# Status Monitoring of CATV Power Supplies and Power Systems: Evolution and Change in a World Moving to Packets

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Status monitoring of power supplies allows operators to fully capitalize on investments in the HFC plant power system. As powering systems continue to evolve, offering even more performance and increased functionality, the status monitoring becomes an essential contributor to reliable plant operation. Driven by increased expectations for performance, status monitoring systems are changing along with these evolving powering systems, particularly as system services expand from traditional broadcast video to full service networks, with a growing percentage of these networks being packet based.

Status monitoring information flow is both upstream and downstream. Each monitored power supply has a status monitoring transponder with the typical data flow between the transponder and the power supply illustrated in Figure 1 below. For power systems with multiple power supplies in a common enclosure, two approaches for monitoring are possible: (1) each power supply is teamed with a transponder; or (2) all power supplies interface to a single system controller which coordinates the power system operation and interfaces to a single transponder. Similar techniques are applicable to monitoring curbside engine generators when they are a component of the power system.

Several types of signals are present in the data passing between a transponder and power supply. Analog signals representing time-varying information acquired by the power supply are sent to the status monitoring transponder where an analog-to-digital (A/D) conversion occurs. Other upstream information are digital signals supplied by the power supply to the transponder. In the downstream direction, the

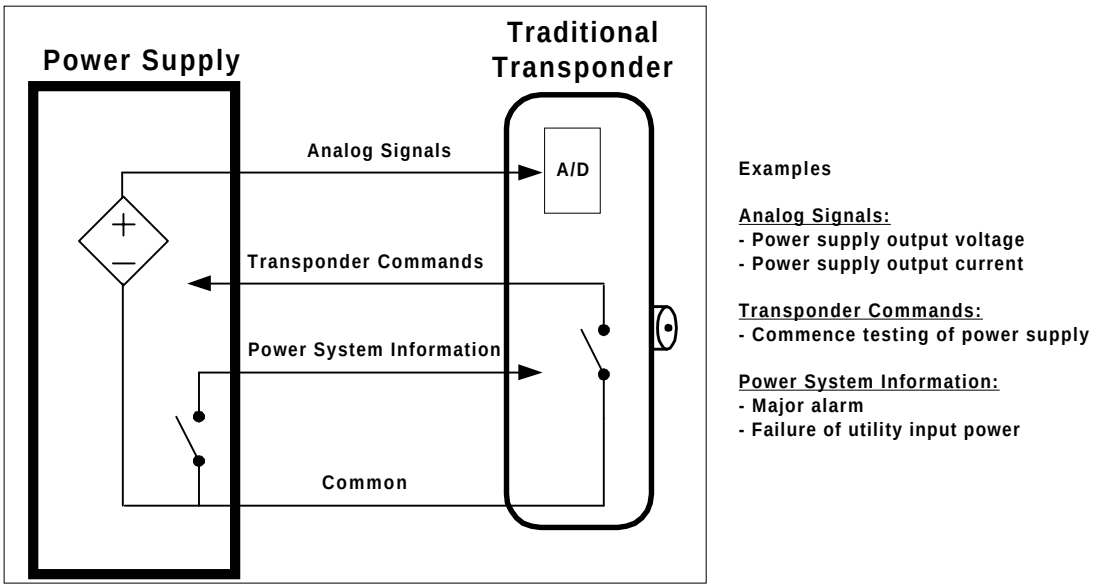


Figure 1. Diagram of conventional interface between status monitoring transponder and power supply.

transponder provides one or more digital signals to the power supply. Most often, at least one of these downstream digital signals is used to initiate a test of the power supply standby system. Such a test varies in complexity, ranging from sequencing the power supply through several states which test the battery system, to coordinated system tests for multiple power supplies, possibly involving a standby engine generator.

