Automated Motion Incorporated

Multi-Channel
Digital to Analog Converter

Setup and Calibration Procedures

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DAC Configuration

This multi-channel DAC unit has been configured by the manufacturer to the following settings.

Number of Outputs	8
Output Mode	4-20mA
Baud Rate	1200
Data Bits	8
Parity	N
Stop Bits	2
Tank Capacity	Programmable

Setup and Calibration

Note: This unit has been fully programmed and calibrated by the manufacturer. The following procedures are only necessary if a different configuration is desired or if the unit needs to be re-calibrated.

For setup and calibration of the Multi-Channel DAC unit you will need to use either a Laptop, or a PC, running a terminal emulation program. The terminal program settings are as follows:

9600 BAUD
8 DATA BITS
NO PARITY
1 STOP BIT

The PC serial port is connected to the DAC unit using an RS232 cable (supplied).

Note: Be sure to use anti-static precautions at all times when the cover is off of the DAC unit.

Turn power off to the DAC unit. After carefully removing the cover, set jumper J17 to the 2-3 position. This will put the DAC unit in the setup mode. Position 1-2 is for normal operation.

Turn power on to the DAC unit. The following will appear on the terminal screen (Actual words may vary depending on firmware revision)

```
DEVICE SETUP AND CALIBRATION UTILITY
FOR THE MICROTRONICS 8 CHANNEL DIGITAL TO ANALOG CONVERTER

AUTOMATED MOTION, INCORPORATED
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(816) 524-8104 FAX (816) 524-7862

SELECT  (S)ETUP OR (C)ALIBRATION
<ESC RESETS CPU -- >
```

Note: Press S for setup, C for Calibration, or ESC to reset CPU.

Setup

Setup mode is used to change the DAC configuration settings. These settings are stored on the circuit board in an EEPROM chip. At present there are four parameters that may be altered utilizing the setup mode.

1. Baud Rate
2. Parity
3. Output Mode (Current or Voltage)
4. Tank Capacities

The following commands are available at the prompt:

A --	Change the working address.
D --	Write data to the working address shown (then increment to the next working address).
L --	Dump the entire contents, 128 bytes, of the EEPROM.
? --	Show help on configuration.
RETURN --	Displays the paragraph containing the working address.
ESC --	Return to the main configuration menu.

When you first enter the setup mode, the following will be displayed.

```
? Displays Key Help
00: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
A=00
>
```

Start by pressing L to dump the contents of the EEPROM to the display. This will show what is stored in the EEPROM Addresses currently.

00 is the first address (working address) in the paragraph and the data may be changed by a DXX (write data to that address) entry at the prompt, or the address may be changed by an AXX entry.

```
Address 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
        FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

Address 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F
        FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

Address 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F
        FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

Address 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F
        FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

In the event that an error is made and you would like to nullify that error simply make an AXX entry for that address and key in a DFF entry or enter the correct data.

Address	DXX Entry	Baud Rate
01	01	19200
	02	9600
	04	4800
	08	2400
	10	1200
	20	600
	40	300

Address	DXX Entry	Parity
02	00	None (8 Data Bits)
	01	Odd (7 Data Bits)

Address	DXX Entry	Output # N Mode
10	01	Output #1 = Current
	02	Output #1 = Voltage
11	01	Output #2 = Current
	02	Output #2 = Voltage
12	01	Output #3 = Current
	02	Output #3 = Voltage
13	01	Output #4 = Current
	02	Output #4 = Voltage
14	01	Output #5 = Current
	02	Output #5 = Voltage
15	01	Output #6 = Current
	02	Output #6 = Voltage
16	01	Output #7 = Current
	02	Output #7 = Voltage
17	01	Output #8 = Current
	02	Output #8 = Voltage

Tank Capacities shown are examples and not actual.

Address	DXX Entry (Capacity in HEX)	Tank #	Tank Capacity
40 41 42 43	00 00 30 39	1	12,345 gal.
44 45 46 47	00 00 1A 85	2	6,789 gal.
48 49 4A 4B	00 00 29 04	3	10,500 gal.
4C 4D 4E 4F	00 00 4E 20	4	20,000 gal.
50 51 52 53	NN NN NN NN	5	NN,NNN gal.
54 55 56 57	NN NN NN NN	6	NN,NNN gal.
58 59 5A 5B	NN NN NN NN	7	NN,NNN gal.
5C 5D 5E 5F	NN NN NN NN	8	NN,NNN gal.

After the changes have been made to the contents of the EEPROM, then updating the checksum on the 7F address will complete the memory write process. First press L to view the contents of all of the addresses. Notice the data present at address 7F. This location is where the checksum value is stored. Updating the checksum is done by using the A7F command to move to the 7F address, then press C. Press L again to view the new checksum value on address 7F.

Note: Failure to update the checksum will result in a checksum error causing the settings to default to the original factory settings of 300 Baud, odd parity, 7 data bits, and 2 stop bits the next time power is applied to the DAC unit.

Calibration

Note: The multi-channel DAC requires approximately 25 minutes of warm-up time before attempting to calibrate.

A high resolution Digital Multi-Meter is necessary to calibrate the DAC unit. The manufacturer uses a Fluke 45 meter which measures three decimal places to the right of a 20mA signal or 20.000mA.

After resetting or powering back on and the terminal display prompts for either setup or calibration, press C for calibration. In the calibration mode the program will toggle between 100% output (10Vdc full scale) and 0% (0Vdc) by pressing any key other than the ESC key.

1. Calibrating the DAC chip. The DAC chip has two adjustments: Zero (R5) and Gain (R6). The output of the DAC chip is measured at pin 17 of U5 with respect to ground. These two adjustments are interdependent and should be adjusted to yield an output of +10.000Vdc at full scale and 0.000Vdc at zero.
2. Calibrate the sample/hold gain. With jumpers J1 to J16 set for Voltage (1-2) and the output of the DAC at full scale, adjust the trimpots for the sample and hold outputs, measured at T1 – T(number of outputs) for 10.000Vdc. This completes the calibration for the Voltage outputs.
3. Calibrate for Current output. Remove power from the DAC unit. Set J1 – J16 for current output (2-3). Restore power to the DAC unit. Go to Calibrate mode. With output toggled to full scale (10.000Vdc) adjust the LM324N trimpots to read 20.000mA measured at T1 – T(number of channels).
4. Remove power. Set J17 to 1-2 for normal operation.

Note: The Output polarity differs for Voltage and Current.