# IT900
# External Interface
# Connections

## February 2011

**IT900-AN-003-R1.1**

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# 1. Introduction

The *IT900 External Interface Connections* Application Note is provided to allow developers a quick understanding of the IT900 Interfaces that need to be considered during the design phase in Protocol Controller Architecture. It should be noted that this document provides only basic details about each interface and it is required to refer to the *IT900 Data Sheet* for further details.

The IT900 provides Digital and Analog interface connections.

The functionalities of all digital interfaces described in this document are relevant for Protocol Controller Architecture developers as the I/O functionality is fixed in this mode; some of these interfaces are mandatory (i.e. UART, Reset, etc.) and others are optional.

The Analog interfaces described in this document are mandatory.

# 2. IT900 PINOUT

The following diagram shows the IT900 PINOUT:
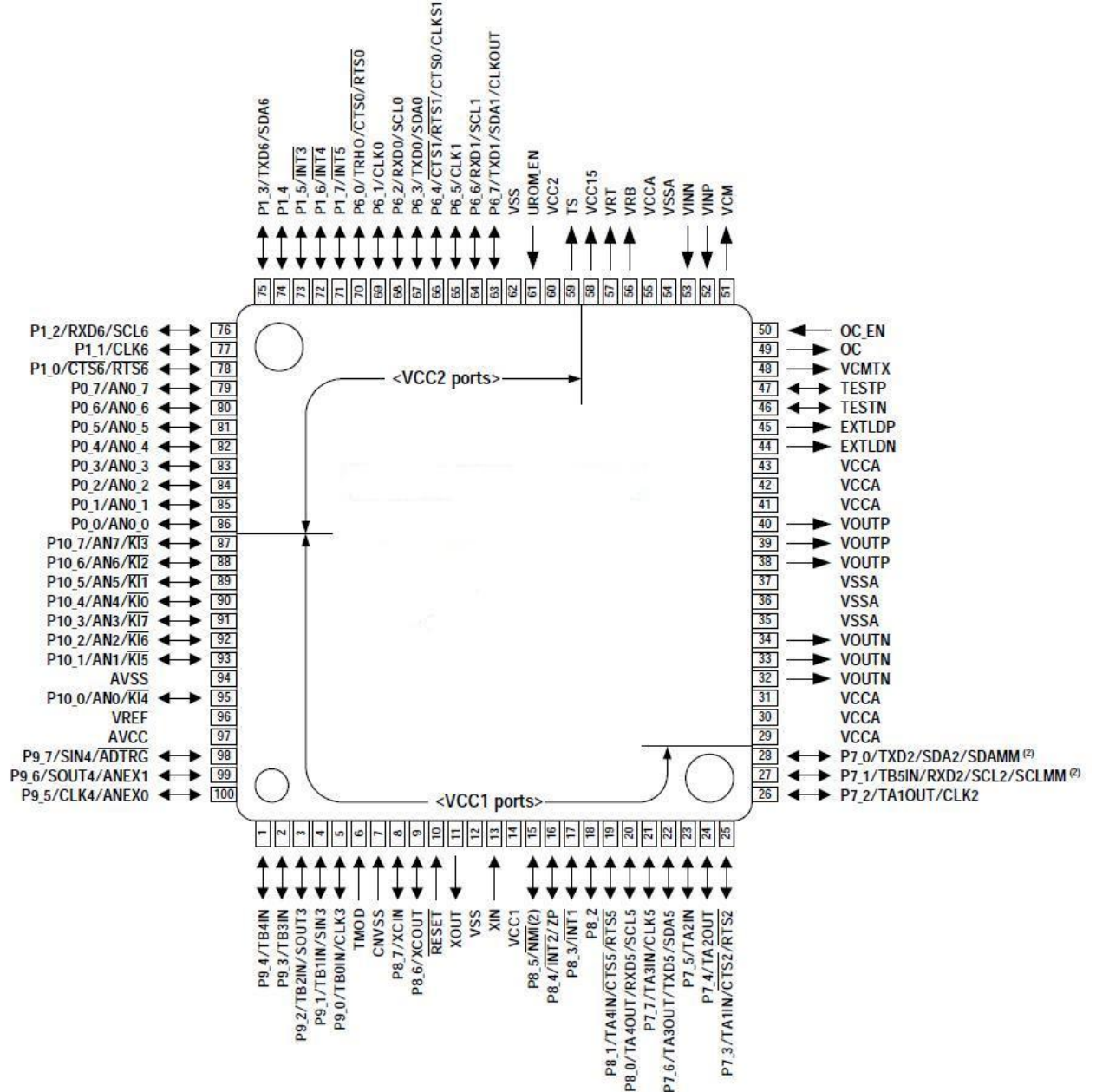