Essentially, status monitoring allows an operator to effectively maintain the powering equipment, particularly batteries, and also ensure that the standby power system is functional should a utility power failure occur. For a standby power system operating without status monitoring, any failure in the battery charging system, even one as simple as leaving the battery circuit breaker in the *off* position, will shorten battery life expectancy. As batteries offer improved performance and longer warranties, battery costs are not dropping, thus leading to increased appreciation for status monitoring of the battery system.

Traditional status monitoring consists of vendor-specific modems collocated with the power supply in an enclosure, such as seen in Fig. 1. Just as standards have enabled the dramatic growth of the internet, so too are standards enabling an evolution of status monitoring. Standards for status monitoring of power supplies are being promoted by an SCTE engineering subcommittee, the hybrid management sub-layer subcommittee (HMS), which is specifically examining hardware and software interoperability. In place of the vendor-specific interface seen in Fig. 1, the HMS committee is working to create, implement, and have accepted by the user community, a standard, digital power supply-transponder interface seen in Fig. 2.

Other topics to be discussed in the complete paper include powering of status monitoring transponders, including grounding and ground loops. Techniques for injecting power from the power supply into the coaxial system along with the rf transponder signals using discrete and integrated power inserters and directional couplers are illustrated and compared. Issues arising from surges and lightning as they relate to the status monitoring of the power supply are also discussed.

Packet-based monitoring of power supplies and power systems, including standards-based monitoring, are compared and contrasted with traditional monitoring systems on the basis of items such as data accuracy and resolution, interface requirements, ability to accommodate variations in powering systems at a single headend monitoring station, and overall cost of ownership for power supply and power system monitoring elements.

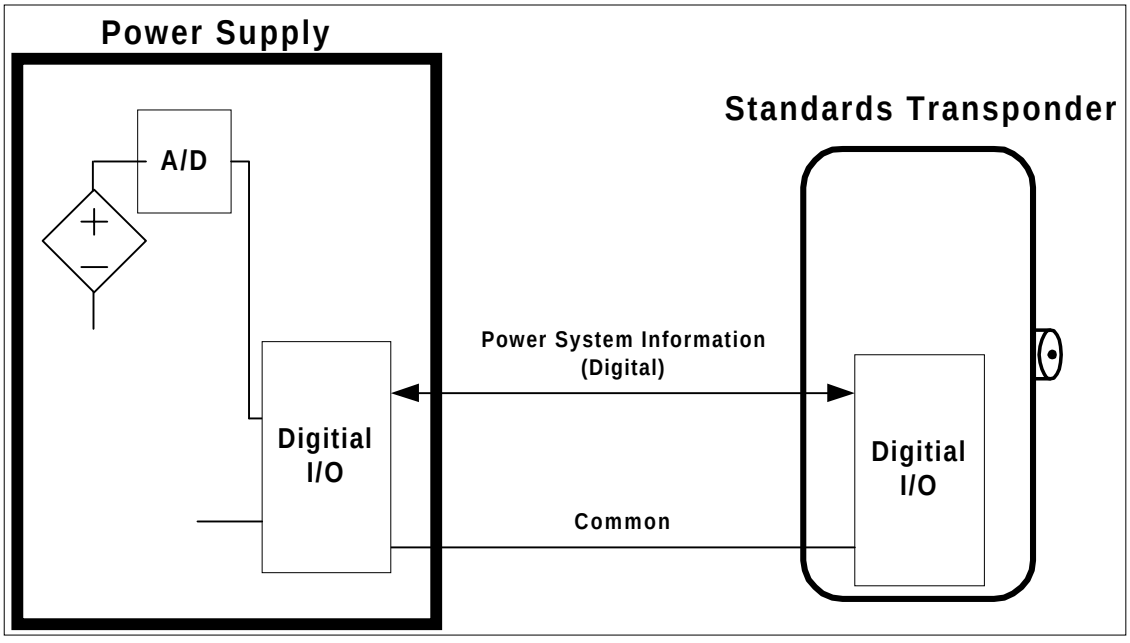


Figure. 2. Standards based monitoring interface between power supply and standards transponder