
CMB-S4

SOUTH POLE - DAQ INTERFACE CONTROL DOCUMENT

CMBS4-doc-423-v6

Document release signatures

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REVISION HISTORY

Version Letter	Revision Date	Author: Notes
v1	6/29/20	Initial draft
v2	4/25/21	Adding details
v3	11/5/21	Adding details
v4	1/15/22	Adding shipping interface
v5	1/28/22	Minor format fixes
v6	7/17/23	Significant addition of technical detail

REFERENCED & APPLICABLE DOCUMENTS

The requirements in the following documents apply, but this document supersedes if there is a conflict.

Reference used within this doc	Version	Title & Description, including Document number if applicable	Notes, relevant part of document

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1. PURPOSE AND SCOPE

This document defines and describes the interfaces between the DAQ and the South Pole Site Infrastructure.

Overview: The DAQ system includes computer workstations for user interface with the DAQ and servers and networking equipment that will require Site Infrastructure for physical location of the computer systems in workspaces, temperature/heat management of the hardware and the workspaces, data connectivity and distribution. DAQ/Control does provide site-wide equipment monitoring, but does **not** provide a personnel and equipment safety alarm system (though will monitor such a system).

DAQ is responsible for:

1. Design of physical computing elements
2. Providing operational requirements and documentation
3. Procurement of DAQ site equipment: servers, GPS clock unit, GPS coax cable, GPS Antenna, DAQ specific network switches, rack-mount UPS, and the racks themselves
4. Procurement of 2 workstations/desktop computers for use at the South Pole
5. Shipping the system for installation to Port Hueneme, CA
6. Software infrastructure to interface with and monitor the DAQ
7. Any specialized tools/fasteners/parts required for system install;
8. Providing northern support & infrastructure to the install and operation of the DAQ system;

Site (South Pole Infrastructure) is responsible for:

1. Installing the DAQ system on-site at the South Pole
2. Site is responsible for the two CMB-S4 networks (internal & external), including building-to-building optical fibers and associated hardware (fiber receiver- building ethernet switch-building ethernet cable);
 - a. demarcation is top-of-rack switches (supplied by DAQ)
 - b. Site will provide one connection per rack to the external network, cable raceways & cabling outside of the rack.
 - c. Site will also provide one connection per rack to the internal network, cable raceways & cabling outside the rack.
3. Providing raceways for power and data cables
4. Providing power, building space, and facility-level support (such as cooling);
 - a. demarcation for power is the plug, DAQ provides in-rack UPS, Site provides out of rack power connection;
5. General tools for system install;
 - a. including lifting hardware for getting heavy equipment into racks (lifting fixture).
6. Providing additional user desktop computers (1 at each telescope location) for access to the DAQ

2. ABBREVIATIONS AND DEFINITIONS

2.1 ABBREVIATIONS

DAQ	Data Acquisition and Control
TCS	Telescope Control System
OCS	Observation Control System
LAT	Large-aperture telescope
SAT	Small-aperture telescope

2.2 DEFINITIONS

3. MECHANICAL/STRUCTURAL INTERFACES

3.1 PHYSICAL ACCOMMODATIONS FOR WORKSTATIONS

SP-DAQ-110 General Use MAPO tables/desks

A minimum of 3 [TBC] standard size office desks or tables will be provided in MAPO for general use work areas in support of all integration and commissioning and operations activities (shared between all subsystems). See requirement SPSITE-MAPO-0190.

SP-DAQ-111 General Use Highbay tables/desks

A minimum of 2 [TBC] standard size office desks or tables will be provided for general use work areas in the LAT high bay in support of all integration and commissioning and operations activities (shared between all subsystems). See requirement SPSITE-LHB-0410.

SP-DAQ-111 General use Station tables/desks

A minimum of 6 [TBC] standard size office desks or tables [add size specification] will be provided in the B2 science lab of the main station for shared general use office work areas, including hosting of the DAQ workstations. See requirement SPSITE-0120.

