A Proposed Green Bank Interferometer Control System

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The GB Interferometer

85-1 -> 85-2

LO

B=35MHz

Sampler, 70 MHz -> Delay line 0.9ns/step, 8us

D/A Converter

Gain/Zero

DDP-116

A/D Converter

Existing control system
Existing Telescope Hardware

- Polar mounted 85 ft. antennas
- Dual polarization S/X band Receivers
- Digital delay rack and multipliers
- DDP-116 Control Computer
New System Block Diagram

- **85-1**
- **85-2**
- **LO**
- **B=35MHz**
- **Delay line**
  - 9ns/step, 8us
- **Sampler, 70 MHz**
- **D/A Converter**
- **Gain/Zero**
- **VME Chassis**
- **Supervisory/data Acquisition Computer**
- **New Jansky Lab control rooms**
- **Delay values**
  - 125Khz serial bit stream
- **Individual fiber MCB links to each telescope for front-end control and telescope control**
- **8 channels total power**
- **8 channels multiplier outputs**
- **50 or 100 Hz sampling rate**
- **Ethernet link**
New Control System Hardware

- Control Computer

- Telescope Interfaces

- Digital Delay Interface

- A-D converter
## Control Computer

<table>
<thead>
<tr>
<th>MVME-167 SBC</th>
<th>VIP-616 IP Carrier</th>
<th>BC-635 VME IRIG-B Decoder</th>
<th>12 slot VME chassis</th>
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</thead>
</table>
Telescope Interfaces

- Standard MCB interface
- Relay controls
- Fiber-optic emergency stop system
Digital delay line interface

- Off the Shelf IP modules
- Delays
- Gain control and zero
BSDO datasheet
IP480 datasheet
A/D Converter

- Off the Shelf IP module
- 16 differential channels at 16 bits
- Samples at intervals determined by on-board timer
IP330 datasheet
IP Carrier Board

- Carries 4 IP modules
- A32 or A16 Addressing
- Front panel or P2 I/O connections
VIP616 datasheet
Control Software General Principles

- Reconfigurable

- Resilient
Control Software modules

- Observing control
- Procedure control
- Time daemon
- Positions daemon
- Data acquisition and fringe Fitting
- Loggers
- Alarms
Ymir slide
Control Software

- Archivist
- Antenna Loggers
- Receiver Loggers
- Fringe Data Loggers
- Backend Manager
- Interferometer Coordinator
- Antenna Coordinator
  - Antenna Manager
  - Receiver Manager

Replicated for each antenna
Device Managers

- Antenna Manager
- Receiver Manager
- Backend Manager
Coordinators

• Interferometer Coordinator

• Antenna Coordinator

• Archivist
Reused GBT software

• mcTime

• Message system

• Watchdog system

• TaskMaster system

• Monitor system

• Data logger system

• User interfaces

• Support libraries
Reused GBT software libraries, Part 1

**ConfigIO** handles reading and writing configuration files in a standard manner.

**Control** is the mother of all libraries. It contains the manager classes.

**Coords** handles coordinate transformations.

**DataDesc** is a library for accessing internal manager information.

**DeviceAccess** works with the above DataDesc library.
Reused GBT software libraries, Part 2

**DynamicLoader** is a library for loading shared objects at run-time.

**FSM** is a finite state machine library.

**FitsIO** encapsulates Pence’s CFITSIO library to handle telescope data.

**GServer** is a Glish RPC server

**IF** provides support for calculating the frequency characteristics of an IF channel.
Reused GBT software libraries, Part 3

**MCBInterface** provides packaged classes for accessing words or parts of words on the MCB.

**Matrix** is a matrix math package.

**MesgMuxIF** is the interface to the system message multiplexer.

**MesgProc** contains all of the container classes for Messages.

**Message** implements the application or event-generating side of the Message system.
Reused GBT software libraries, Part 4

**PVA** is a base class to encapsulate Position / Velocity / Acceleration and duration.

**RPC++** is a C++ Interface for remote procedure calls, including a system interface for the select system call.

**Scan** provides a framework for specification of arbitrarily complex movements of a mirror.

**ScanSpec** is used to sequence through XXXSegment lists, in real-time.

**Sequencer** flushes system defined vxWorks semaphores at their defined interval.
Reused GBT software libraries, Part 5

**TaskLib** implements vxWorks task management calls on Solaris

**TimeKeeper** is used by the coordinate transformation libraries to keep track of local time.

**TimeStamp** is a class for producing and manipulating Time reference tags or TimeStamps.

**TimeStampUtil** contains a routine to set the clock on a Unix machine.

**util** is a module with utility functions and classes for getting the environment, parsing text, etc.
Conclusion