Digital Control Distribution Boards

V1.00 20 Jul 1998 Written by Jeff Kern
V1.21 23 Jun 2000 Revisions - T. Hankins.
V1.21 19 Jun 2002 Added DCB to BBM2 wire list. - THH
Note 19 Jun 2002: This section needs extensive updating to reflect the change from the serial to IEEE-488 digital controller. - THH

Purpose The Digital Control Distribution Boards (DCDB) function as the relay between the Display and Control Computer (DCC) and the hardware located in the Frequency Generation Chassis, the Baseband Mixer Chassis and the Fast Analog to Digital Converter Chassis. There are four boards in this set:

1. ICS Electronics 2303 Serial to Parallel interface board.
2. Two Digital Control Distribution Boards (DCDBs) which contain the address decoders and control registers.
3. Connector board that distributes signals from the ICS 2303 to the two DCDBs.

A serial line from the DCC drives the ICS 2303, which has five 8-bit ports. These TTL signals are distributed by the Connector Board from the ICS 2303 to the DCDBs. The ICS 2303 allows data to be written by the computer and read back for verification. The primary purpose of the DCDBs is to provide static control register storage for Baseband Mixer attenuator and bandwidth selection and synthesizer frequency controls. Ports 4 and 5 of the ICS 2303 Serial to Parallel board Controller are multiplexed for many devices. There are currently two DCDBs. DCDB0 handles device addresses 0–7, while DCDB1 handles device addresses 8–15. Ports 1 – 3 of the ICS 2303 are used to emulate a standard PC parallel port for control of the FADCs.

0.1 ICS 2303 Serial to Parallel Card

The ICS 2303 Serial to Parallel Card is a commercial product that allows read/write control of 40 TTL lines organized as five 8-bit ports. Ports 1–3 are used to emulate a standard PC parallel port. Ports 4 and 5 are used as address and data ports to control many devices. Table 1 shows the assignment of the ports.

Port	Use	I/O
1	Parallel port emulation data	output
2	Parallel port emulation status	input
3	Parallel port emulation control	output
4	Device address	output
5	Device data	in/out

Table 1: ICS 2303 TTL port assignments. "Input" and "output" are as seen by the ICS 2303. In addition to these 40 lines, the STROBE signal from the ICS 2303 is used to clock the data into registers on the Digital Distribution Control Boards.

0.1.1 ICS 2303 I/O

The ICS 2303 Serial to Parallel adapter card and the ExacTime GPS Receiver (See section **??**) are controlled by serial lines from the Control Computer. The Sparc 20 has a dual-serial port connector. The serial ports A and B are split using a special splitter cable, part number 2588 purchased from UltraSpec Cables, Inc. The splitter cable has a DB25 Male connector to connect to the Sparc 20, and two female DB25 connectors for Serial ports outputs A and B.

The connection from the Sun computer serial port splitter port B to the ICS 2303 requires a DB25 male to DB25 female null modem cable, *i.e.*, the following signals are transposed:

- TRANSMIT DATA ↔ RECEIVE DATA
- READY TO SEND ↔ CLEAR TO SEND
- DATA TERMINAL READY ↔ DATA CARRIER DETECT
- RECEIVE CLOCK ↔ TRANSMIT CLOCK

DB25M–DB25F
1–1
2–3
3–2
4 = 5–8
6–20
7–7
8–4 = 5
20–6

Table 2: Null Modem Pin Connections.

The null modem used is a Belkin Components #284052, whose connections are given in Table 2. There is a short ribbon cable connecting the IDC DB25 female mounted on the rear panel of the Frequency Generation Chassis to J1, a 26-pin header on the ICS 2303. Note that there are two adjacent 26-pin headers on the ICS 2303 for serial input. Use J1, *not* J2.

A summary of the Serial Port pin connections is shown in Table **??** in section **??**.

0.2 Connector Board

The Connector Board adapts the 64-pin output of the ICS 2303 Serial to Parallel Interface Board to the 60-pin inputs of the Digital Control Distribution Boards. It makes the emulated Parallel Port connection for the Fast ADCs, and it provides a connection to the front panel status LEDs from the ICS 2303. There are currently two 60-pin outputs (one for each DCDB, designated JP2 and JP3, though one is not used; the 60-pin ribbon cable is daisy-chained to both DCDB0 and DCDB1), a single 64-pin connector (JDH1, mounted underneath the Connector Board on hinged stilts. This connector plugs directly into the ICS 2303), a 26-pin header, JP1, a 16-pin header for the ICS 2303 communications status LEDs, and a 12-conductor power connector, JP4. Separate grounds for each power supply voltage are provided. However, the +15V and −15V power to the Frequency Synthesizers (see section **??**) are referred only to the +5V ground, as only one ground connection is provided on the synthesizer input connectors.

0.2.1 LED Displays

The LED display connector JP6 on the Connector Board is a 16-pin connector which carries signals to the front of the Frequency Generation Chassis for display. The pin asignments are given in Table 3

Pin	Function
2	+5 V
4	ERROR_LED
6	SRQ_LED
8	LISTEN_LED
10	TALK_LED
12	RDY_LED
1–15 Odd	Ground

Table 3: Pin assignments for ICS2303 LED communications status display, connector JP6 on the Connector Board.

0.3 Digital Control Distribution Boards

0.3.1 Input

The inputs to the DCDBs are through 60-pin ribbon connectors from the Connector Card. The pin assignments for the 60-pin connector are listed in Table 4.

