

# **MRO FTT/NAS & FLC ICD**

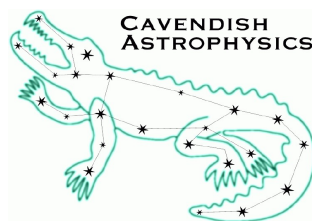
## **FTT/NAS Electronics to FTTA Controller ICD**

### **MRO-ICD-CAM-1100-0108**

**The Cambridge FTT Team**

**Rev 1.0**

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## ICD Description

ICD Number	Sub-systems		Org	Owner	Brief description and preliminary contents
MRO-ICD-CAM-1100-0108	FTT/NAS	FTTA	MRAO	MF	Defines the electronic interface between the AMOS/PI FTFA controller and the FTT/NAS electronics <ul style="list-style-type: none"> <li>• Analog connections</li> <li>• Connector type</li> <li>• Size and location of FTT/NAS electronics.</li> </ul>

## Change Record

Revision	Date	Author(s)	Changes
0.1	2010-07-09	MF	First draft version
0.2	2012-04-25	MF	Updated for PDR
0.3	2012-04-26	MF	Applied document number & minor corrections plus conversion to LibreOffice
0.4	2012-04-28	MF	Minor corrections
1.0	2013-05-09	MF	Released

## Notification List

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## Scope

This document defines the connections between the signal connectors of the FTTA controller which is located in EIE electronics housing Q5 and the FTT-NAS electronics interface also located in Q5.

## Acronyms and Abbreviations

<b>EIE</b>	Enclosure vendor	<b>NAS</b>	Narrow-field Acquisition System
<b>EMCCD</b>	Electron-Multiplying Charge-Coupled Device	<b>NMT</b>	New Mexico Tech
<b>FTT</b>	Fast Tip-Tilt	<b>PC</b>	Personal Computer
<b>FTTA</b>	Fast Tip-Tilt Actuator	<b>PSU</b>	Power Supply Unit
<b>FLC</b>	First Light Camera	<b>TBC</b>	To be confirmed
<b>GPS</b>	Global Positioning System	<b>TBD</b>	To be determined
<b>ICD</b>	Interface Control Document	<b>UT</b>	Unit Telescope
<b>ID</b>	Inner Diameter	<b>UTCS</b>	Unit Telescope Control System
<b>ISS</b>	Interferometer Supervisory System	<b>UTE</b>	Unit Telescope Enclosure
<b>MROI</b>	Magdalena Ridge Observatory Interferometer	<b>WFS</b>	WaveFront Sensor
<b>MRAO</b>	Mullard Radio Astronomy Observatory		

## Documents

### Drawings

AD1 Unit Telescope Electrical ICD MRO-ICD-AMO-6000-025

AD2 Control Cabinet Q5 MRO-DWG-EIE-00-410-02-05c

### Reference Documents

RD1 MRO FTT-NAS Technical Requirements INT-403-ENG-0003 rev 2.2

RD2 MROI Unit Telescope ICD MRO-ICD-AMO-0000-022, issue 7

# 1 Introduction

This ICD describes the electrical connections between the Fast Tip-tilt Actuator controller supplied by Physik Instrumente (PI), as part of the AMOS telescope contract, and the electronics interface to the FTT-NAS computer. Both pieces of equipment are mounted in EIE electronics housing designated Q5 and it is only necessary to connect the electronics interface to the connectors provided in the PI controller unit.

## 2 Requirements

The requirements of the electronics interface are defined by the PI controller specification, the relevant part of which is reproduced here.

