

## INTRODUCTION

The *ADMC CONNECTOR BOARD* permits easy access to the various input and output signals of the ADCM Processor Boards. The *ADMC CONNECTOR BOARD* contains a generic set of Interface Connectors that match the Connectors underneath each of the Processor Boards. The aim of the *ADMC CONNECTOR BOARD* is to provide an easy initial development platform for the user while space is not a major concern. In addition, the user may choose the appropriate Processor Board that meets the particular application need. Future motion control processors will also plug into this *ADMC CONNECTOR BOARD*.

On the *ADMC CONNECTOR BOARD*, the various input and output signals are brought to convenient terminal block connectors that permit easy interface to the target motion control system.

In particular, the *ADMC CONNECTOR BOARD* offers the following features:

- Connector (J1) to an incremental encoder system, that accepts differential signals from the encoder.
- Connector (J2) that brings up to 24 digital I/O lines from the DSP-based motor controller. Other digital signals such as PWMSYNC and the auxiliary PWM outputs are also brought to this connector.
- Connector (J3) that provides up to 12 analog inputs that are fed to the ADC interface circuitry of the appropriate processor board.
- Connector (J4) that brings the six PWM output signals from the DSP through a buffer, 74HC244, to a terminal block. In addition, the PWM trip signal is also accessible from this connector.
- Connector (J5) is a single in line header that interfaces to the International Rectifier PowIRtrain™ modules.
- Connector (J6) that provides eight analog outputs from a serial DAC on the ADCM CONNECTOR BOARD.
- A 25-way D-type connector (P1) that brings the serial port, SPORT0, pins from the processor to the

connector. This connector may be use to interface SPORT0 of the particular ADCM motion control DSP to either some external circuitry or to the evaluation board for the AD2S90 resolver to digital converter (AD2S90-EB).

- A differential line receiver (DS26LS32) that converts differential signals from the encoder interface connector into the single-ended signals needed by the encoder interface unit of devices such as the ADCM300, ADCM331 or ADCM401.
- An eight channel, 12-bit serial DAC (AD7568) that interfaces to the DSP-based motor controller through SPORT0. The eight analog outputs are accessed through a set of test-pins or connector J6.
- A large prototype area for development of application specific hardware by the user.

## Digital to Analog Converter

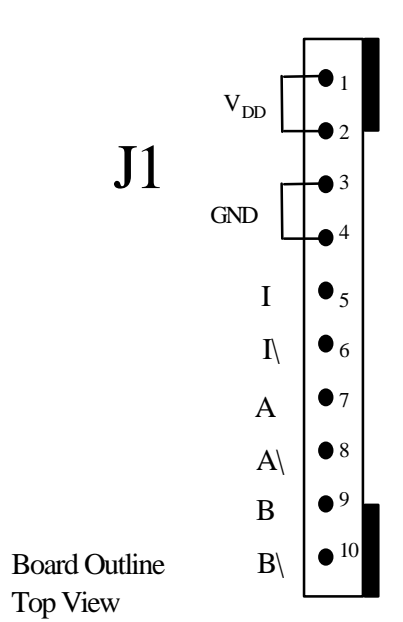
The *ADMC CONNECTOR BOARD* contains an octal, serial 12-bit Digital to Analog Converter (DAC), the AD7568. The AD7568 contains eight current output DACs, configured in voltage mode, to provide eight analog outputs from the development system that can be useful for program development and real-time debugging. The AD7568 is programmed via serial port, SPORT0, of the DSP-based motor controller on the processor board.

The serial interface is a three-way connection consisting of a clock line (SCLK0), a data transmit line (DT0) and a frame synchronization line (TFS0). The DSP may be set up to operate in the SPORT Transmit Normal Internal Framing Mode. The following DSP conditions are recommended: Internal SCLK; Active High Framing Signal; 16-bit word length. The characteristics of the serial port are programmed in the **Sport0\_Ctrl\_Reg** of the DSP. Transmission is initiated by writing a word to the TX0 register after SPORT0 has been enabled. The data is then clocked out on every rising edge of SCLK0 after TFS0 goes low. TFS0 stays low until the next data transfer. Data can be transmitted to the DAC one word at a time, or the DAC can be configured in Autobuffer mode.

Please refer to the datasheet, for the AD7568 DAC for further programming information, which is available on the Analog Devices Internet site at URL: <http://www.analog.com/pdf/ad7568.pdf>.

