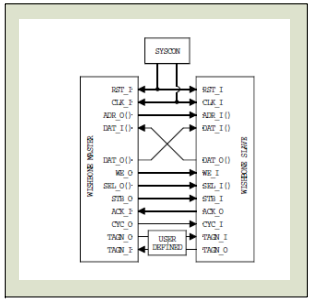


REFERENCE WISHBONE BUS INTERCONNECTION SCHEME
See http://www.opencores.org/projects.cgi/web/wishbone/wishbone

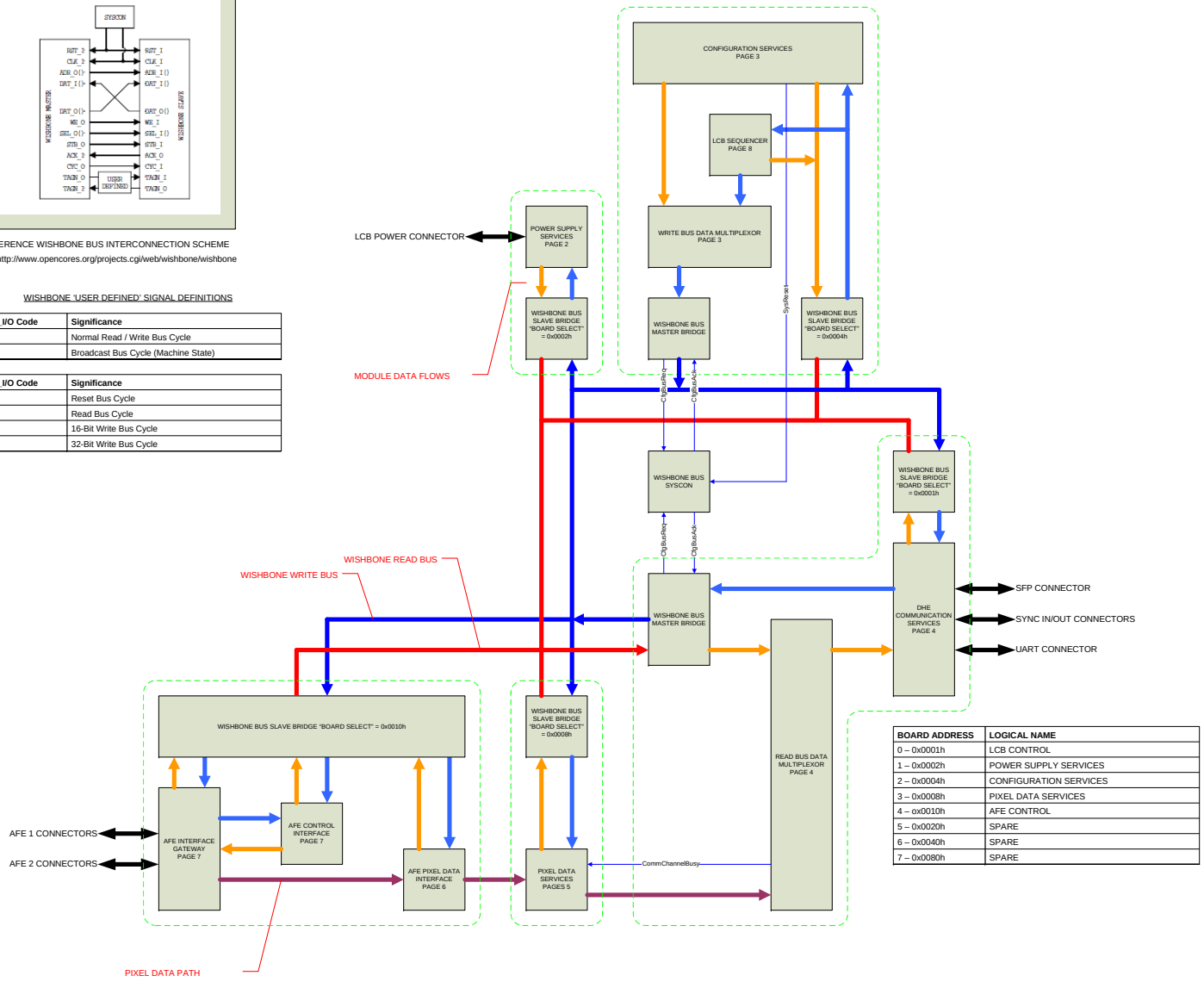
WISHBONE 'USER DEFINED' SIGNAL DEFINITIONS

TGD_I/O Code	Significance
'0'	Normal Read / Write Bus Cycle
'1'	Broadcast Bus Cycle (Machine State)

