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**Hybrid Fiber Coax Outside Plant Status Monitoring –
Power Supply to Transponder Interface Bus (PSTIB)
Specification v1.1**

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1 Introduction

The Hybrid Fiber Coax (HFC) Outside Plant (OSP) Power Supply to Transponder Interface Bus (PSTIB) Specification is part of the suite of specifications developed by the Hybrid Management Sub-Layer (HMS) subcommittee under the SCTE. The purpose of the HMS specifications is to support the design and implementation of interoperable management systems for evolving HFC cable networks. The HMS Power Supply to Transponder Interface Bus (PSTIB) Specification describes the physical (PHY) interface and related messaging and protocols implemented at the Data Link Layer (DLL), Layers 1 and 2 respectively in the 7-layer ISO-OSI reference model, that support communications between HMS-compliant transponders and the managed OSP power supplies and other related power equipment to which they interface.

1.1 Scope

This specification describes the PSTIB PHY and DLL layer requirements and protocols that must be implemented to support reliable communications between all *Type 2* and *Type 3* compliant OSP HMS transponders on the HFC plant and managed OSP power supplies and related hardware. Any exceptions to compliance with this specification will be specifically noted in this document as necessary. Refer to **Table 1** for a full definition of the Type Classifications.

1.2 Transponder Type Classifications

Transponder type classifications referenced within the HMS suite of specifications are defined in **Table 1**.

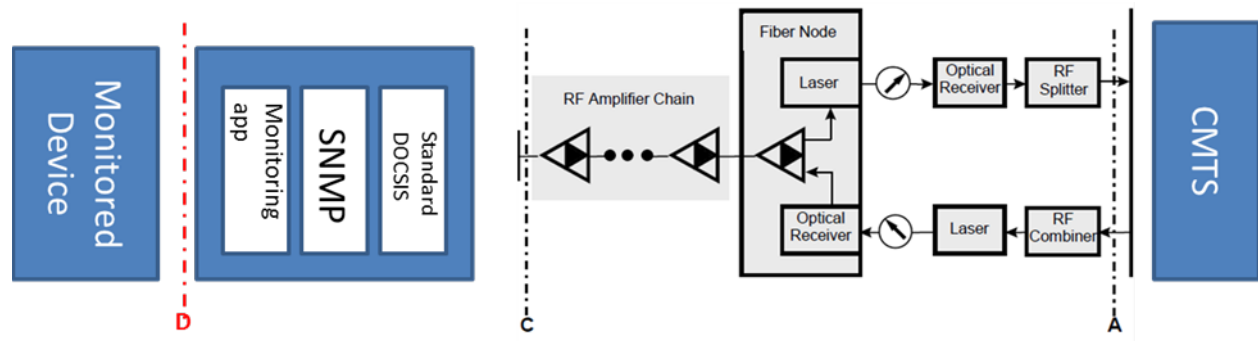
Table 1: Transponder Type Classifications

Type	Description	Application
<i>Type 0</i>	Refers to legacy transponder equipment which is incapable of supporting the HMS specifications.	- This transponder interfaces with legacy network equipment through proprietary means. - This transponder could be managed through the same management applications as the other types through proxies or other means at the headend.
<i>Type 1</i>	Refers to stand-alone transponder equipment (legacy or new) which can be upgraded to support the HMS specifications.	- This transponder interfaces with legacy network equipment through proprietary means. - Type 1 is a standards-compliant transponder (either manufactured to the standard or upgraded) that connects to legacy network equipment via a proprietary interface.
<i>Type 2</i>	Refers to a stand-alone, HMS-compliant transponder.	- This transponder interfaces with network equipment designed to support the electrical and physical specifications defined in the HMS standards. - It can be factory or field-installed. - Its RF connection is independent of the monitored NE.
<i>Type 3</i>	Refers to a stand-alone or embedded, HMS-compliant transponder.	- This transponder interfaces with network equipment designed to support the electrical specifications defined in the HMS standards. - It may or may not support the physical specifications defined in the HMS standards. - It can be factory-installed. It may or may not be field-installed. - Its RF connection is through the monitored NE.

1.3 HMS Reference Architecture Forward and Return Channel Specifications

The reference architecture for the HMS suite of specifications is illustrated in **Figure 1**.

Figure 1: HMS Reference Architecture Diagram



All quantities relating to forward channel transmission or reverse channel reception are measured at point A in **Figure 1**. All quantities relating to forward channel reception or reverse channel transmission are measured at point B for two-port devices and point C for single-port devices as shown in **Figure 1**.

1.4 HMS Specification Documents

A list of documents in the HMS specifications family is provided in **Table 2**.