### Encoder Interface

The encoder interface of the *ADMC CONNECTOR BOARD* consists of a simple differential line receiver (U2) that accepts differential signals from the encoder interface connector (J1). Three pairs of differential signals are accepted (A and A\, B and B\ and I and I\) that represent the two encoder channels (A and B) and the index pulse (I). The DS26LS32 converts these differential inputs signals to the appropriate TTL signals for interface to the encoder interface unit of the ADMC300, for example. The connections to the encoder interface connector (J1) are shown in Figure 1.



**Figure 1:** Format of Encoder Interface Connector J1 on ADMC CONNECTOR BOARD.

### Digital Expansion Connector (J2)

The *ADMC CONNECTOR BOARD* contains the 29-way digital expansion connector (J2) that brings digital signals to terminal connections. The connector permits up to 24 general-purpose I/O lines (PIO0 to PIO23). These I/O lines are connected directly to the same-named PIO pins of the processor on the appropriate ADMC Processor

module plugged into the ADMC CONNECTOR BOARD. For example, for the ADMC401 device all of its 12 PIO lines are connected to the pins PIO0 to PIO11 of the connector J2. With the *ADMC401 PROCESSOR BOARD* connected to the *ADMC CONNECTOR BOARD*, pins PIO12 to PIO23 are thus undefined. They may be used as general inputs or outputs to the prototype area.

With the *ADMC331 PROCESSOR BOARD* connected all 24 of the PIO pins of the ADMC331 can be made use of, via the J2 connector.

The J2 connector also make the PWMSYNC pulse and the auxiliary PWM outputs (AUX0 and AUX1) from the processor module available for external connection.

All pins of the J2 connector are labeled on the board silkscreen layer for easy identification.

### Analog Input Connector (J3)

The analog input connector (J3) of the *ADMC CONNECTOR BOARD* permits connection of up to 12 analog inputs. These signals are fed directly to the appropriate analog interface circuitry of the processor board through the IF2 interface connector. For example, with the *ADMC300 PROCESSOR BOARD*, all 12 analog inputs are available on the processor board. However, only eight analog inputs (VIN1 to VIN8) are fed to the analog interface circuits of the *ADMC401 PROCESSOR BOARD*. Additionally, two analog ground pins are made available at the J3 connector. All pins are labeled for easy identification on the silkscreen.

### PWM Output Connector (J4)

The PWM signals from the DSP are made available at the J4 terminal connector. The pins of this connector are labeled on the silkscreen and consist of DGND, AH, AL, BH, BL, CH, CL and PWMTRIP. The AH to CL signals are brought from the corresponding PWM outputs of the DSP-based controller used, through the interface connector, IF3, and fed through a non-inverting buffer, 74HC244. The PWMTRIP pin of J4 is also fed through the buffer and interface connector IF3 to the processor board.

**Note:** The PWMTRIP input to the 74HC244 buffer is left floating. Please tie this input, via a 10K $\Omega$  resistor to +5V (VDD) to ensure correct performance of the PWM generator.

are tabulated for connector IF1 in Table 1, for connector IF2 in Table 2 and for connector IF3 in Table 3.

### **PowIRtrain Interface (J5)**

Interface connector J5 is a single in line connector that matches the input connector of the International Rectifier PowIRtrain™ integrated power modules. A simple ribbon cable can be used to connect the *ADMC CONNECTOR BOARD* to the appropriate PowIRtrain™ module. The pinout details of this connector may be found in the schematics at the end of this document. In addition, a npn transistor is included on the *ADMC CONNECTOR BOARD* that may be used to clear a latched fault condition on the PowIRtrain™ module. This transistor may be driven from the PIO3 line of the digital I/O system by connecting jumper JP1. Refer to the appropriate documentation for the PowIRtrain™ modules for further information.

### **Analog Output Connector (J6)**

The analog outputs from the DAC of the *ADMC CONNECTOR BOARD* are fed to connector J6. The analog outputs are also brought out to individual test-pins. All outputs are labeled for easy identification.

### **Interface Connectors**

Two connectors (IF1 and IF3) are dedicated to digital signals and the third (IF2) is reserved for analog signals. This three-connector User Interface will be used in future evaluation boards for future motion control products from Analog Devices. Therefore, many of the pins on the connectors for the *ADMC CONNECTOR BOARD* are unconnected (n/c). These pins are reserved for other functions in future products. Please refer to the relevant Processor Board User's Manual to view the pin-out for the User Interface Connectors for that particular Processor Board.