**Figure 1: IT900 Pinout**

# 3. Digital Interfaces

## 3.1 Digital Interfaces Summary

The following table summarizes the IT900 digital interfaces. Each digital interface is marked as Mandatory (**M**), Optional (**O**) or Recommended (**R**). In addition, the table below separates NC (Network Concentrator) and RS (Remote Station) devices.

| Interface | Protocol Controller | | Section |
|---|---|---|---|
| | *NC* | *RS* | |
| *UART* | M | M | 3.2 |
| *Reset* | M | M | 3.3 |
| *Activity* | R | R | 3.4 |
| *Safe Mode* | R | R | 3.5 |
| *IT900 (JTAG) Programmer* | O | O | 3.6 |
| *Eeprom* | M | R | 3.7 |
| *Leds* | O | O | 3.8 |

## 3.2 UART Interface

The following figure shows IT900 UART pins connection to Host controller.
These connections are **mandatory when working in Protocol Controller mode**.
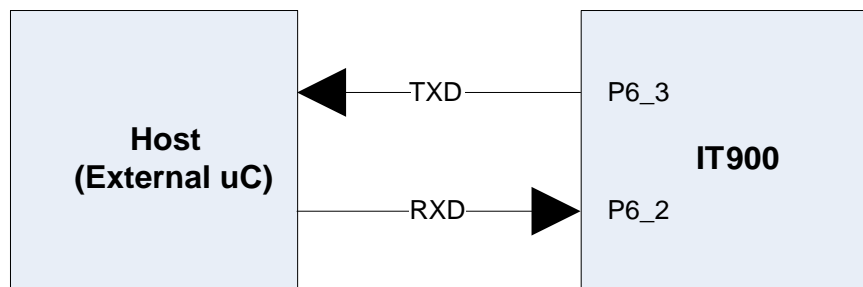


**Figure 2: IT900 UART Pins Connection to Host Controller**

The UART interface pins are listed in the table below:

**Table 1: UART Interface Pins**

| Pin Name | IT900 Pin Number | Interface Function | Description |
|---|---|---|---|
| P6_3 | 67 | TXD | UART data output (IT900 → Host) |
| P6_2 | 68 | RXD | UART data input (Host → IT900) |

The communication default parameters of the UART host interface are set to the values listed in the table below:

<p align="center">**Table 2: UART Interface Default Parameters**</p>

| Parameter | Value |
|---|---|
| Communication Rate [bps] | 960000 or 38400 |
| Data [bits] | 8 |
| Parity [bits] | 0 |
| Stop [bits] | 1 |
| Flow Control | Off |

**Fast/Slow UART baud rate select**

uC which don't support fast UART baud rates may select slow baud rate mode. The selection between Fast and Slow rate is preformed using P6_0 (pin 70) as detailed below:

P6_0 = '1': Fast baud rate (default value is 960000)

P6_0 = '0': Slow baud rate (default value is 38400)

