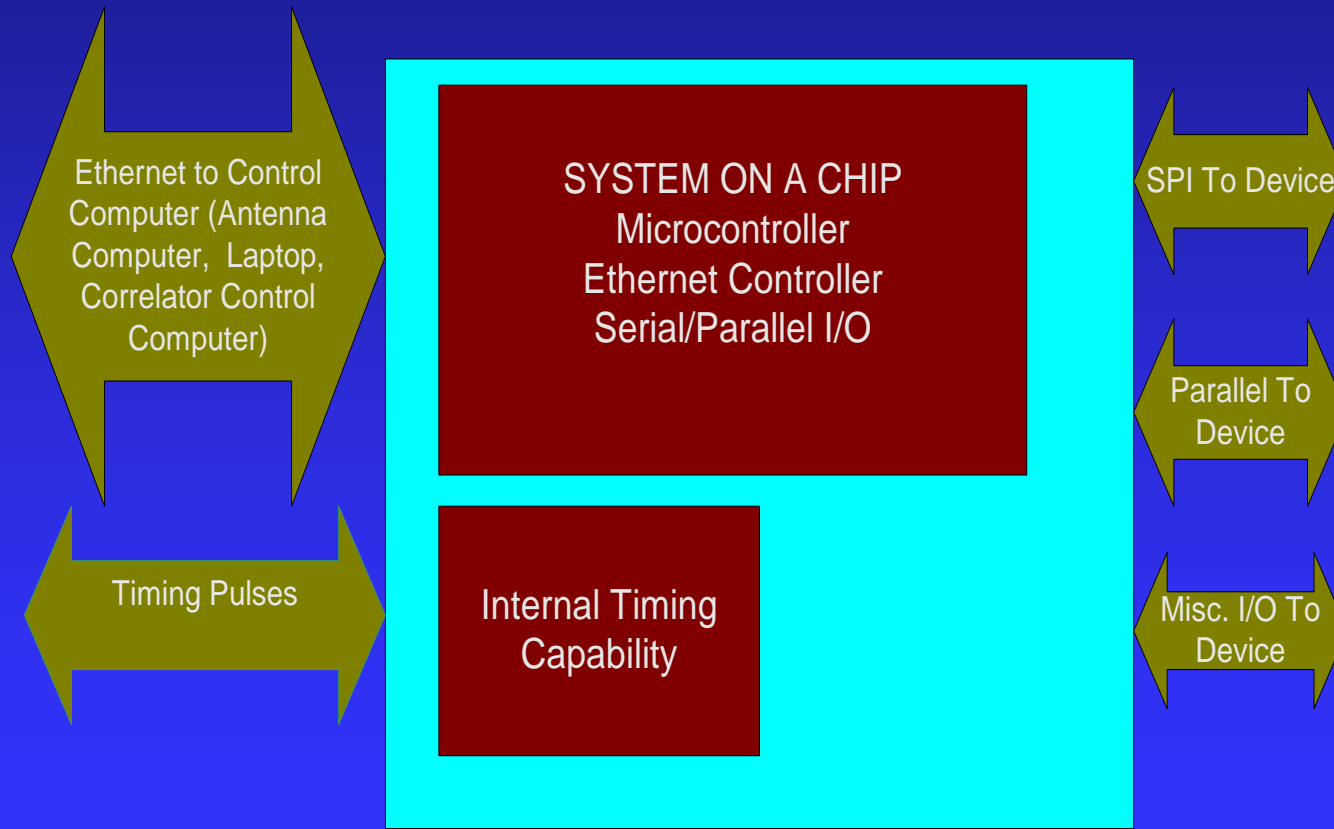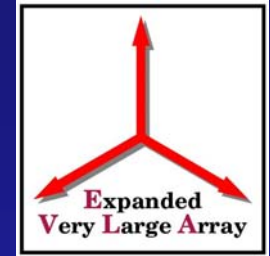# EVLA MONITOR & CONTROL CDR

## MIB CAPABILITIES

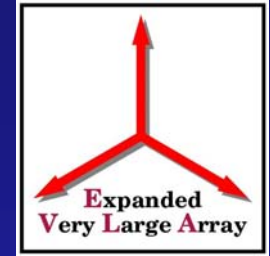# Module Interface Board (MIB)