TGC_I/O Code	Significance
"00"	Reset Bus Cycle
"01"	Read Bus Cycle
"10"	16-Bit Write Bus Cycle
"11"	32-Bit Write Bus Cycle

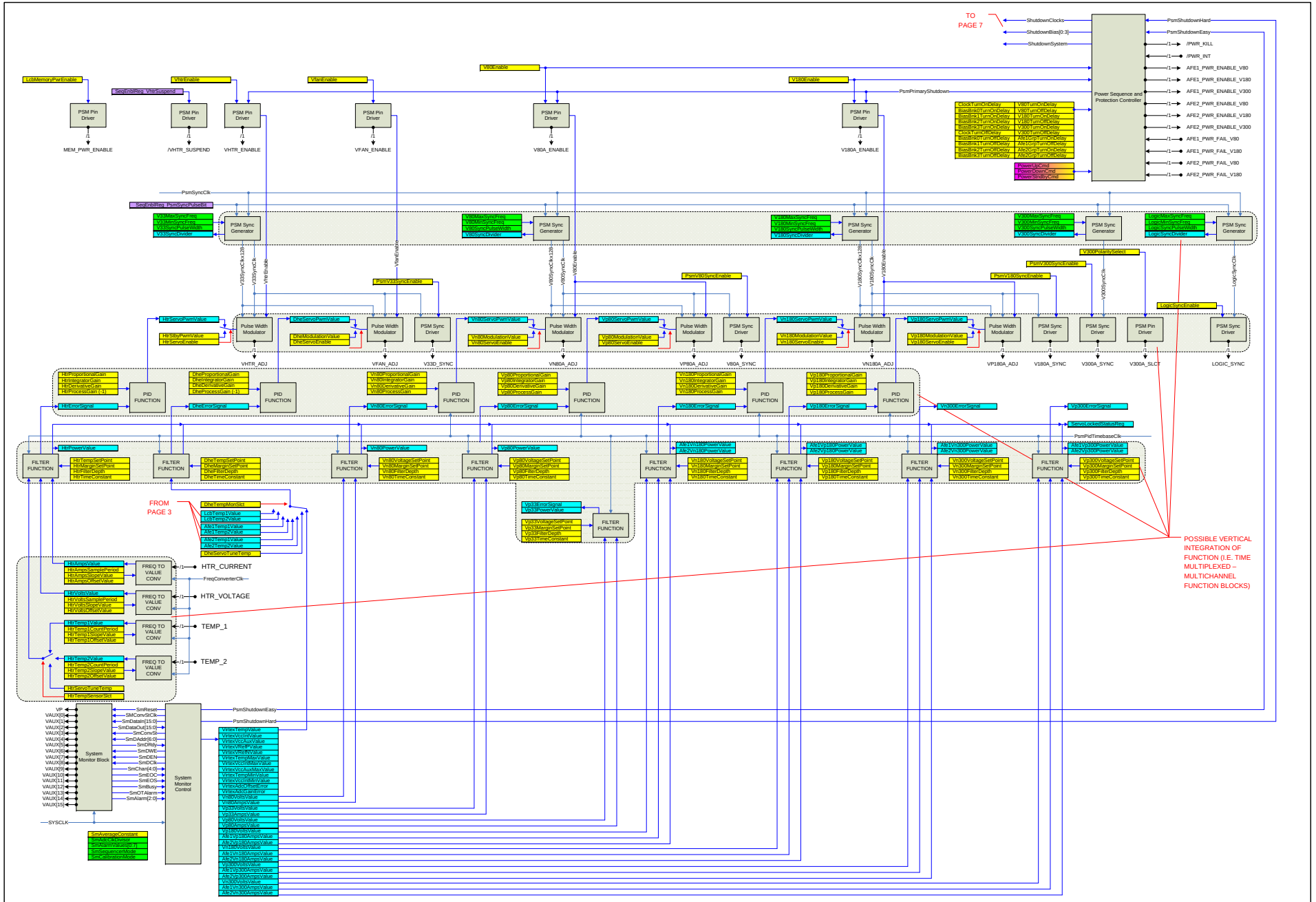
CHANGES FROM VERSION C1 to C2
1. Moved Sequencer logic from LCB control module to CFG Services module.

