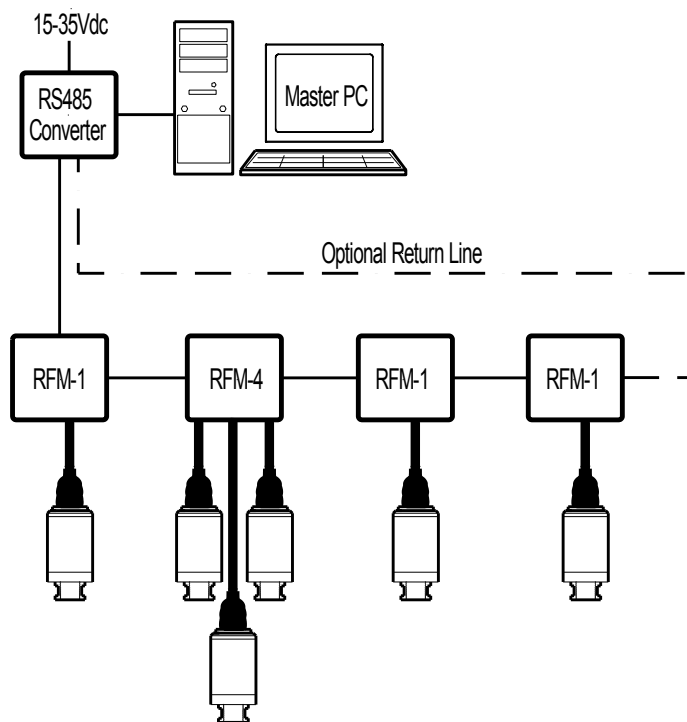
- When installing a network make sure that the overall maximum load does not exceed the safety (maximum current) rating of the RFM-ISR Barrier. Which is 315mA
- Too many devices connected via a single barrier will cause it to blow.

**Note:** Where the ict's also have 4-20mA enabled for local indicators the total quantity of ict's per Barrier is reduced.

## 8.0 Typical network Configurations

### 8.1 Non Intrinsically Safe Digital Only Installations

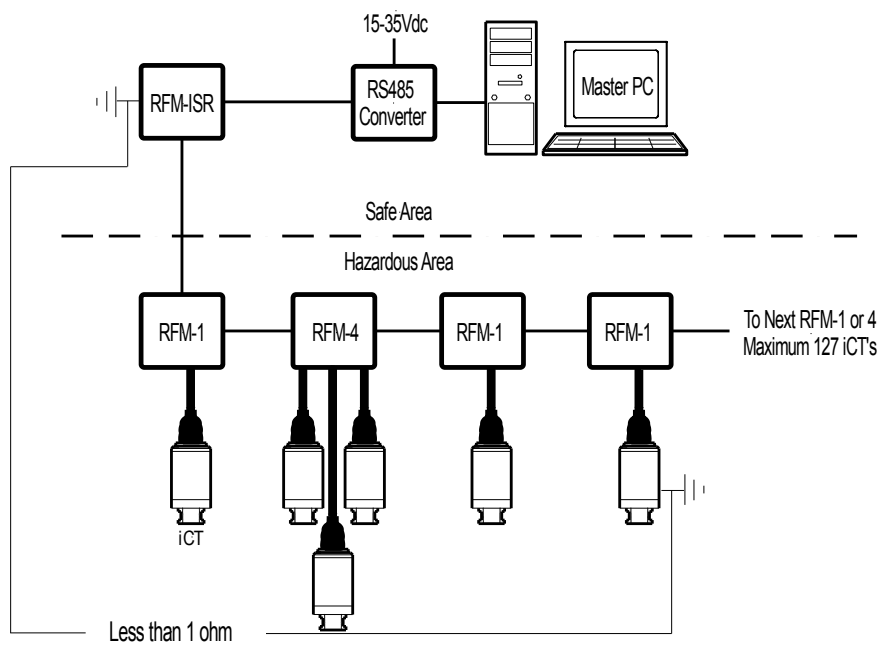
Power and data cable are passed from one RFM1 (or RFM4) module to the next. For redundancy the network can be configured as a loop where the power and data cable returns to the PC's RS485 converter from the furthest RFM on the network.