## 3.3 Reset PIN

The following diagram shows IT900 Reset pin connection to Host controller.
This connection is **mandatory when working in Protocol Controller mode**.
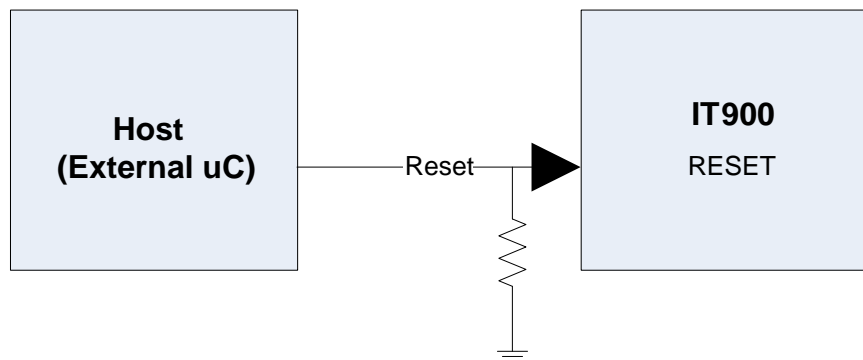


<p align="center">**Figure 3: IT900 Reset PIN Connection to Host Controller**</p>

The Reset pin is listed in the table below:

<p align="center">**Table 3: Reset Pin**</p>

| Pin Name | IT900 Pin Number | Interface Function | Description |
|---|---|---|---|
| RESET | 10 | RESET | RESET (active low) |

## 3.4 Activity Pin

It is recommended to implement firmware activity monitoring logic by periodically polling the External Host Interface using NOP command, and verifying correct response from the IT900. If no response is received from the IT900, the Host should issue a reset sequence.

For devices that require very high reliability, the IT900 provides an "activity monitor" Pin (P1_0), that may be used by an external circuitry to monitor correct operation. This pin generates pulse (1 mS width - active high) every $0.8 \pm 0.1$ seconds for all bands, except for CA2 that generates pulse every $1.2 \pm 0.1$ seconds.

If the pulse is not generated for more than 1.7 sec, then the IC should get a reset sequence. The monitoring circuitry may be implemented by watchdog element.

The following diagram shows IT900 Activity pin connection to Host controller:
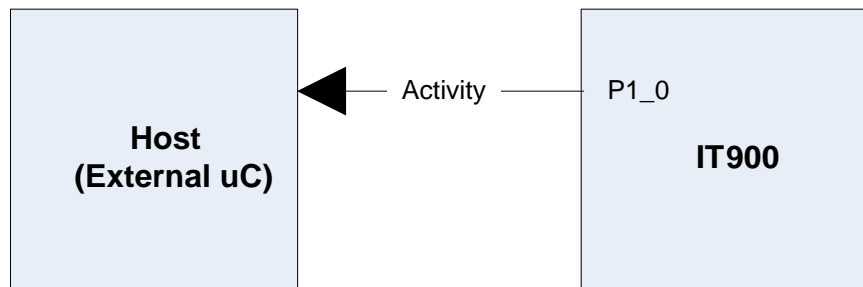


**Figure 4: Activity Pin Connection**

The following table details the IT900 Activity pin:

**Table 4: Activity Monitoring Pin**

| Pin Name | IT900 Pin Number | Interface Function | Description |
|:---:|:---:|:---:|:---:|
| P1_0 | 78 | Activity | Activity Monitor |

## 3.5 Safe Mode

As part of the startup sequence after reset, IT900 loads parameters stored in the NVM (non-volatile memory). The host application may inadvertently set the values of the parameters therefore causing a bad startup sequence of IT900, which may result in repeated resets. Safe mode enables IT900 to startup using the default parameter values stored in the firmware, thus guaranteeing successful completion of the startup sequence. The Safe Mode startup sequence is set through P1_4. See the *IT900 Data Sheet* for more details about Safe Mode procedure.