CHANGES FROM VERSION C2 to C3
1. Corrected signal arrow on page 7 to point to page 2 rather than page 3..
2. Removed multiplexor from page 3
3. Renumbered pages
4. Colored blocks orange to indicate available firmware from MONSOON Orange
5. Aded extra level of heirarchy to I2C_Sequencer logic on page 3

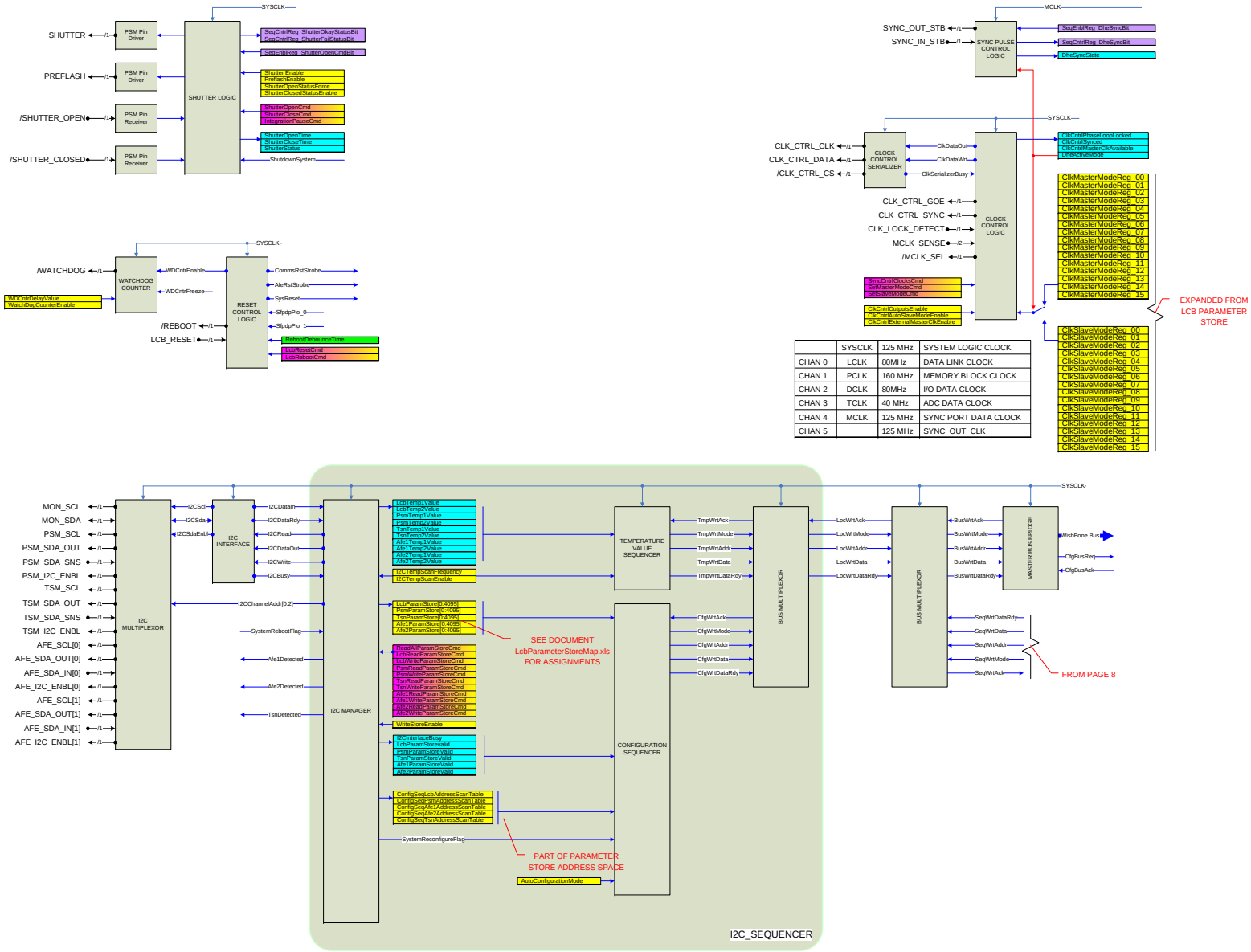


BOARD ADDRESS	LOGICAL NAME
0 – 0x0001h	LCB CONTROL
1 – 0x0002h	POWER SUPPLY SERVICES
2 – 0x0004h	CONFIGURATION SERVICES
3 – 0x0008h	PIXEL DATA SERVICES
4 – 0x0010h	AFE CONTROL
5 – 0x0020h	SPARE
6 – 0x0040h	SPARE
7 – 0x0080h	SPARE

NATIONAL OPTICAL ASTRONOMY OBSERVATORIES			
NAME: MONSOON TORRENT LCB FIRMWARE ARCHITECTURE TOP LEVEL STRUCTURE			
DWG NO	SIZE: C	REF	REV: C3
RELEASED	PAGE 1 OF 8		