Interface connectors IF1 and IF3 are both 3-way by 30 pin connectors. Connector IF2 is 3-way by 24 pins. The exact connections to this interface may be seen in the schematics at the end of this document. The connections

IF1A		IF1B		IF1C	
Pin	Signal	Pin	Signal	Pin	Signal
1	n/c	1	n/c	1	n/c
2	n/c	2	n/c	2	n/c
3	n/c	3	n/c	3	n/c
4	n/c	4	n/c	4	n/c
5	n/c	5	n/c	5	n/c
6	n/c	6	n/c	6	n/c
7	n/c	7	n/c	7	n/c
8	n/c	8	n/c	8	n/c
9	VDD	9	VDD	9	VDD
10	GND	10	GND	10	GND
11	n/c	11	n/c	11	n/c
12	n/c	12	n/c	12	n/c
13	n/c	13	n/c	13	n/c
14	n/c	14	n/c	14	n/c
15	n/c	15	n/c	15	n/c
16	n/c	16	n/c	16	n/c
17	n/c	17	n/c	17	n/c
18	n/c	18	n/c	18	$\overline{\text{RESET}}$
19	n/c	19	n/c	19	n/c
20	n/c	20	n/c	20	CLKOUT
21	n/c	21	n/c	21	n/c
22	n/c	22	n/c	22	n/c
23	GND	23	GND	23	n/c
24	SCLK0	24	SCLK1	24	n/c
25	TFS0	25	TFS1	25	n/c
26	RFS0	26	RFS1	26	n/c
27	DR0	27	DR1A	27	n/c
28	DT0	28	DR1B	28	n/c
29	n/c	29	DT1	29	n/c
30	n/c	30	E <sup>2</sup> PROG	30	n/c

**Table 1:** Definition of digital interface connector IF1 of  
ADMC CONNECTOR BOARD.

IF2A		IF2B		IF2C	
Pin	Signal	Pin	Signal	Pin	Signal
1	VIN1	1	GND	1	DAC1
2	VIN2	2	GND	2	DAC2
3	VIN3	3	GND	3	DAC3
4	VIN4	4	GND	4	DAC4
5	VIN5	5	GND	5	DAC5
6	VIN6	6	GND	6	DAC6
7	VIN7	7	GND	7	DAC7
8	VIN8	8	GND	8	DAC8
9	VIN9	9	GND	9	n/c
10	VIN10	10	GND	10	n/c
11	VIN11	11	GND	11	n/c
12	VIN12	12	GND	12	n/c
13	+AVDD	13	+AVDD	13	+AVDD
14	-AVDD	14	-AVDD	14	-AVDD
15	VREF	15	GND	15	n/c
16	n/c	16	GND	16	n/c
17	n/c	17	GND	17	n/c
18	n/c	18	GND	18	n/c
19	n/c	19	GND	19	n/c
20	n/c	20	GND	20	n/c
21	n/c	21	GND	21	n/c
22	n/c	22	GND	22	n/c
23	n/c	23	GND	23	n/c
24	n/c	24	GND	24	n/c