The following diagram shows IT900 Safe Mode connection to Host controller:
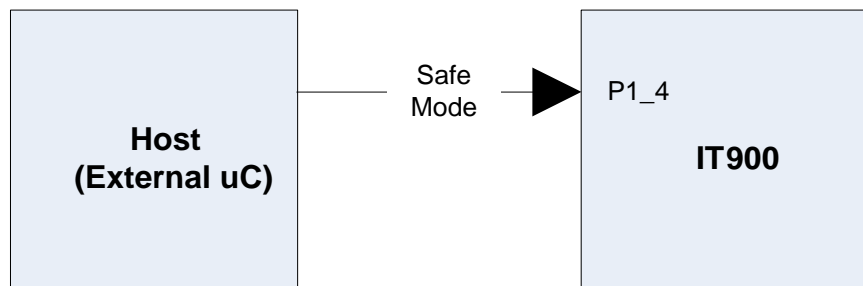


**Figure 5: Safe Mode Pin Connection**

The following table details the IT900 Safe Mode pin:

**Table 5: Safe Mode Pin**

| Pin Name | IT900 Pin Number | Interface Function | Description |
|----------|------------------|--------------------|-------------|
| P1_4 | 74 | SM | Safe Mode (Active Low) |

## 3.6  IT900 Emulator Interface

The IT900 Emulator allows FW download to the IT900.
The following table details the IT900 PINs used for Emulator connection:

**Table 6: IT900 Emulator PINs**

| IT900 Pin Name | IT900 Pin Number | Emulator Interface Function | Description |
|---|---|---|---|
| P6_4 | 66 | BUSY | Handshake |
| P6_5 | 65 | SCLK | Serial Clock |
| P6_6 | 64 | RXD | Serial Data Input |
| P6_7 | 63 | TXD | Serial Data Output |
| CNVss | 7 | CNVss | Service signal |
| Reset | 10 | nRST | IT900 RESET (Active Low) |

The IT900 Emulator uses a 10 PINs connector. The following figure shows the connector pinout (signal 'CE' is not used for IT900 programming):

**Figure 6: IT900 Emulator Connector Pinout**
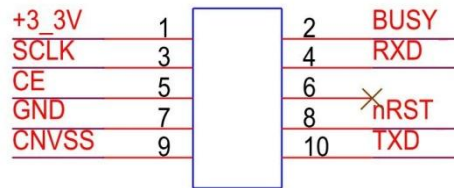


The following figure shows the Emulator Connector dimensions:
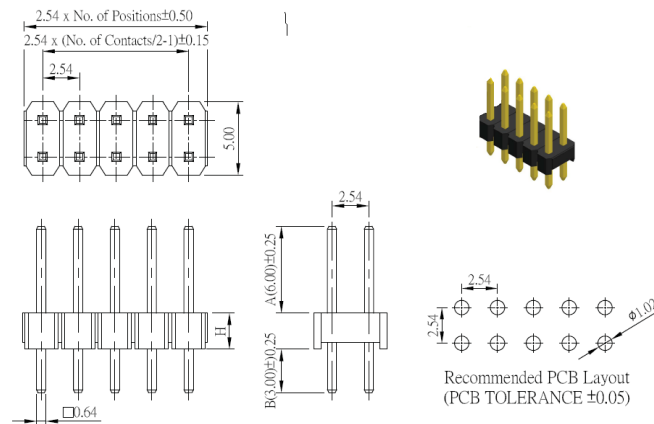


**Figure 7: IT900 Emulator Connector Dimensions**

## 3.7 EEPROM

The EEPROM is mandatory for IT900 NC and for any application that requires Remote Version Download support (firmware upgrade through power line).

For a RS or for any application which does not rely on IT900 Network Layer (NL Manager Disabled), the EEPROM is optional.