DWG NO	SIZE C	REF	REV C3
RELEASED	PAGE 2 OF 8		



	SYSCLK	125 MHz	SYSTEM LOGIC CLOCK
CHAN 0	LCLK	80MHz	DATA LINK CLOCK
CHAN 1	PCLK	160 MHz	MEMORY BLOCK CLOCK
CHAN 2	DCLK	80MHz	I/O DATA CLOCK
CHAN 3	TCLK	40 MHz	ADC DATA CLOCK
CHAN 4	MCLK	125 MHz	SYNC PORT DATA CLOCK
CHAN 5		125 MHz	SYNC_OUT_CLK

DATA REGISTER COLOUR CODES

PROGRAMATIC DATA	REGISTER NAME (READ AND WRITE)
INTERNALLY GENERATED DATA	REGISTER NAME (READ ONLY)
DATA CONSTANTS	REGISTER NAME
SEQUENCER REGISTERS	REGISTER BIT(S)
FUNCTION TRIGGERS	FUNCTION NAME

SYMBOL LEGEND

FIRMWARE CONTROL SIGNALS — FIRMWARE PROCESS — FILTER FUNCTION

HARDWARE SIGNALS

INTERNAL DATA & CLOCK FLOWS — SYSTEM READ / WRITE BUS. ACCESS TO ALL REGISTERS

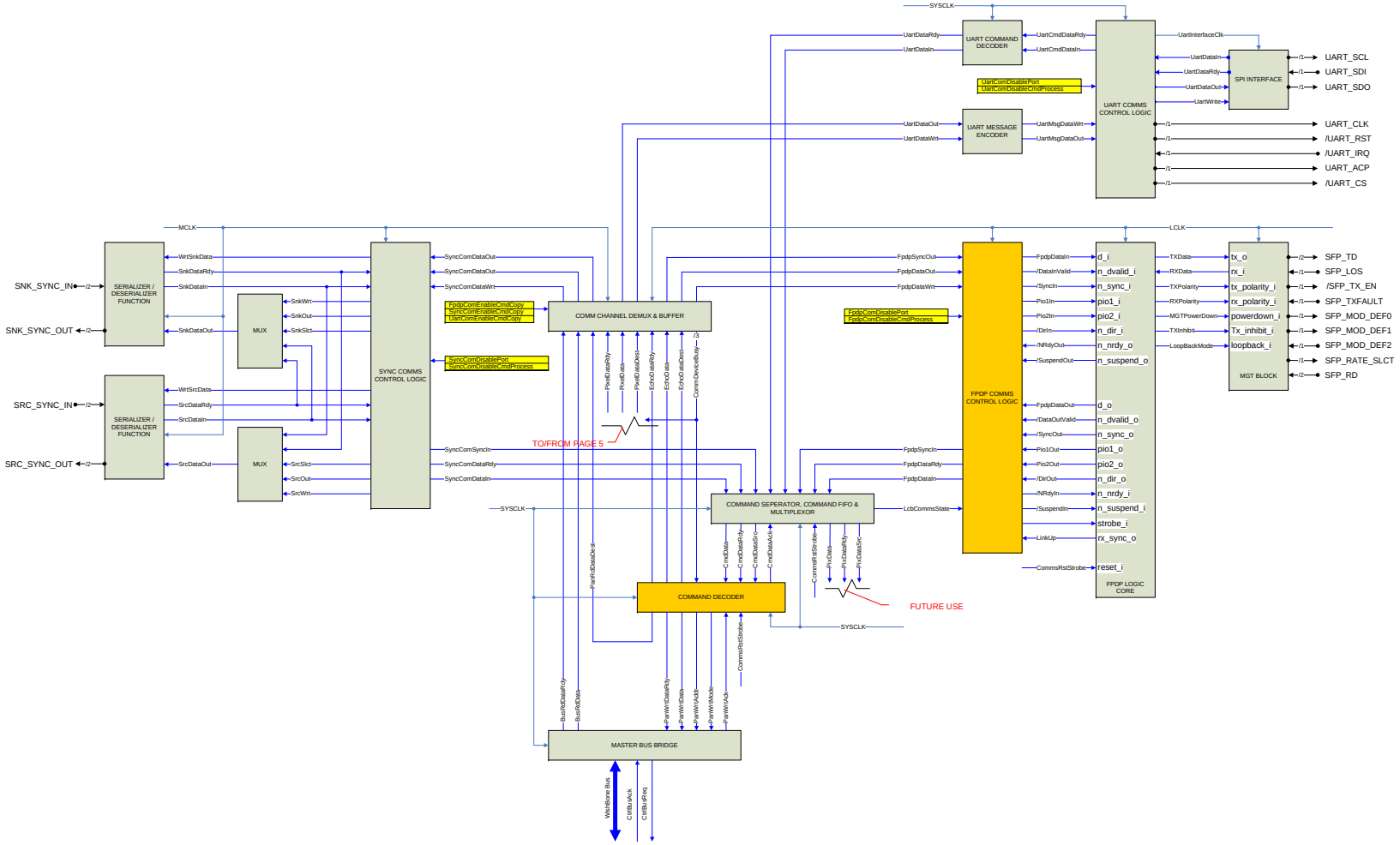
NATIONAL OPTICAL ASTRONOMY OBSERVATORIES

NAME

MONSOON TORRENT
LCB FIRMWARE ARCHITECTURE
CONFIGURATION SERVICES

DWG NO	SIZE	REF	REV
	C		C3

RELEASED — PAGE 3 OF 8



SYMBOL LEGEND

DATA REGISTER COLOUR CODES

PROGRAMATIC DATA	REGISTER NAME (READ AND WRITE)
INTERNALLY GENERATED DATA	REGISTER NAME (READ ONLY)
DATA CONSTANTS	REGISTER NAME
SEQUENCER REGISTERS	REGISTER BIT(S)
FUNCTION TRIGGERS	FUNCTION NAME