**Table 2:** Definition of analog interface connector IF2 of ADCM CONNECTOR BOARD.

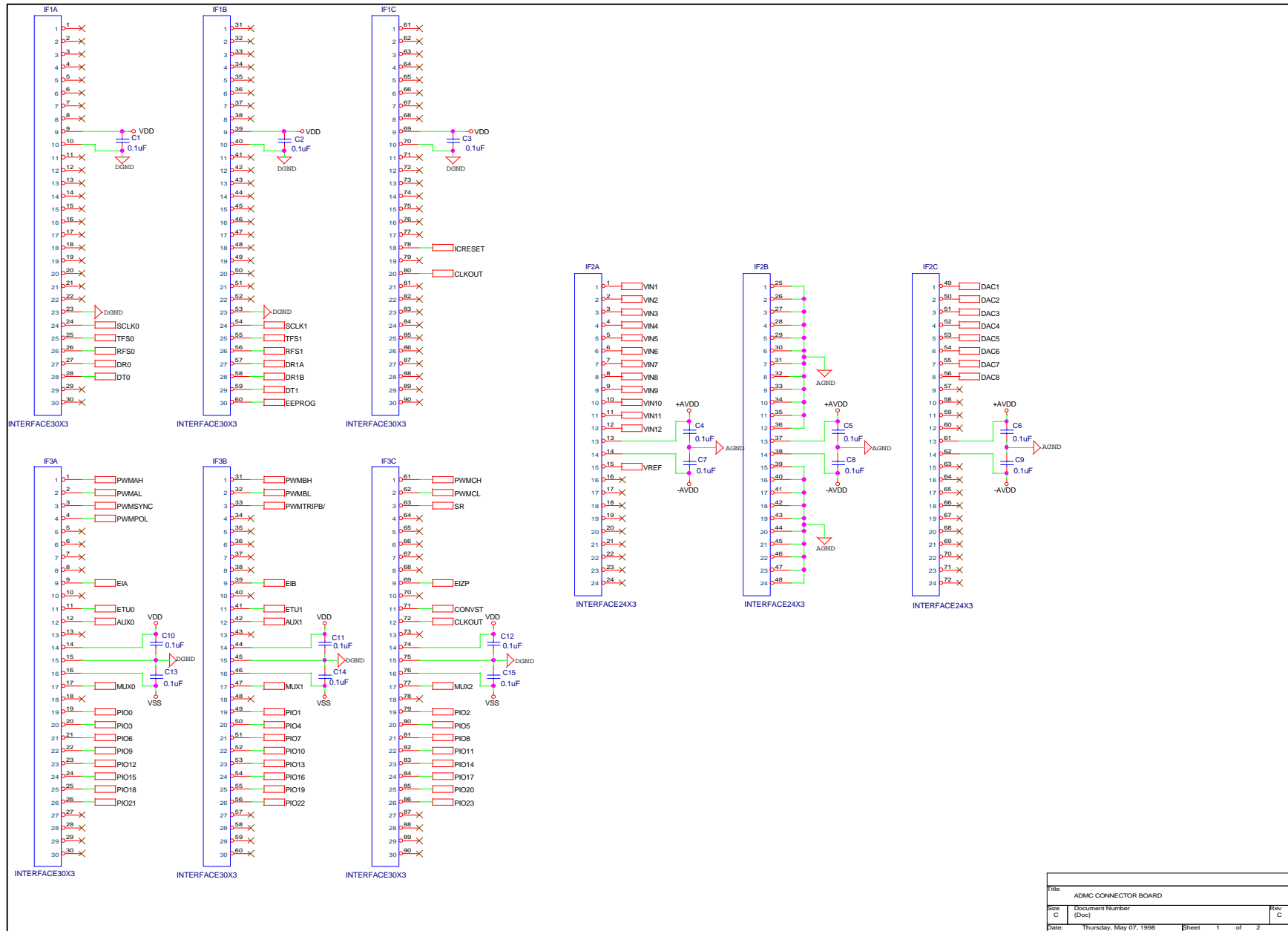
IF3A		IF3B		IF3C	
Pin	Signal	Pin	Signal	Pin	Signal
1	AH	1	BH	1	CH
2	AL	2	BL	2	CL
3	PWMSYNC	3	PWMTRIP	3	PWMSR
4	PWMPOL	4	n/c	4	n/c
5	n/c	5	n/c	5	n/c
6	n/c	6	n/c	6	n/c
7	n/c	7	n/c	7	n/c
8	n/c	8	n/c	8	n/c
9	EIA	9	EIB	9	EIZP
10	n/c	10	n/c	10	n/c
11	ETU0	11	PIO11	11	PIO9
12	AUX0	12	AUX1	12	CLKOUT
13	n/c	13	n/c	13	n/c
14	VDD	14	VDD	14	VDD
15	GND	15	GND	15	GND
16	n/c	16	n/c	16	n/c
17	MUX0	17	MUX1	17	MUX2
18	n/c	18	n/c	18	n/c
19	PIO0	19	PIO1	19	PIO2
20	PIO3	20	PIO4	20	PIO5
21	PIO6	21	PIO7	21	PIO8
22	PIO9	22	PIO10	22	PIO11
23	PIO12	23	PIO13	24	PIO14
24	PIO15	24	PIO16	24	PIO17
25	PIO18	25	PIO19	26	PIO20
26	PIO21	26	PIO22	26	PIO23
27	n/c	27	n/c	27	n/c
28	n/c	28	n/c	28	n/c
29	n/c	29	n/c	29	n/c
30	n/c	30	n/c	30	n/c