Ethernet to Control Computer (Antenna Computer, Laptop, Correlator Control Computer)

SYSTEM ON A CHIP
Microcontroller
Ethernet Controller
Serial/Parallel I/O

SPI To Device

Parallel To Device

Timing Pulses

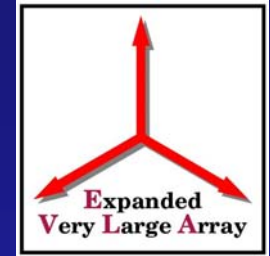Internal Timing Capability

Misc. I/O To Device
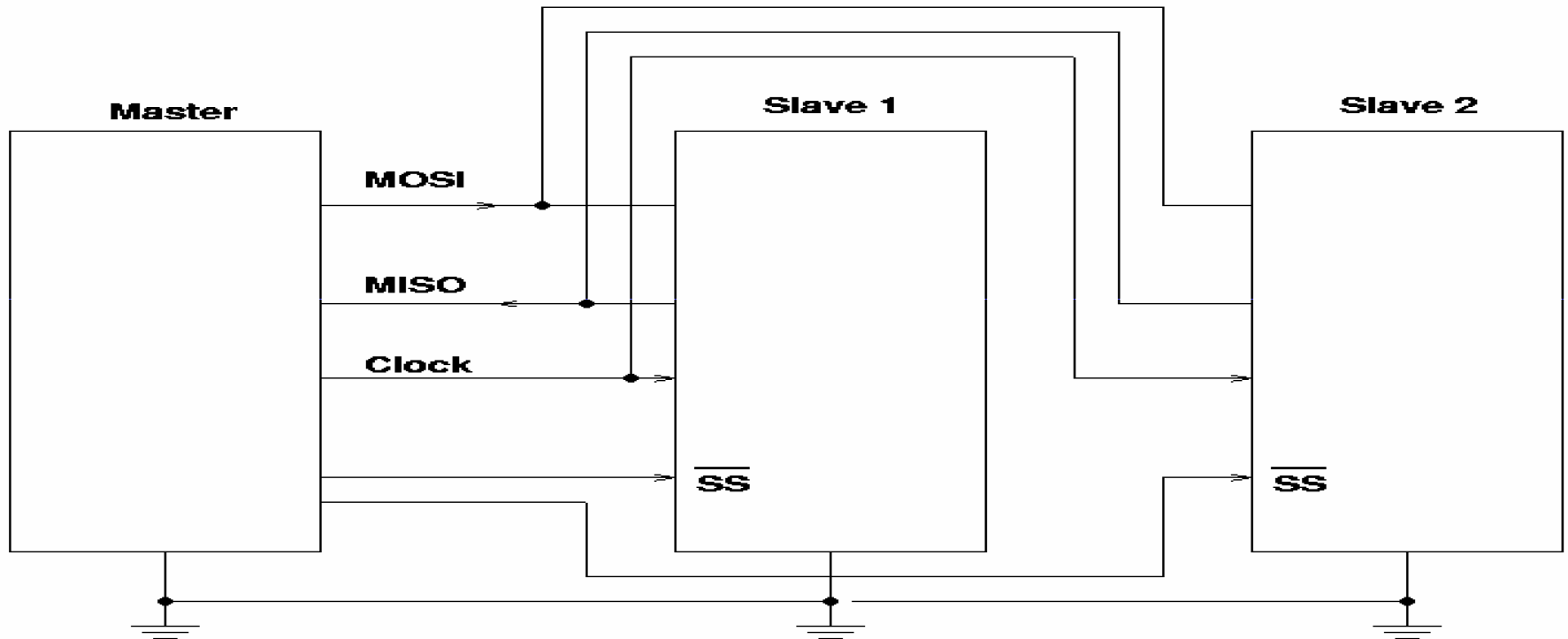
# TC11IB Microprocessor

- System On A Chip

- 1.5M RAM

- Ethernet Controller

- Serial/Parallel IO

- On Board Timers
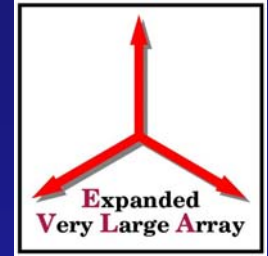
# SERIAL PERIPHERAL INTERFACE (SPI)