FIRMWARE CONTROL SIGNALS

HARDWARE SIGNALS

INTERNAL DATA & CLOCK FLOWS

FIRMWARE PROCESS

FILTER FUNCTION

SYSTEM READ / WRITE BUS. ACCESS TO ALL REGISTERS

NATIONAL OPTICAL ASTRONOMY OBSERVATORIES

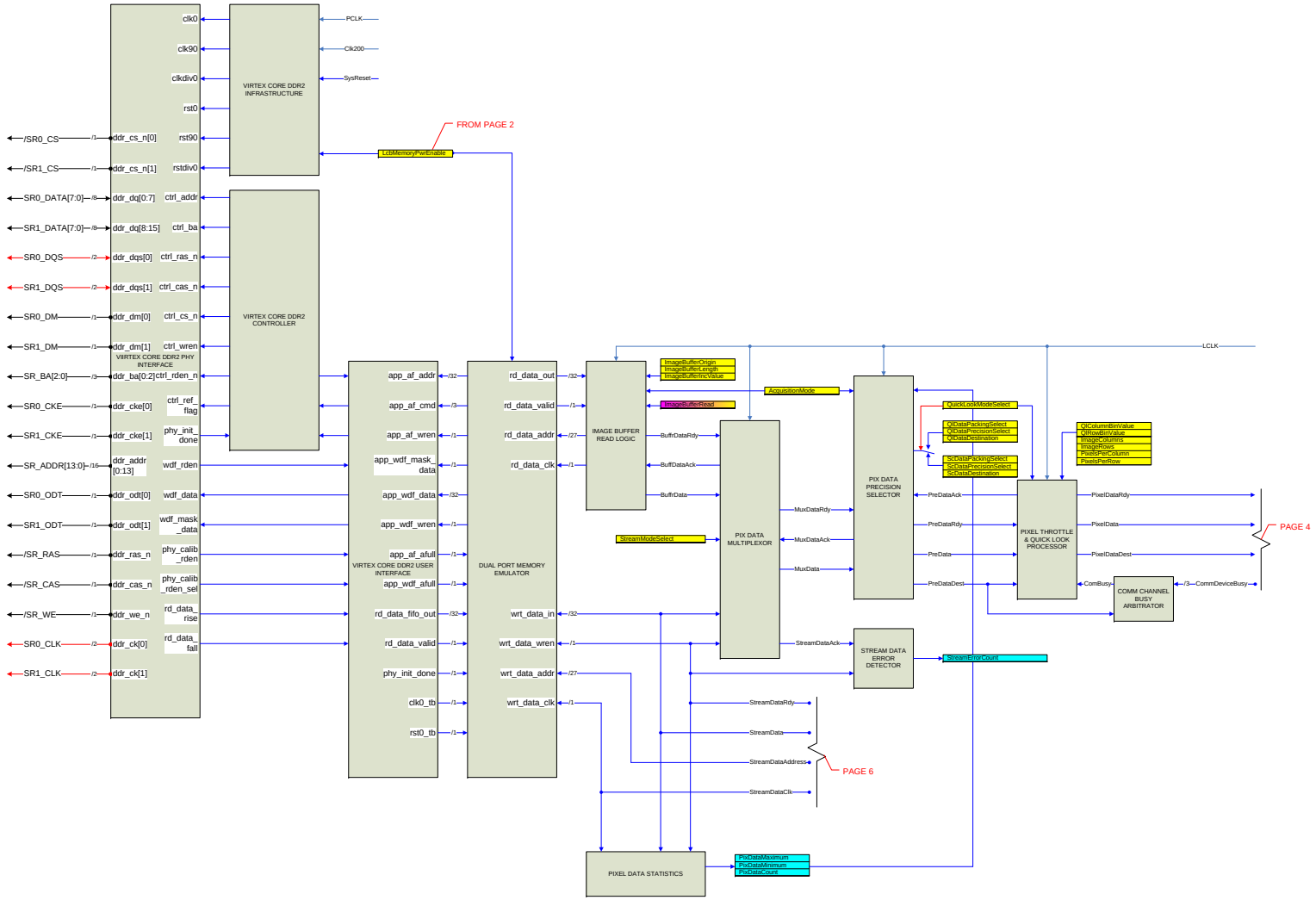
NAME

MONSOON TORRENT
LCB FIRMWARE ARCHITECTURE
COMMUNICATION SERVICES

DWG NO	SIZE	REF	REV
	C		C3

RELEASED

PAGE 4 OF 8



DATA REGISTER COLOUR CODES

PROGRAMATIC DATA	REGISTER NAME (READ AND WRITE)
INTERNALLY GENERATED DATA	REGISTER NAME (READ ONLY)
DATA CONSTANTS	REGISTER NAME
SEQUENCER REGISTERS	REGISTER BIT(S)
FUNCTION TRIGGERS	FUNCTION NAME

SYMBOL LEGEND

FIRMWARE CONTROL SIGNALS
HARDWARE SIGNALS
INTERNAL DATA & CLOCK FLOWS
FIRMWARE PROCESS
FILTER FUNCTION
SYSTEM READ / WRITE BUS. ACCESS TO ALL REGISTERS