3.2 PHYSICAL ACCOMMODATIONS FOR SERVERS

SP-DAQ-120 DAQ Electronics Rack Footprint

South Pole Site shall provide a space of (0.75m wide x 2m deep X 2m high) [TBC] to DAQ for the housing of their computer rack , including front and back clearance.

SP-DAQ-121 DAQ Electronics Rack Location

Site shall place the rack adjacent to the rack(s) used by the Data Management system

SP-DAQ-122 DAQ Electronics Rack Weight

The combined weight of DAQ rack (a standard EIA 310 compliant four post rack) and its components shall be less than TBD kg, with a floor load rating greater than a minimum of TBD kg/m².

SP-DAQ-126 DAQ rackspace in Elevated Station

Site shall provide in the Elevated Station B2 for DAQ provided network switches. A rack is considered desirable.

3.3 GPS ANTENNA

SP-DAQ-130 GPS Antenna

DAQ shall provide a GPS antenna and provide description of mounting interface.

SP-DAQ-131 GPS Antenna location & Cable Length

Site shall provide a mounting location for the GPS antenna to be located on the top of the building containing the DAQ electronics rack. This location shall result in a cable run between the antenna and the DAQ electronics rack no greater than 50m.

SP-DAQ-132 GPS Cable Route

DAQ shall provide an appropriate 50-ohm low-loss coax cable to be installed between the GPS antenna and DAQ electronics rack. The connector types on the two ends shall be TBD. There are no known mechanical requirements on the cable from sites.

4. DATA INTERFACES

4.1 DATA CONNECTIVITY

There will be two CMB-S4 specific networks at the South Pole Site. One will carry all DAQ and OCS traffic between the telescopes and the DAQ and Controls systems. The network equipment for this network will have specific requirements to support the timing and synchronization system that DAQ provides. The other will carry all non-DAQ and Controls traffic like user workstations that are not controlled by OCS or produce data to be monitored by OCS. It is the responsibility of the Site to provide connectivity (the physical layer) for these networks in the form of fiber optic cables which run between the DAQ switches in the various buildings.

SP-DAQ-XX1 Site Wide Networks

Site shall provide no fewer than 4 fiber pairs (2 networks with redundancy) from the DAQ electronics rack to each of the:

- SAT control rooms,
- LAT yoke room,
- LAT high bay,
- MAPO and the
- Elevated Station.

Site may place disconnects (at the building boundaries for example) to separate the internal and external fiber runs.

SP-DAQ-XX1 Raceways

Site shall provide raceways between the DAQ electronics rack and the fiber building ingress, and the workstation location or use existing “in-wall” network infrastructure if available.