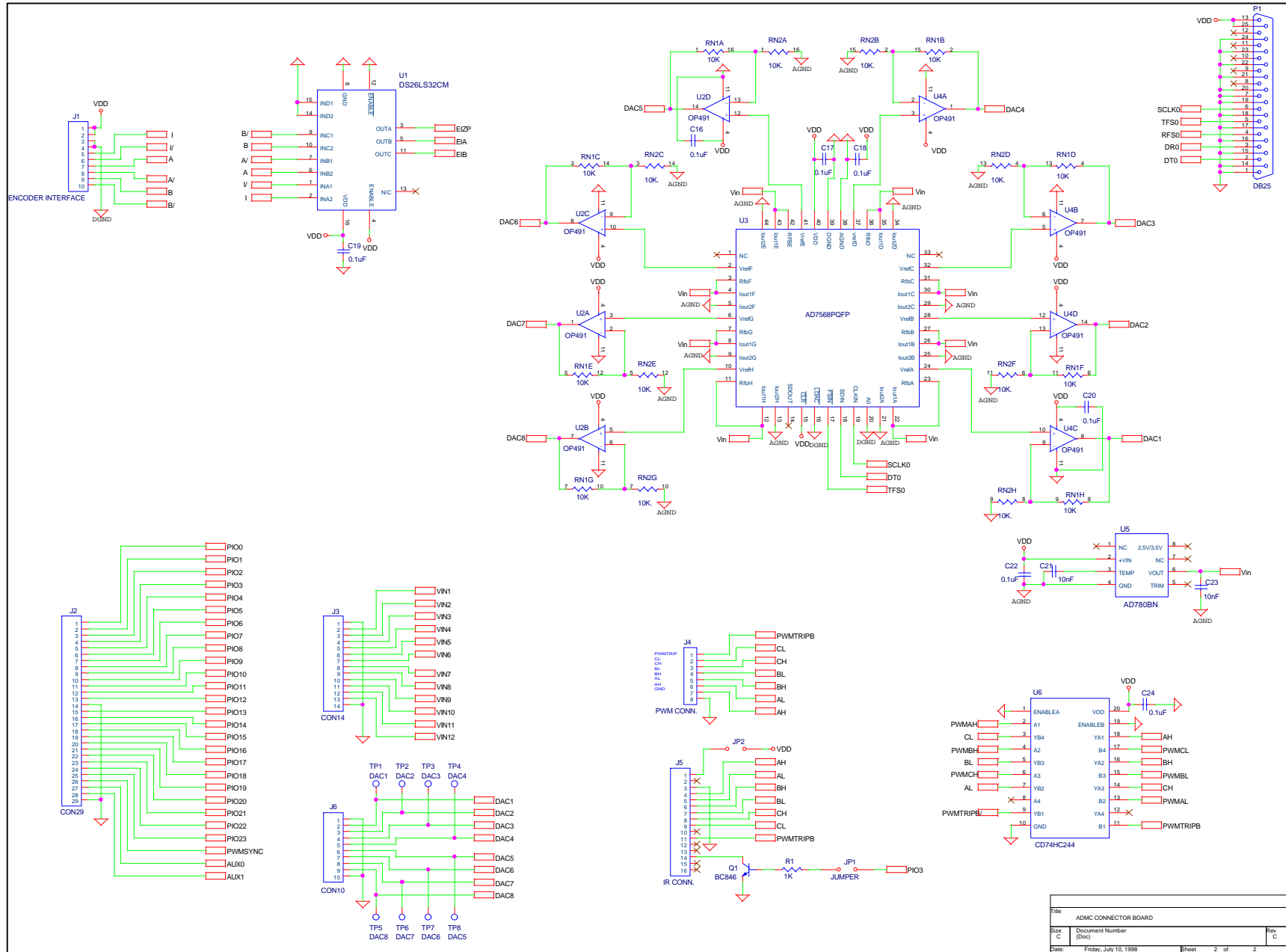
**Table 3:** Definition of digital interface connector IF3 of ADCM CONNECTOR BOARD.

The description of the various connections to the three interface connectors is given in Table 4.

Signal(s)	Function
VDD	+5 V power supply
GND	Ground
+AVDD	+15 V power supply
-AVDD	-15 V power supply
SCLK0, TFS0, RFS0, DT0, DR0	SPORT0 pins
SCLK1, TFS1, RFS1, DR1A, DR1B, DT1	SPORT1 pins
E <sup>2</sup> PROG	E <sup>2</sup> PROM programming pin
DAC1-DAC8	Analog Outputs
VIN1 – VIN12	Analog inputs
VREF	Buffered reference voltage output
AH – CL	TTL-level PWM outputs
PWMSYNC	PWMSYNC pulse
$\overline{\text{PWMTRIP}}$	$\overline{\text{PWMTRIP}}$ pin
PWMPOL	PWM polarity pin
PWMSR	PWM switch reluctance mode pin
EIA, EIB	TTL-level encoder interface unit pins
EIZP	TTL-level encoder zero marker
PIO0 - PIO23	Dedicated programmable input/outputs
CONVST	External convert start signal
ETU0, ETU1	Event timer inputs
CLKOUT	TTL-level CLKOUT signal
AUX0, AUX1	TTL-level auxiliary PWM outputs
MUX0 - MUX2	TTL-level multiplexer control

**Table 4:** Function of signals on interface connectors of  
ADMC CONNECTOR BOARD.





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