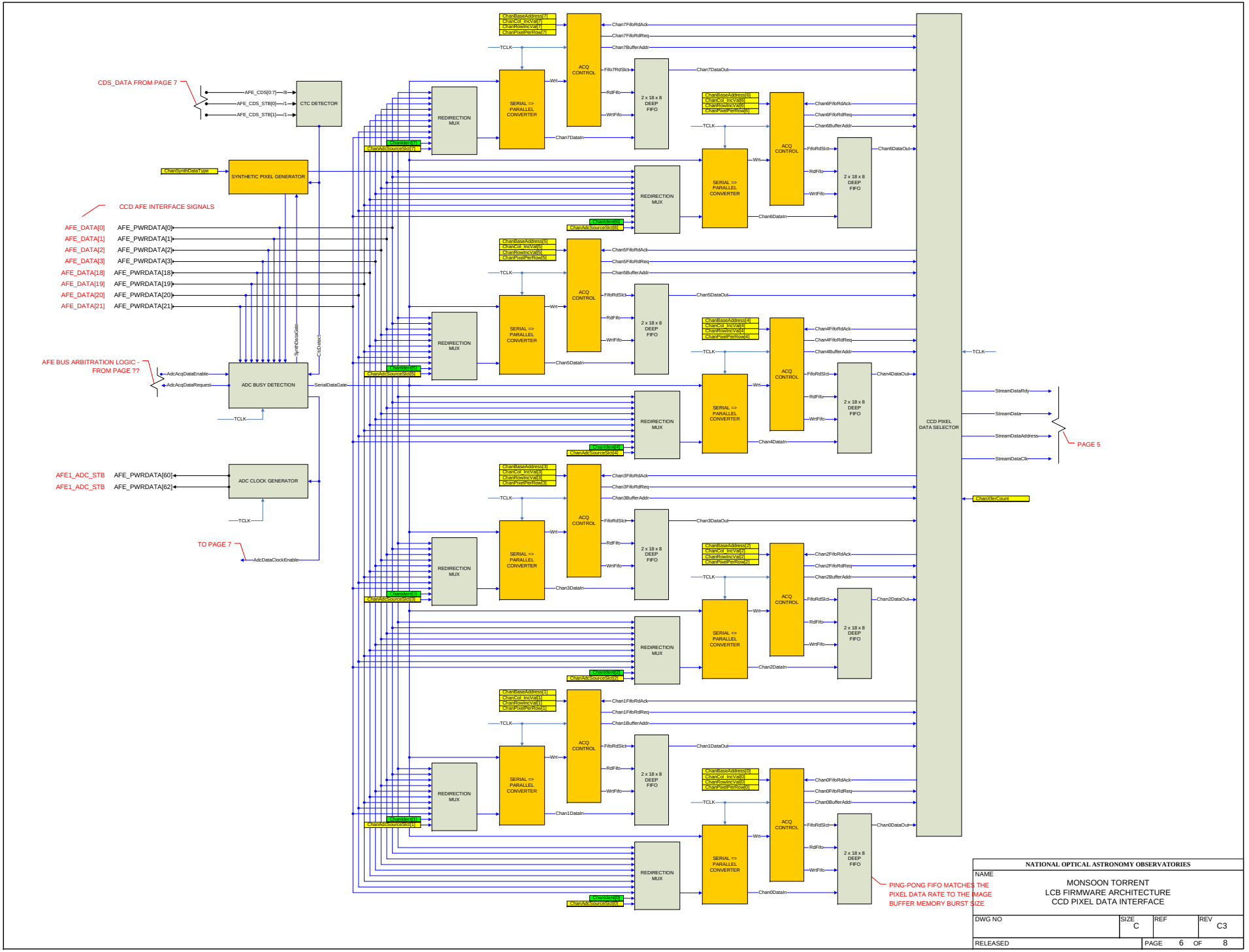
NATIONAL OPTICAL ASTRONOMY OBSERVATORIES

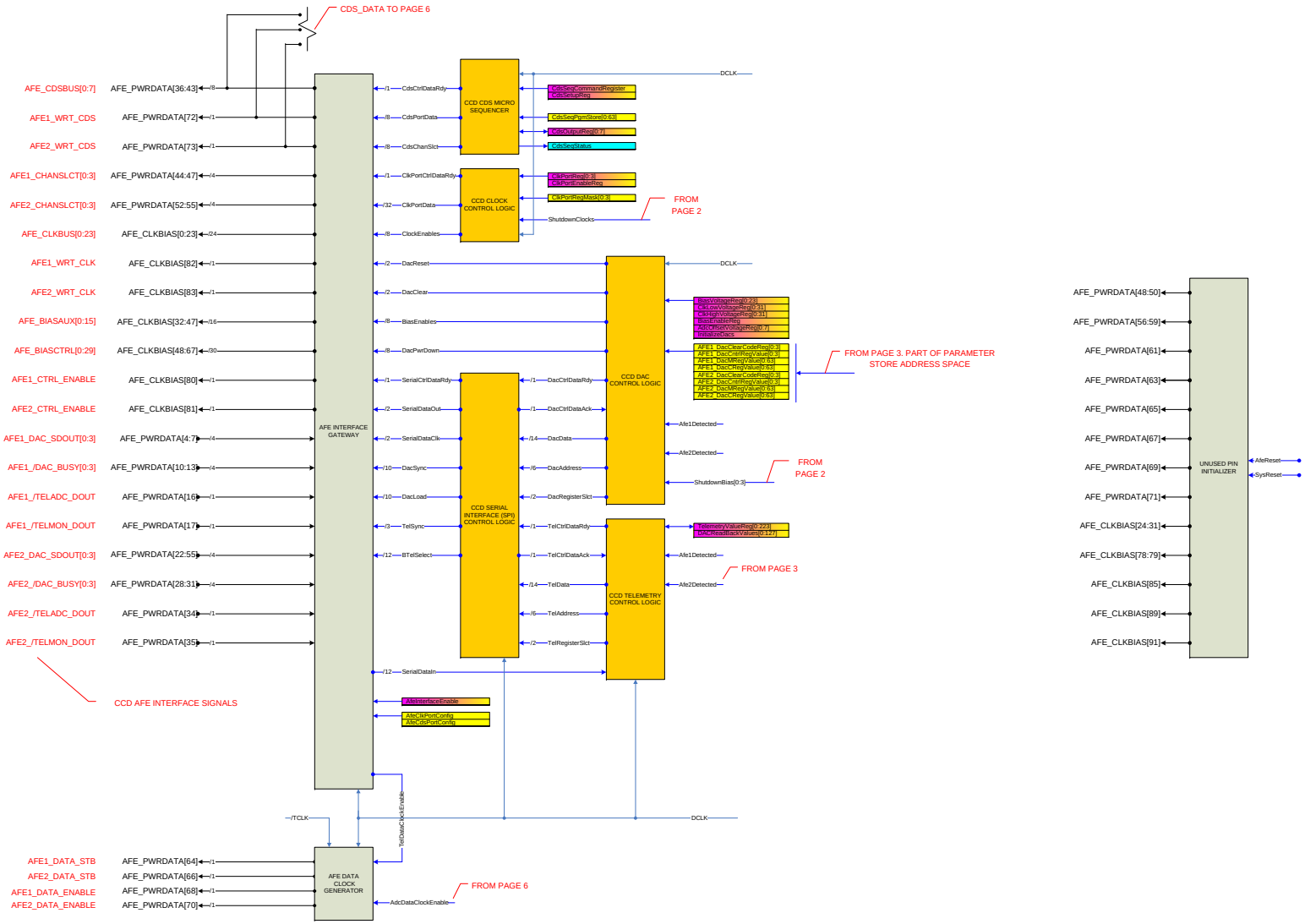
NAME

MONSOON TORRENT
LCB FIRMWARE ARCHITECTURE
LCB PIXEL DATA SUPPORT

DWG NO	SIZE	REF	REV
	C		C3

RELEASED | PAGE 5 OF 8


CDS_DATA FROM PAGE 7
AFE_CDS[0:7]
AFE_CDS_STB[0]
AFE_CDS_STB[1]
CTC DETECTOR
SYNTHETIC PIXEL GENERATOR
CCD AFE INTERFACE SIGNALS
AFE_DATA[0] AFE_PWRDATA[0]
AFE_DATA[1] AFE_PWRDATA[1]
AFE_DATA[2] AFE_PWRDATA[2]
AFE_DATA[3] AFE_PWRDATA[3]
AFE_DATA[18] AFE_PWRDATA[18]
AFE_DATA[19] AFE_PWRDATA[19]
AFE_DATA[20] AFE_PWRDATA[20]
AFE_DATA[21] AFE_PWRDATA[21]
AFE BUS ARBITRATION LOGIC - FROM PAGE ??
ADC BUSY DETECTION
ADC CLOCK GENERATOR
AFE1_ADC_STB AFE_PWRDATA[60]
AFE1_ADC_STB AFE_PWRDATA[62]
TO PAGE 7
REDIRECTION MUX