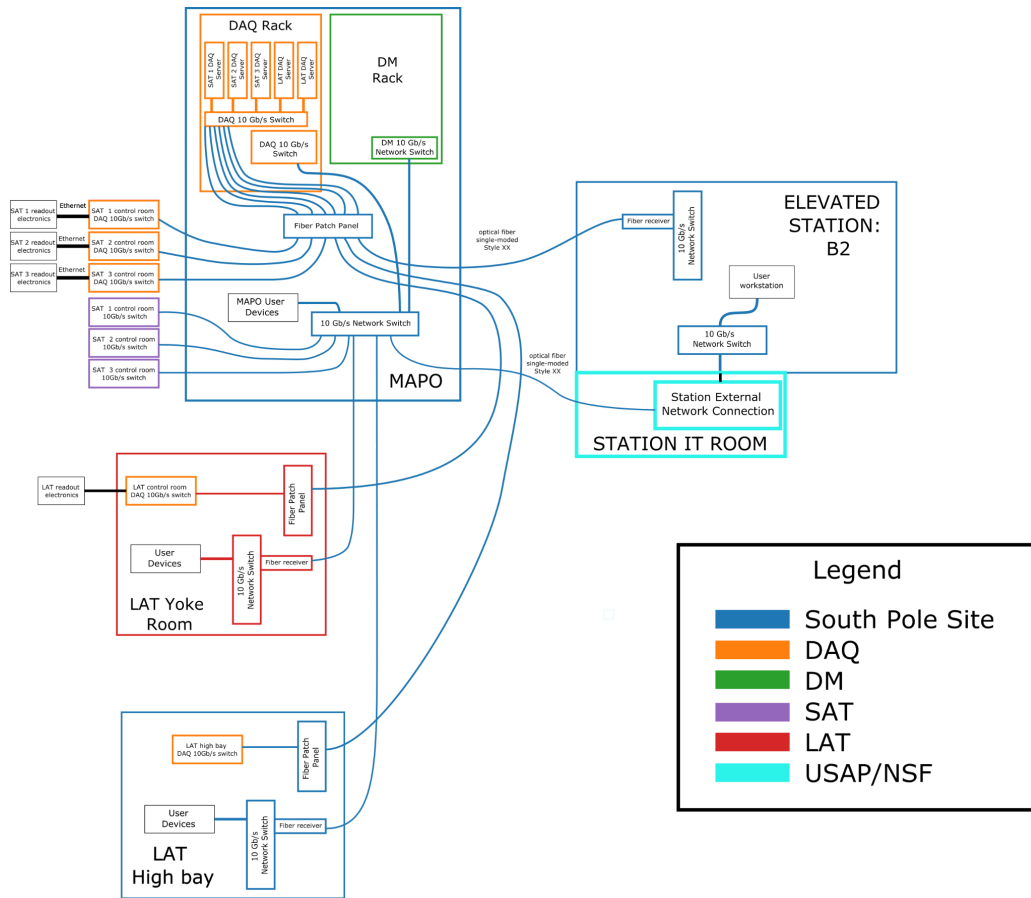
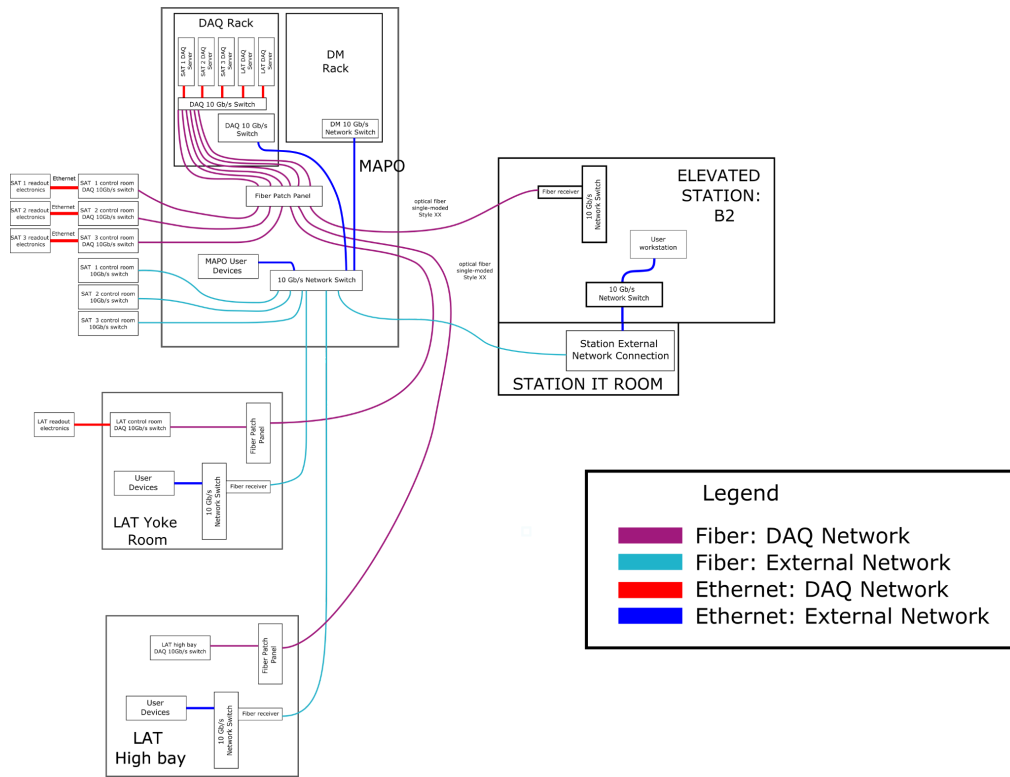
SP-DAQ-XX1 Fiber Type

The fibers shall be capable of transporting 10Gbps Ethernet over the necessary distances taking into account any splices or disconnects.

