



Polistream Redundancy Strategies

Introduction

The Polistream subtitle transmission system has been designed to cater for a range of redundancy strategies. Given the variation in system configurations and sizes of installations that Polistream can support there can never be a single redundancy scheme that will suit all cases. This paper explains the underlying concepts and the options available to a system designer.

A basic knowledge of the Polistream system components and nomenclature is assumed.

Scope

This paper considers redundancy schemes for a Polistream subtitle transmission system and the signals directly connected to it. How these signals are derived and how the redundancy of external interface equipment is arranged is outside the scope of this paper. Also, this discussion is restricted to 'full' Polistream systems and excludes D4000 and R4000 single channel designs. These can only support duplicate system (N+N) redundancy.

Design

There are two areas that need to be considered, physical I/O redundancy and software component redundancy. In any system there will be a number of physical signal connections and there needs to be a scheme to handle the failure of any one of these

The redundancy options available are:

- **None**
- **Cold standby spares**
- **N+1 with manual changeover**
- **N+1 with automatic change over**
- **N+N with manual changeover**
- **N+N with automatic change over**
- **N+N duplicate systems (complete duplicate system running in parallel)**

Polistream allows for any of these schemes but different strategies work best for specific areas of redundancy design.



Physical I/O Redundancy

Polistream systems can support a range of signal types and the redundancy strategy recommended for each type varies depending on signal type, cost of Polistream, cost of external equipment and Polistream internal architecture.

Inputs

- **Time code (HD-TC, VITC, LTC or DVITC)**
- **Serial automation control**
- **ASI**
- **Video (HD-SDI, SDI or Composite)**
- **Video data streams in VBI and VANC**

Outputs

- **ASI**
- **Video (HD-SDI, SDI or Composite) for open subtitles**
- **Video (HD-SDI, SDI or Composite) data streams for VANC or VBI insertion**

For each signal type there is a preferred redundancy strategy described below.

Time Code Input

Polistream supports a distributed time code system. This means that it does not matter where in the system a timecode input is located as the timing information is available anywhere within the Polistream system. For each time code source it is possible to have a second, standby input. With one, two and four input time-code cards in the Polistream range a cost effective N+N redundancy solution can be designed.

This redundancy scheme for time code inputs has several advantages:

- Low cost – only an additional time code input required per channel.
- Automatic changeover and recovery
- Supports failures in the time code card, cabling or U4000 platform
- No breaks in service



Serial Automation Control Input

Each channel of a play out system needs a source of automation control. Often this is supplied via an RS232 or RS422 cable. To provide redundancy the simplest and lowest cost solution is to connect two automation ports to two different U4000 units. Polistream will then assign one as the main and the other as standby. If messages are not received on the main input the standby would be used. Again changeover is automatic and worst case will result in a 20 second delay in putting a file on or off air.

ASI Input and Output

Polistream supports an N+N scheme for ASI inputs and outputs.

In most systems there will only be one or two multiplexes so there is little difference between a N+1 or N+N redundancy strategy for ASI inputs or outputs.

In the case of ASI inputs these are used to recover PCR to provide timing information. This operates in the same way as the timecode inputs with a main (A) and standby (B) source.

In the case of ASI outputs these are simply duplicated and normally fed to two multiplexers, main and standby.

Video (HD-SDI, SDI or Composite) Inputs for VBI or VANC Data Recovery

VBI and VANC inputs are supported by a range of SD and HD cards. With one, two and four input cards a similar redundancy strategy to that used for timecode is recommended for data inputs.

Video (HD-SDI, SDI or Composite) Inputs and Outputs for Open Subtitles or VANC and VBI Data Insertion

For graphics (open) or data insertion (VBI or VANC) a dedicated single or dual channel insertion card is used. The system design is complicated by there being both an input and an output signal, if there are only one or two channels involved then a simple duplicate N+N system is appropriate. The main and standby output signal can then be selected by an external switch.

For larger systems an external router may be more cost effective to support an N+1 architecture.

Software Redundancy

A Polistream system is made up of a number of U4000 units plus a range of I/O cards and software modules. One U4000 unit supports the central configuration database and configuration server (CMM) while other U4000s support the various software components needed to run a specific system. Inherent in the Polistream system design is a sophisticated redundancy scheme that caters for all the software components.



System level redundancy

In any Polistream system there is the option to fit a second U4000 unit running a backup copy of the CMM. This hosts a standby copy of the configuration database and configuration server. In normal operation the standby configuration server will keep its copy of the configuration database synchronized with the main database.

In the event of the failure of the main U5000 or CMM the standby unit will take over automatically.

U4000 processing unit redundancy.

Polistream supports an inherent N+M scheme for all U4000 platforms. Normally a system will be designed with sufficient U4000 platforms to support all the software components and I/O cards required to run the system. The software components are assigned to the U4000 platforms to give an even loading. However if a level of redundancy is required then one or more extra U4000s can be added. The software components can then be spread across all the U4000s or any other configuration as required. In the event of a U4000 failure the software components assigned to the failed unit will be moved and restarted on an alternative U4000. This will happen automatically and within 30 seconds.

When the failed unit is restored there is a simple manual action to restore the original configuration.

Polistream supports addition levels of sophistication to this redundancy scheme by allowing multiple groups of U4000 platforms and defining how the software components can be spread within these groups. This is used where a group of premium channels has a higher priority than other channels and a failure in the low priority group should not compromise the performance of the premium channels.

Software component redundancy

If a software component stops for any reason the Polistream system will attempt to restart the component on the same U4000. If this fails after repeated attempts it will be started on a different platform. Again all of this is automatic.

Because the configuration of all software components is stored in the configuration database the components can be moved, stopped and started on any platform while retaining their configuration data. This is inherent in Polistream and provides a very flexible and robust system.



Network Redundancy

All Polistream units are connected via a 10/100 Base-T Ethernet network using switching hubs. This provides a simple, reliable and standard interconnect architecture. To provide redundancy for the network section there are two main options: Hot standby spare and system segmentation.

With system segmentation the Polistream configuration is designed so that the units are split across two or more Ethernet switches. This system ensures that the failure of a single switch still leaves one set of units capable of running the services. For this system to work there needs to be sufficient redundancy for the I/O and the platforms.

A hot standby system provides a second Ethernet switch powered and ready for use adjacent to the primary switch. In the case of a failure of the primary switch the connections must be moved manually to the standby switch.

Power feed Redundancy

Broadcast transmission systems need to be on air 24/7 and it is common for broadcast equipment to have twin power supplies with separate power feeds. One of the main advantages of this design is that it allows the power feeds and any associated UPS units to be taken out of circuit for maintenance without interrupting the operation of the broadcast equipment or signal.

However having twin power supplies in all units adds additional cost and complexity so the Polistream system takes a different approach more suitable for a multi-platform architecture.

Separate Polistream 2Power units provide dual power feeds that can then be fed to up to eight U4000 or other units. By providing fast switchover between the main and standby power feed all units will continue to function while the main power feed is out of service. Once the main feed is re-established the units are seamlessly switched back to this source.