SERIAL => PARALLEL CONVERTER
ACQ CONTROL
2 x 18 x 8 DEEP FIFO
CCD PIXEL DATA SELECTOR
StreamDataRdy
StreamData
StreamDataAddress
StreamDataClk
PAGE 5
PING-PONG FIFO MATCHES THE PIXEL DATA RATE TO THE IMAGE BUFFER MEMORY BURST SIZE
NATIONAL OPTICAL ASTRONOMY OBSERVATORIES
NAME
MONSOON TORRENT
LCB FIRMWARE ARCHITECTURE
CCD PIXEL DATA INTERFACE
DWG NO
SIZE C
REF
REV C3
RELEASED
PAGE 6 OF 8



DATA REGISTER COLOUR CODES

PROGRAMATIC DATA	REGISTER NAME (READ AND WRITE)
INTERNALLY GENERATED DATA	REGISTER NAME (READ ONLY)
DATA CONSTANTS	REGISTER NAME
SEQUENCER REGISTERS	REGISTER BIT(S)
FUNCTION TRIGGERS	FUNCTION NAME

SYMBOL LEGEND

FIRMWARE CONTROL SIGNALS — FIRMWARE PROCESS — FILTER FUNCTION

HARDWARE SIGNALS

INTERNAL DATA & CLOCK FLOWS — SYSTEM READ / WRITE BUS. ACCESS TO ALL REGISTERS