SP-DAQ-XX1 Transceivers

For each end of each of the fiber pairs, Site shall provide an SPF+ transceiver that is compatible with the fiber type and termination and capable of 10Gbps signaling.

The two networks are shown in the diagram below.



4.2 BUILDING MONITORING SYSTEM

SP-DAQ-250 Building Monitor Inputs to DAQ

Sensor readings from the building monitoring system shall be input as a package using an ethernet connection to the observatory control system for integrated monitoring as well as having a standalone user interface and alarm system. These measurements will also be transmitted directly over the non-DAQ network for monitoring and control by station engineers and technicians.

5. THERMAL INTERFACES

SP-DAQ-301 DAQ Server Area Ambient Temperature

Temperature in the room that houses the DAQ servers will be maintained between 15 C and 25 C [TBC], with an average temperature of 20 C [TBC].

SP-DAQ-302 DAQ Ancillary Equipment Ambient Temperature

Temperatures in rooms/buildings that house DAQ networking equipment and/or general use workstations will be maintained between 15C and 25 C [TBC], with an average temperature of 20 C [TBC]. The one exception is the GPS antenna, which will be located outside a building.

SP-DAQ-303 DAQ Electronics Rack Waste Heat

The DAQ electronics rack shall produce a maximum of 13,650 BTU/hour [TBC] of waste heat and a steady state of 9560 BTU/hour [TBC] waste heat. .

6. ELECTRICAL INTERFACES

SP-DAQ-401 South Pole Site Power Standard

All DAQ equipment shall be rated 60 Hz electrical power (see requirement SYS-PRJ-180).

6.1 WORKSTATION ELECTRICAL POWER

SP-DAQ-411 Workstation Electrical Power Outlets

Power will be supplied to individual workstations (desktop computers) via single phase supply 125 VAC outlets rated for 15A. Outlets will be NEMA 5-15R.

6.2 SERVER RACK ELECTRICAL POWER

SP-DAQ-412 DAQ Server Rack Electrical Power Connection

Power will be supplied to the DAQ server rack via a 3-phase 220/230 VAC outlet [TBC] rated for 15 A [TBC] dedicated breaker. Outlet will be NEMA [TBD] receptacle twist lock.

SP-DAQ-413 DAQ Electronics Rack UPS

DAQ shall provide a UPS in the electronics rack that can maintain operation of the DAQ equipment for no less than TBD minutes.

6.3 TOTAL DAQ ELECTRONICS ELECTRICAL POWER

SP-DAQ-420 DAQ Electronics Rack Average Power

The average power consumed by all equipment in the DAQ rack shall not exceed 2.8kW [TBC] as documented in the electrical power budget ([+ CMB-S4 Electrical Power Needs](#) , CMBS4-doc-873).

SP-DAQ-421 DAQ Electronics Rack Maximum Power

The maximum power consumed by all equipment in the DAQ rack shall not exceed 4.0kW [TBC] as documented in the electrical power budget ([+ CMB-S4 Electrical Power Needs](#) , CMBS4-doc-873).

6.4 TOTAL DAQ WORKSTATION ELECTRICAL POWER

SP-DAQ-423 Workstation Power Supply

South Pole site shall supply power for across the site for the DAQ computer workstations as documented in the electrical power budget : [+ CMB-S4 Electrical Power Needs](#) (CMBS4-doc-873). (Main station: 2) XX kW [TBC].

6.5 SHIPPING

All DAQ materials shipping to the South Pole shall adhere to the project-wide shipping requirements in [CMBS4-L1_SYS-208](#), including the South Pole specific requirements found in: The South Pole Site Shipping Plan [CMBS4-doc-703](#) and USAP Packing and Shipping Instructions [CMBS4-doc-722](#)