The required EEPROM connection to the IT900 is shown in the following figure:
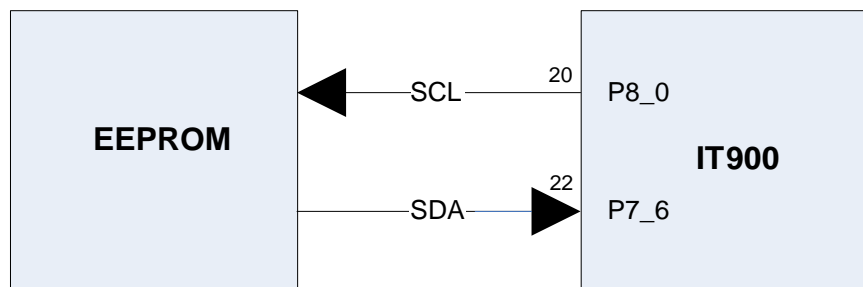


**Figure 8: IT900 to EEPROM Connection**

The different EEPROM size options are detailed in the table below:

**Table 7: EEPROM Size Options**

| EEPROM Size | Supports RS | Supports NC | Supports Remote Version Download |
|---|---|---|---|
| None | + | | |
| 256Kbit | + | + | |
| 1Mbit | + | + | + |

**Note:** The EEPROM is assembled by default as part of the IT900 PIM. Refer to the *IT900 PIM Reference Design* document for specific EEPROM selection.

## 3.8 LEDS

The IT900 provides 3 LED indications detailed in the table below:

**Table 8: LED Pins**

| Pin Name | Pin Number | Interface Function | Description |
|----------|-----------|-------------------|-------------|
| P7_3 | 25 | RX_LED | Receive LED (Active High) |
| TS | 59 | TX_LED | Transmit LED (Active High) |
| P7_2 | 26 | LINK LED | Network Layer Link LED (Active High) |

**Note:**    The LEDs are assembled by default as part of the IT900 PIM. Refer to the *IT900 PIM Reference Design* document for reference on connection between IT900 and LEDs.

# 4. Analog Interfaces

## 4.1 Analog Interfaces Summary

The following table summarizes the IT900 Analog interfaces. Each Analog interface is marked as Mandatory (**M**), Optional (**O**) or Recommended (**R**). In addition, the table separates between NC (Network Concentrator) and RS (Remote Station) devices.

**Table 9: IT900 Analog Interfaces**

| Interface | Protocol Controller | | Section |
|-----------|------|------|---------|
| | *NC* | *RS* | |
| *PLC Signal* | M | M | 4.2 |
| *Power Supply and Ground* | M | M | 4.3 |
| *Crystal* | M | M | 4.4 |

## 4.2 PLC Signal PINs

The IT900 PLC Signal Input and Output PINs are detailed in the table below:

**Table 10: Input and Output Pins**

| Pin Name | Pin Number | Description |
|----------|-----------|-------------|
| VINP | 52 | Positive Differential Input from power line coupler/filter |
| VINN | 53 | Negative Differential Input from power line coupler/filter |
| VOUTP | 38.39,40 | Positive Differential Line Driver Output to power line coupler |
| VOUTN | 32,33,34 | Negative Differential Line Driver Output to power line coupler |

The IT900 PLC Signals are connected through an analog circuit to the line coupler. For more information regarding the connection between the IT900 PLC signals and line coupler, refer to the *IT900 PIM Reference Design* document.

## 4.3 Power Supply and Ground PINs

The IT900 Power Supply and Ground PINs are detailed in the *IT900 Data Sheet*.

For more information regarding the required connection of the IT900 Power and Ground Pins, refer to the *IT900 PIM Reference Design* document.

## 4.4 Crystal

The IT900 PINs used for connection to the external crystal are detailed below:

**Table 11: Connection to External Crystal**

| Pin Name | Pin Number | Description |
|:---:|:---:|:---|
| XOUT | 11 | External Oscillator Output |
| XIN | 13 | External Oscillator Input |

For more information regarding the connection between the IT900 and external crystal, refer to the *IT900 PIM Reference Design* document.

**Proprietary Information**

# Document Control

| Revision | Date | Description |
|----------|------|-------------|
| 1.0 | January, 2011 | Creation |
| 1.1 | July, 2011 | Table 8 corrected: EEPROM size option from 32Kbit to 256Kbit |

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