## Synchronous Serial Communications



Master  Slave 1  Slave 2

MOSI

MISO

Clock

$\overline{SS}$  $\overline{SS}$

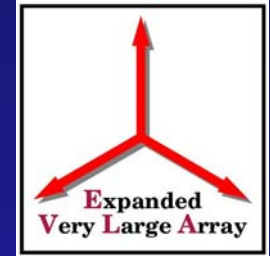With select lines, one master can communicate with more than one slave

# SERIAL PERIPHERAL INTERFACE (SPI)

- Widely Used to Communicate With Many Devices (A/D & D/A Converters, Memory Chips, Temperature Sensors, Microprocessors, Etc.)

- Clock, MISO, MOSI, Chip Select are Idle When Not Used

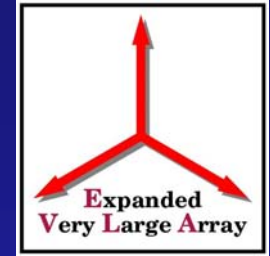- MIB Dedicates 16 Lines To Slave Select

# General Purpose IO

- 32 IO Lines Available
- 4 Banks of Eight Lines Each
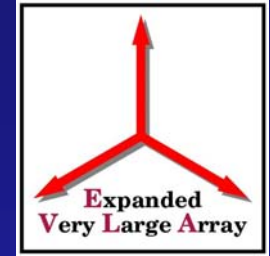- Each Bank Is Input or Output

# RS-232 Interface

- 2 Interfaces Available

- 1 Is For Hardware Use Such As Communicating With External Device

- 1 Is For Software Use, Such As Debugging
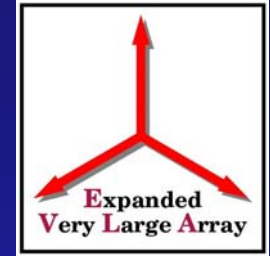
# Timer Unit Interface

- Access Is Provided To GPTU1 On TC11IB

- The GPTU Includes 3 32-Bit Timers

- Many Features Make The Unit Versatile

- 2 Inputs To The Timer Unit
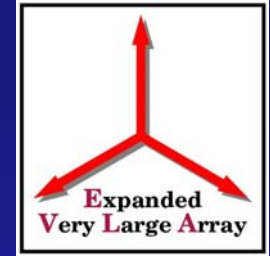
- 2 Outputs From The Timer Unit

# Interrupts

- Device Designers Have 8 Interrupts Available

- An Interrupt Is Dedicated To 19.2 Hz Heartbeat

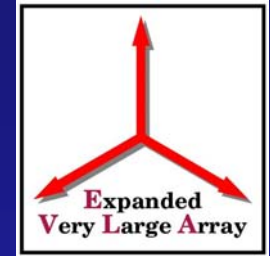- An Interrupt Is Dedicated To The Ethernet Controller

# Ethernet Interface

- Ethernet Interface – 100 MBit/second
  - ➤ PHY – Intel LXT971A
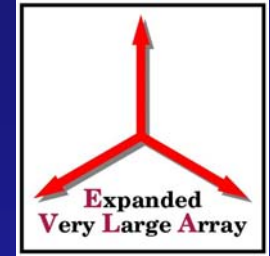  - ➤ Fiber Optic Transceiver – Agilent HFBR-5903

# Serial Flash Memory

- 4K SPI Flash Device

- Used To Store MAC Address, MIB Serial Number, MIB Revision Level, and MIB Specific Parameters
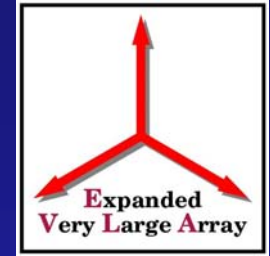
# Parallel Flash Memory

- 8M or 16M Flash Chip Can Be Used

- Used For Storage Of MIB Code

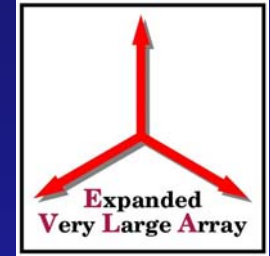- Code Will Be Transferred On To TC11IB RAM At Boot-Up

