



## MULTIPLE MIRROR TELESCOPE OBSERVATORY

Smithsonian Astrophysical Observatory and Steward Observatory, University of Arizona

MMTO Technical Memorandum 86-2

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Subj: **Interfacing instrument control computers to certain  
Top Box functions.**

This technical memo details how to computer-control the top box functions of comparison mirror, Hartmann mask wheel, filter wheel and comparison lamps, and how to read the status of any of these.

The interface to the top box consists of a 16-bit parallel input port for commands and a 16-bit output port for status information. The physical connection is via two DB25 connectors with the pin layout as follows. The connectors on the GAITS box (the top box arbitrator) are female.

PIN	COMPUTER SIGNAL	DESCRIPTION	
1			
2			
3	A7	Comparison lamp	0
4	A5	" "	2
5	A3	" "	4
6	A1	" "	6
7	B0	Busy	
8	B2	Filter bit	C
9	B4	" "	A
10	B6	Hartmann bit	B
11			
12			
13			
14	GND		
15	GND		
16	A6	Comparison lamp	1
17	A4	" "	3
18	A2	" "	5
19	A0	" "	7
20	B1	Comparison Mirror	
21	B3	Filter bit	B
22	B5	Hartmann bit	C
23	B7	" "	A
24	GND		
25	GND		

NOTE - The pin layouts for input (command) and output (status) DB25 connectors are identical.

For ease of documentation, we will consider the 16-bit ports as two 8-bit bytes each (shown as computer signals A0 - A7 and B0 - B7 in the pinout list above, where 0 refers to the least-significant bit). The 'A' byte contains the comparison lamp commands or status, and the 'B' byte contains the comparison mirror, filter wheel, Hartmann wheel and a 'busy' bit.

This document was prepared after interfacing the top box to a Z80 'Blue Box' computer controlling the Echelle spectrograph. In this case we used two 8-bit parallel output ports and two 8-bit input ports in the Blue Box, but obviously, for 16-bit (or more) computers 16-bit parallel ports would be used. In the following description of these ports, a logic 0 corresponds to a +5 volt signal to the top box, and logic 1 corresponds to 0 volts.

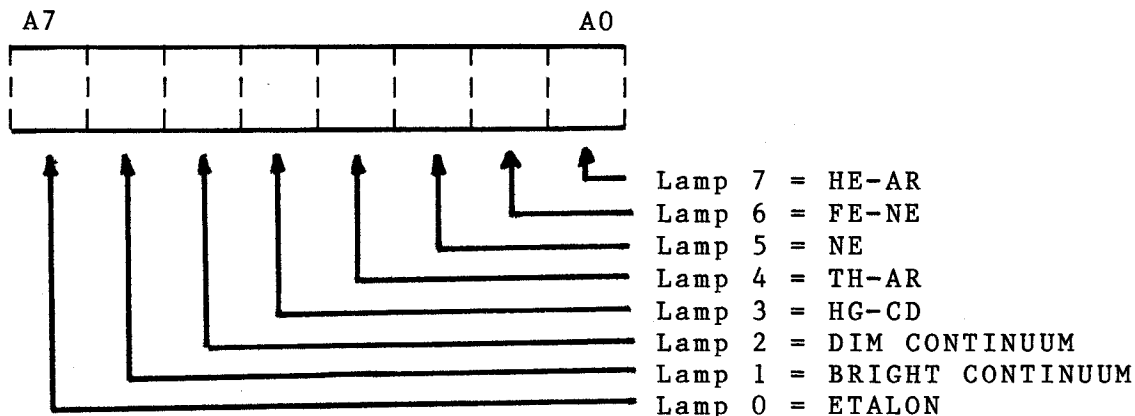
The input to GAITS is a 74LS07 with a 10K pull-up to +5 volts. A suggested drive circuit would be an open-collector TTL gate. The output from GAITS (status) is an MPQ 2222 open-collector (approx. 30V @ 100ma). Please note that inputs to GAITS should power-on / reset to +5 volts (considered a logic 0 in this system).

Note that for the Z80 Blue Box system, in order to conform to the requirement to power-on to +5 volts, the interface had to be set up in such a way that the computer commands - and the status information read back - all had to be INVERTED from the logic values in the following descriptions.

Also, the following descriptions state the correspondence between lamp or filter numbers and the lamp or filter physically installed in that position. This is correct as of this date, but could be changed at some future time.

**THE 'A' BYTE**

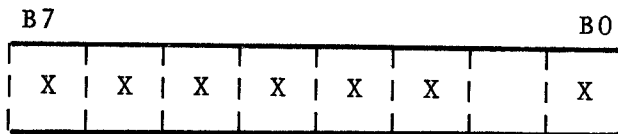
**LAMPS**



1 in any command bit position turns lamp ON  
 1 in any status bit position means lamp is ON.  
 i.e. FF hexadecimal = all lamps ON

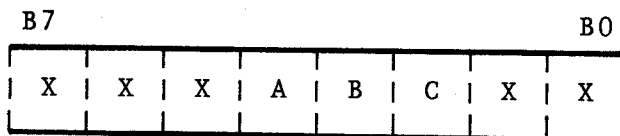
## THE 'B' BYTE

### COMPARISON MIRROR



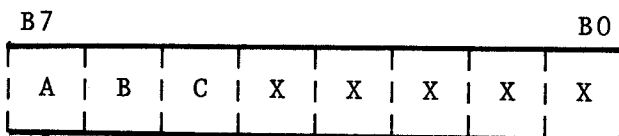
1 = Mirror IN  
 0 = Mirror OUT (Command or Status)

### FILTERS



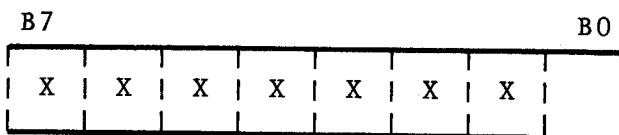
	0	0	0	=	Filter	0	=	ND 2.3	(Command or Status)
	1	0	0	=	"	1	=	ND 2.0	
	0	1	0	=	"	2	=	ND 1.6	
	1	1	0	=	"	3	=	ND 1.3	
	0	0	1	=	"	4	=	ND 1.0	
	1	0	1	=	"	5	=	ND 0.6	
	0	1	1	=	"	6	=	ND 0.3	
	1	1	1	=	"	7	=	CLEAR	

### HARTMANN MASKS



	0	0	0	=	Mask	0	=	DARK	(Command or Status)
	1	0	0	=	"	1	=	LEFT HART	
	0	1	0	=	"	2	=	RIGHT HART	
	1	1	0	=	"	3	=	OPEN HEX	
	0	0	1	=	"	4	=	LEFT HART HEX	
	1	0	1	=	"	5	=	RIGHT HART HEX	
	0	1	1	=	"	6	=	ND 2.0 + OPEN HEX	
	1	1	1	=	"	7	=	CLEAR	

### BUSY BIT



For COMMAND, Bit B0 currently has no meaning, so is a DON'T CARE.  
 For STATUS, Bit B0 = 1 = BUSY (i.e. something is moving)  
 = 0 = NOT BUSY