### 2.1 Signal definitions

These are provided by AD1 but reproduced here:

#### FTTA <sup>(2)</sup>

220X10	1	LEMO connector : EPG.00.302.NLN	Q5	Tip Input signal (Ain+)	MRO -> AMOS	Analog signal + / - 10 V
	2			Tip Input signal (Ain-)	MRO -> AMOS	
	Housing			Cable shield	MRO -> AMOS	
220X11	1	LEMO connector : EPG.00.302.NLN	Q5	Tip Output signal (Aout)	MRO -> AMOS	Analog signal + / - 10 V
	2			Tip Output signal (GND)	MRO -> AMOS	
	Housing			Cable shield	MRO -> AMOS	
220X12	1	LEMO connector : EPG.00.302.NLN	Q5	Tilt Input signal (Ain+)	MRO -> AMOS	Analog signal + / - 10 V
	2			Tilt Input signal (Ain-)	MRO -> AMOS	
	Housing			Cable shield	MRO -> AMOS	
220X13	1	LEMO connector : EPG.00.302.NLN	Q5	Tilt Output signal (Aout)	MRO -> AMOS	Analog signal + / - 10 V
	2			Tilt Output signal (GND)	MRO -> AMOS	
	Housing			Cable shield	MRO -> AMOS	

### 2.2 Connector specifications and connections

#### 2.2.1 Analogue input sockets

Connector type: LEMO EPG.00.302.NLN

Pin	Signal	Function
1	input	A <sub>IN+</sub> Analog differential input
2	input	A <sub>IN-</sub> Analog differential input



The socket case is connected to GND.

$|A_{IN+} - A_{IN-}| \leq 10 \text{ V}$  in the range of -10 to +10 V

Resolution: 18 bit

Bandwidth: 25 kHz

Max. impedance of the signal source: 250 ohm


A larger impedance of the signal source will increase the noise and hence reduce the resolution.

## 2.2.2 Analogue output sockets

The analog output lines Out 1 to Out 4 are located on E-711.IA4 analog interface module.

Connector type: LEMO EPG.00.302.NLN

Pin	Signal	Function
1	output	A <sub>OUT</sub> Analog output, -10 to 10 V
2	GND	GND



Resolution: 16 bit  
Bandwidth: 25 kHz

## 3 Design

### 3.1 Interface description

The connection between the electronics interface and the PI controller will be made using identical connectors at both ends of a suitable screened cable. The screens of each cable are to be connected to the shell of the connector at the source equipment and not connected at the receiving equipment.

The analogue output interface in the FTT-NAS electronics interface is to comply with the design objectives of the PI controller in minimising the impact of noise on the signal inputs, specifically:

1. To use the full dynamic range of  $\pm 10V$
2. To ensure the output impedance of the signal source is  $< 250$  Ohms.

The analogue input interface in the FTT-NAS electronics interface is to accept the full range of output available, specifically:

1. To accept an analogue input range of  $\pm 10V$

The selected analogue interface board meets the signal requirements and so no signal level shifting/scaling and buffering are required to meet cable transmission and source/load impedance restrictions. A circuit board, mounted in the 2U module allows the analogue interface board cable to be separated into the required input/output signal pairs which are wired to the Lemo connectors specified in 2.2. These connectors are mounted on the back panel of the 2U module and the cables which link these to the FTTA electronics mounted below are also supplied.

### 3.2 Interface location

The interfaces are both located in EIE electronics housing designated Q5 (AD2). The diagram in Table 1 below shows the allocation of space in the 24 available positions, or slots, in Q5. The numbering at the left is in 'U' (unit height) modules. The location reserved for the FTTA controller is slots 1-3 and for the FTT/NAS electronics, slots 11-15. The cables supplied with the FTT/NAS electronics shall be long enough to allow the electronics module to be located in slots 14 and 15.

24	UTE (9U)
23	
22	
21	
20	
19	
18	
17	
16	
15	FTT (5)
14	
13	
12	
11	
10	Network switchable Power Distribution Unit (1U)
9	UTCS PC (including GPS card) (2U)
8	
7	M2 hexapod controller (4U)
6	
5	
4	
3	M2 FTTA controller (3U)
2	
1	

*Table 1: Allocation of space within EIE enclosure cabinet Q5*

## 4 Appendix

The diagram in Figure 1 below indicates the location of cabinet Q5 within the telescope enclosure. The supports for the Nasmyth table are at the top of the picture, nearer to Q1.