# Power Management

- TPS70351PWP Regulator
- +5V In, +3.3V and +1.8V Out
- Power Up Sequence - +3.3V First, Then +1.8V
- Reset Goes High When Proper Levels Reached
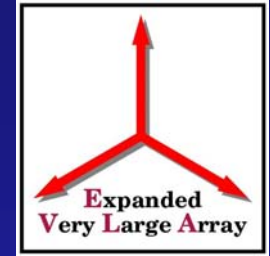- If Overloaded, Shuts Down & Asserts Reset

# Heartbeat Signal

- 19.2 Hz Heartbeat Interrupts MIB

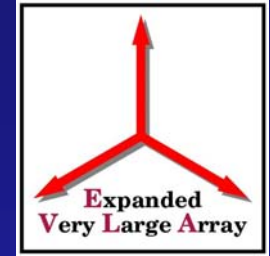- MIB Can Pass This Heartbeat Signal To The Devices That It Controls

# Debug Capability

- OCDS1 Connector Available For Debugging/JTAG (Programming) Purposes
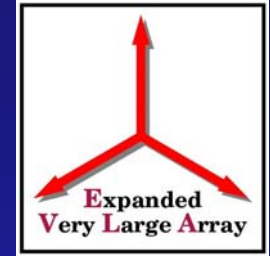- OCDS2 Connector Available For Tracing Of Instructions

# On Board Crystals

- 12 MHZ Crystal To Clock TC11IB, Multiplied To 48 And 96 MHZ Inside Chip

- 25 MHZ To Clock Intel LXT971A Ethernet PHY Chip
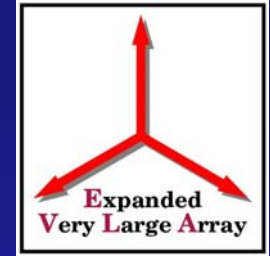
- Both Crystals Generate Sine Waves

# MIB Per/Board Cost

- Present Cost Is Approximately $756

- $658 for Assembled Board, $70 for NRAO Supplied Components, $28 for Functional Test

- This Cost Is For An Outside Company To Procure The Parts , Assemble And Test The Boards
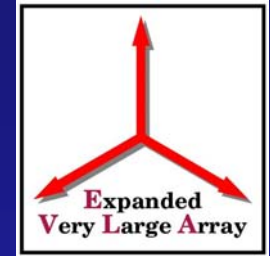
# Number Of Required MIBS

- 964 MIBS Are Required For Antennas (34/Antenna )
- 12 MIBS Are Required For Master Rack
- 193 MIBS Are Needed For 20% Spares
- Total MIBS For Project = 1157
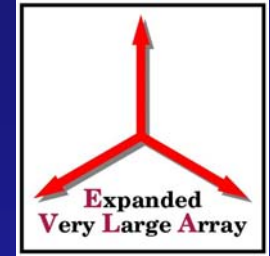- 231 (20%) Spares Of Certain Key Components Such As TC11IB

# MIB Construction Cost

- $874,692 For 1157 MIBS

- $14,784 For 20% Spares Of TC11IB

- $5,000 For Other Spare Components

- Total of $894,476 MIB Construction Costs
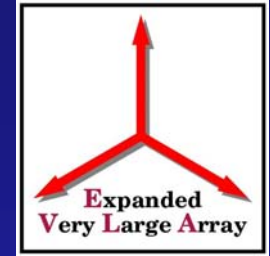
- WBS Has $902,100 Allocated

# Lifetime Of MIBS

- We Do Not Have An Estimate Of MTBF

- We Could Not Find MTBF Information For TC11IB Chip

- It Is Expected That TC11IB Will Be Manufactured For At Least 3 More Years

- It Is Important To Acquire Plenty Of Spares

# Manufacturability Of MIBS

- MIBS Will Be Built By Outside Company That Has Demonstrated Good Quality Work

- Bare Board Is A Complicated Board, However PC Houses Can Successfully Build It

- NRAO Has Complete Capability To Build And Repair Board In House