Table 2: HMS Document Family

HMS Notation	Title
SCTE HMS PHY	HMS Outside Plant Status Monitoring – Physical (PHY) Layer Specification
SCTE HMS MAC	HMS Outside Plant Status Monitoring – Media Access Control (MAC) Layer Specification
SCTE HMS PSTIB	HMS Outside Plant Status Monitoring – Power Supply to Transponder Interface Bus (PSTIB) Specification
SCTE HMS ALARMS MIB	HMS Alarms Management Information Base
SCTE HMS COMMON MIB	HMS Common Management Information Base
SCTE HMS FIBERNODE MIB	HMS Fiber Node Management Information Base
SCTE HMS PROPERTY MIB	HMS Alarm Property Management Information Base
SCTE HMS PS MIB	HMS Power Supply Management Information Base
SCTE ROOT MIB	SCTE Root Management Information Base
SCTE HMS GEN MIB	HMS Power Supply Generator Management Information Base
SCTE HMS TIB MIB	HMS Transponder Interface Bus Management Information Base
SCTE HMS DOWNLOAD MIB	HMS Transponder Firmware Download Management Information Base
SCTE HMS TREE MIB	HMS Root Object Identifiers Management Information Base

2 Power Supply to Transponder Interface Bus Specification Overview

Version 1.1 of the HMS PSTIB specification defines a status monitoring topology intended to replace existing analog, discrete status monitoring interfaces used today for monitoring power supplies and other power-related equipment deployed in HFC networks. In this topology, the transponder is simplified by moving all measurements and sensors to the monitored equipment; i.e., power supply or other power equipment. The transponder interfaces to the monitored equipment through a single multi-conductor cable. Transponder power is also provided through this interface. The power supply or other monitored power equipment assumes responsibility for measuring battery parameters, voltages, and other data associated with the equipment installation. Status and commands are passed between transponder and monitored equipment via a serial data interface bus.

The data protocol and command set are simple enough to be implemented in a simple micro-controller. The communication protocol is open and expandable such that as new requirements are defined they can be easily added to new revisions of this specification.

2.1 Compliance

The power supply and or transponder are said to be compliant with this specification if the following conditions are met: 1) the mechanical and electrical interface requirements at the PHY layer and the packet and protocol message formats at the DLL layer that are defined within this specification are implemented, 2) the communication across this interface between the transponder and the power supply are open and not secured by a vendor specific security mechanism such that any transponder that implements this specification can communicate with any power supply that implements this specification.

2.2 Supported Implementation

Not all vendors will support the complete data set defined throughout this specification. The Get_Configuration response (see Section 4.4.3) provides the transponder or EMS with the specific status data that is and is not supported for each installation.

A Get Configuration command (see Section 4.4.3) enables the transponder to determine compliance with a particular revision of this specification for power supplies or other power equipment. Support for this capability is critical as the PSTIB specification is updated over time and power supply equipment supporting different revisions of this specification co-exists within the same network

2.3 Revision Control

The command and response data in this specification is synchronized with associated HMS SNMP MIBs (see **Table 2**) that are used to represent this data in management systems. To maintain synchronization, a revision control mechanism must exist. Therefore, any time this specification is revised such that new data items are added to any command or response, those data items shall be appended to the END of an existing command or response definition. New command and response sequences may also be created as needed. No revision shall change the location, definition or function of a previously defined datum.

3 Power Supply to Transponder Interface Bus - Physical Layer Specification

3.1 Interface Requirements

3.1.1 Connector Type

The physical connector to support serial communications over the PSTIB between HMS-compliant transponders and managed OSP power supply hardware shall implement the following:

1. RJ-45, eight-wire conductor.
2. Appropriate metallic plating for outdoor usage.
3. Operating temperature: -40 degrees Celsius to +70 degrees Celsius.
4. Dual connectors wired in parallel shall be included on the monitored equipment to support daisy-chaining multiple monitored devices from a single HMS-compliant transponder.

3.1.2 Communications Interface

The communications interface shall support the RS-485 standard as defined in TIA/EIA-485-A (ANSI/TIA/EIA-485-A-98), "Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems".

3.1.3 Connector Signals

Connector pins shall support signaling as described in **Table 3**.

Table 3: RJ-45 Connector Pin Assignment

Connector Pin Number	Signal
1, 8	Ground
2, 7	+24 VDC $\pm$ 15% at 200 mA
3, 6	RS-485 (+)
4, 5	RS-485 (-)

3.1.4 Transponder Power

Powering of transponders from PSTIB interface compliant power supplies shall support the following attributes:

1. The transponder is powered only from the power supply. The transponder shall not connect directly to the system batteries.
2. The power supply shall implement appropriate isolation and system grounding such that the communication interface and transponder power remains functional under the operating conditions defined herein.
3. The transponder shall be bonded to chassis ground directly and/or through the system coaxial cable sheath.
4. Optionally, transponder power may be bonded to chassis ground at the power supply interface. The power supply vendor shall determine this.
5. The power supply shall implement appropriate over-current and short-circuit protection of transponder power such that the communication interface and transponder power remain functional under the operating conditions defined herein.
6. Up to eight (8) power supplies may be connected in parallel using the RS-485 interface.

3.1.5 Line Balance

3.1.5.1 Monitored Equipment

Line balance for monitored equipment shall be implemented as follows:

1. RS-485 (+) to +5 VDC through a resistor (jumper/switch removable).
2. RS-485 (-) to Ground through a resistor (jumper/switch removable).
3. RS-485 (+) tied to RS-485 (-) through a resistor (jumper/switch removable).
4. Monitored equipment shall include jumpers to select or bypass resistors to an open state. Jumper or switch-selectable terminating resistors enable on-site configuration of individual installations. Transponders shall include line balance resistors only. Refer to **Figure 2**.