0.3.2 Output

The decoded control signals are output through headers on the DCDBs. Table 5 lists the output connectors and provides an overview of their purpose.

Test Signal Generator Chassis: *Not yet written -22 Jun 2000 - THH*

BBM R1/L1, BBM R2/L2: These 40-pin connectors convey the controls for the filter bandwidth, and attenuation for the Baseband Mixers. The pin assignments are given in Table 6. The wire list for the connections from the Digital Distribution Board to the BBM2 connector ar4e given in table 7.

Synthesizer Control: The 26-pin connectors JP4 and JP6 control the RF Prototype Systems frequency sythesizers used to generate the local oscillator, and sample frequencies. Ribbon cables convey the signals and power to the female DB25 connectors mounted on the synthsizers. The pin assignments are shown in Table 8. Note that the synthesizer controls are identical.

Port 4: Device Address			
Signal	Bit	DCDB Pin	ICS 2303 Pin
A7	MSB	1	A25
A8	6	3	C25
A5	5	5	A26
A4	4	7	C26
A3	3	9	A27
A2	2	11	C27
A1	1	13	A28
A0	LSB	15	C28
Port 5: Data			
Signal	Bit	DCDB Pin	ICS 2303 Pin
D7	MSB	17	A29
D6	6	19	C29
D5	5	21	A30
D4	4	23	C30
D3	3	25	A31
D2	2	27	C31
D1	1	29	A32
D0	LSB	31	C32
R/W_STROBE		33	A12
Ground		2–60 Even	
+5 V		59 (2–60)	
−5 V		55 (57)	
−12 V		47 (49)	
+12 V		51 (53)	
−15 V		39 (41)	
+15 V		43 (45)	
N.C.		1, ??	

Table 4: Signal and pin assignments for DCDB 60-pin I/O connectors. The port numbers refer to the I/O of the ICS 2303. The pin numbers in parentheses for the power supply voltages are the grounds for those specific voltages.

LED Displays: The power LED display connector JP7 is a 16-pin connector which carries signals showing power status and synthesizer lock information to the front of the Frequency Generation Chassis for display. The pin assignments are given in Table 9.

Conn-ector	Function	Con-ductors	Board	Addr.
JP 2	Test Signal Generator Chassis Control	32	1	16,17, 18,19, 20,21
JP 3	BBM R1/L1 Control	40	0	8,9, 10,11
JP 4	LO Synth Control	26	0	0,1, 2,3
JP 5	BBM R2/L2 Control	40	0	12,13, 14,15
JP 6	Samp Synth Control	26	0	4,5, 6,7
JP 7	LED Display	16	0	N/A

Table 5: Summary assignments for Digital Control Distribution Board Connectors. The even-numbered addresses are outputs, odd-numbered addresses are inputs.

Pin	Function
1	Narrow Bandwidth RHCP
3	Wide Bandwidth RHCP
5	0.5 db attenuation RHCP
7	1.0 db attenuation RHCP
9	2.0 db attenuation RHCP
11	4.0 db attenuation RHCP
13	8.0 db attenuation RHCP
15	16.0 db attenuation RHCP
17, 19	Not Connected
21	Narrow Bandwidth LHCP
23	Wide Bandwidth LHCP
25	0.5 db attenuation LHCP
27	1.0 db attenuation LHCP
29	2.0 db attenuation LHCP
31	4.0 db attenuation LHCP
33	8.0 db attenuation LHCP
35	16.0 db attenuation LHCP
37, 39	Not Connected
2–40 Even	Ground

Table 6: DCDB pin assignments for baseband mixer connectors.

Signal	Source	Destination	color
B8.0	JH1-71	BBM2-1	black
B8.1	JH1-70	BBM2-3	brown
B8.2	JH1-69	BBM2-5	red
B8.3	JH1-68	BBM2-7	orange
B8.4	JH1-75	BBM2-9	yellow
B8.5	JH1-74	BBM2-11	green
B8.6	JH1-73	BBM2-13	blue
B8.7	JH1-72	BBM2-15	violet
+5V	(orange)	BBM2-17	
+5V	(orange)	BBM2-19	
B9.0	JH1-63	BBM2-21	black
B9.1	JH1-62	BBM2-23	brown
B9.2	JH1-61	BBM2-25	red
B9.3	JH1-60	BBM2-27	orange
B9.4	JH1-67	BBM2-29	yellow
B9.5	JH1-66	BBM2-31	green
B9.6	JH1-65	BBM2-33	blue
B9.7	JH1-64	BBM2-35	violet
+15V	(red)	BBM2-37	
+15V	(red)	BBM2-39	

Table 7: DCDB to BBM2 connector wire list.

Pin	Function	Pin	Function
1,3,14–16	Ground	13	N9
2	Lock Detect	17	+15 V
4	M0	18	+5 V
5	M1	19	−15 V
6	M2	20	A0
7	M3	21	A1
8	M4	22	A2
9	M5	23	A3
10	M6	24	A4
11	N7	25	A5
12	N8	26	N. C.

Table 8: Pin assignments for connectors to frequency synthesizers, DCDB0 connectors JP3, JP5.

Pin	Function
1	+5 V
3	+15 V
5	−15 V
7	Not Connected
9	Lock Detect Samp Synth
11	$\overline{\text{LockDetect}}$ Samp Synth
13	Lock Detect LO Synth
15	$\overline{\text{LockDetect}}$ LO Synth
2–16 Even	Ground

Table 9: Pin assignments for synthesizer LED display connector, JP7 on DCDB0