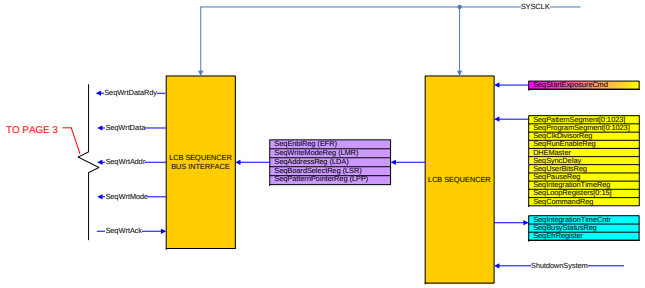
NATIONAL OPTICAL ASTRONOMY OBSERVATORIES

NAME

MONSOON TORRENT
LCB FIRMWARE ARCHITECTURE
CCD AFE SERVICES INTERFACE

DWG NO	SIZE	REF	REV
	C		C3

RELEASED — PAGE 7 OF 8



DATA REGISTER COLOUR CODES

PROGRAMATIC DATA	REGISTER NAME (READ AND WRITE)
INTERNALLY GENERATED DATA	REGISTER NAME (READ ONLY)
DATA CONSTANTS	CONSTANT NAME
SEQUENCER REGISTERS	REGISTER BIT(S)
FUNCTION TRIGGERS	FUNCTION NAME

SYMBOL LEGEND

FIRMWARE CONTROL SIGNALS

HARDWARE SIGNALS

INTERNAL DATA & CLOCK FLOWS

FIRMWARE PROCESS — FILTER FUNCTION

SYSTEM READ / WRITE BUS. ACCESS TO ALL REGISTERS

NATIONAL OPTICAL ASTRONOMY OBSERVATORIES

NAME

MONSOON TORRENT
LCB FIRMWARE ARCHITECTURE
LCB SEQUENCER

DWG NO	SIZE	REF	REV
	C		C3

RELEASED