## 8.2 RFM-ISR Intrinsically Safe Digital Only Installations

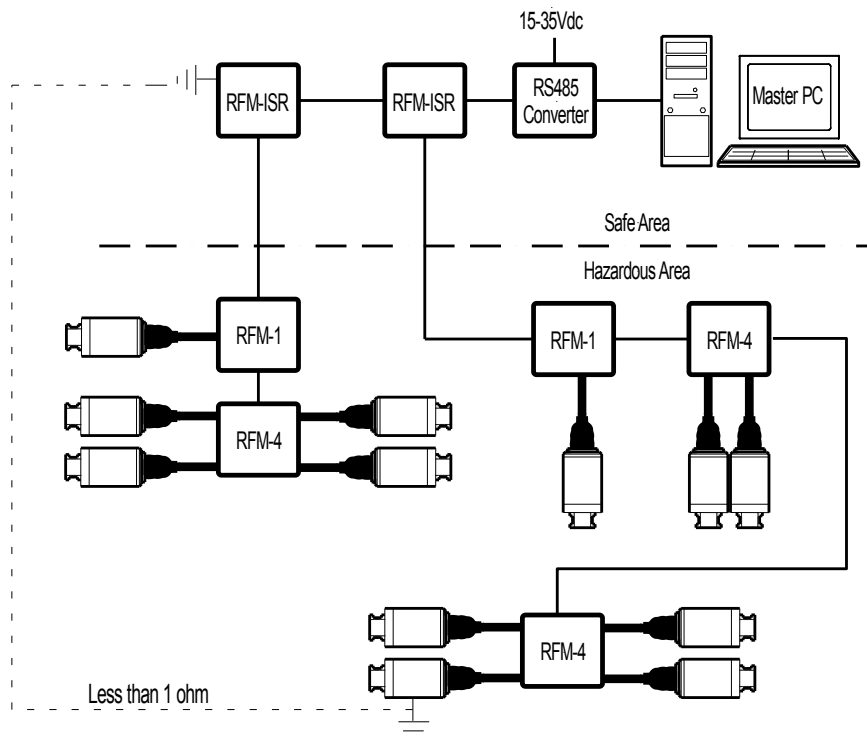
The network depicted below employs a single RFM-ISR Barrier to protect all ict transmitters. As detailed in section 7.0.1 the total load of all connected instruments must be calculated to ensure that one RFM-ISR is sufficient

**Note** that the system requires an equipotential earth with a resistance of less than 1 ohm between RFM-ISR and ict earth



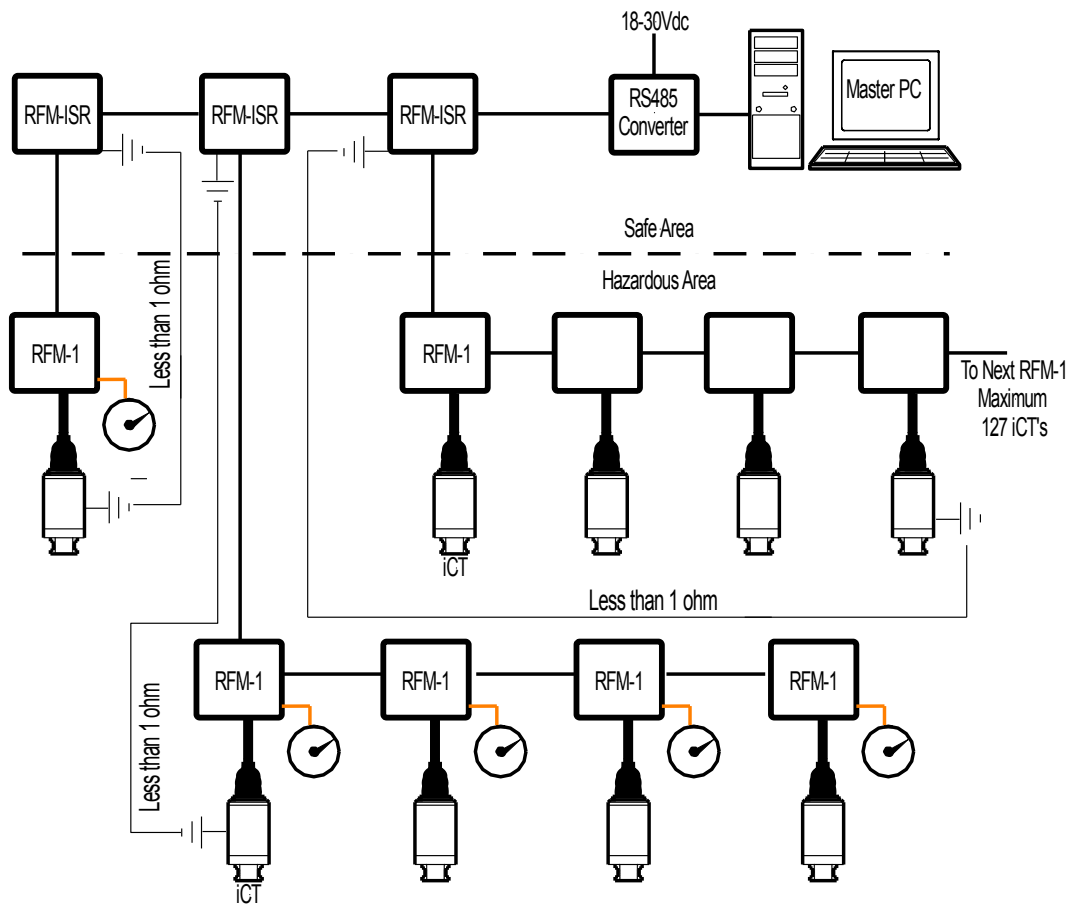
### 8.3 Multiple RFM-ISR Intrinsically Safe Digital Only Installations

For large digital only networks it may be necessary to employ more than one RFM-ISR as shown below.



### 8.4 RFM-ISR Intrinsically Safe Digital & Analogue Installations

This will normally require multiple RFM-ISR Barriers to ensure that the load in any one leg of the network does not exceed the permitted current limit. Refer to section 7.0.1 for guidance regarding current limits.





**PSM WEEE Producer Registration No WEE/HC0106WW**

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