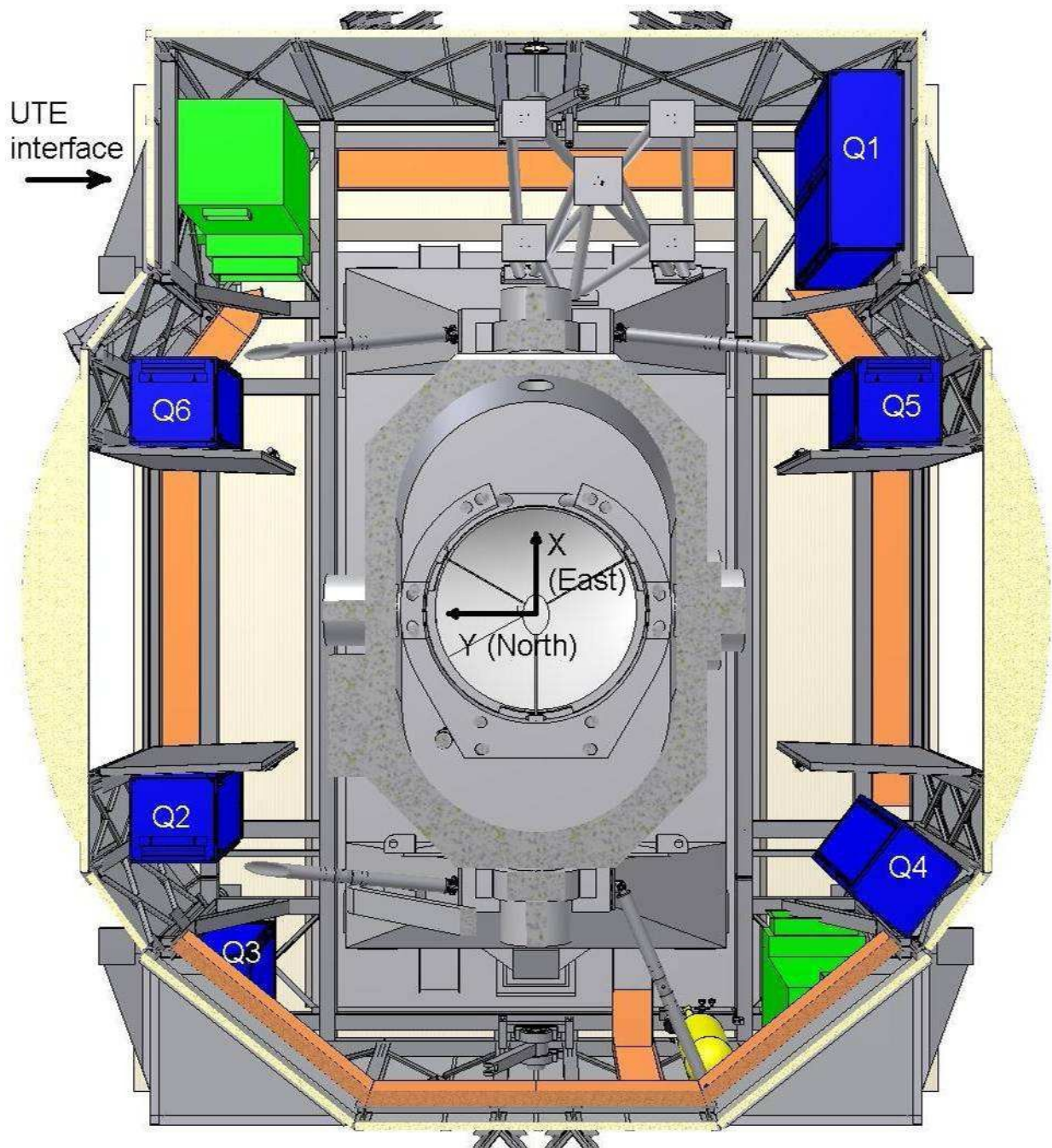


Figure 1: Disposition of cabinets in the telescope enclosure