

THE DAC-QM

The DAC-QM is a complete self-contained digital-to-analog converter module, available in 8-, 10-, and 12-bit versions. Complete with strobed data entry to the input register, the module is offered wired for a variety of binary codes as well as BCD. Logic levels are compatible with DTL and TTL. The output amplifier circuit is exceptionally versatile, utilizing jumper programming at the module terminals to allow the user to determine the output range and offset. The DAC-QM module also contains monolithic μ DAC current switches, a thin film resistor network, and a reference supply with amplifier.

THE DAC-QS

The DAC-QS is a much smaller module without input register, but is nonetheless a complete digital-to-analog converter in all respects, and is also available in 8-, 10-, and 12-bit versions. The internal μ DAC AD550 converter switches are driven directly by complementary binary and complementary BCD input logic, without need for a strobe. In all other respects, the DAC-QS is electrically identical to the DAC-QM.

GENERAL DESCRIPTION

The DAC-QM and DAC-QS are module versions of the popular DAC-Q card mounted D/A converter. Each is a complete converter, containing the new IC μ DAC AD550 quad current switches, precision thin film resistor networks, reference supply with amplifier, and the versatile output operational amplifier. The units are electrically identical, except for omission of the input register from the DAC-QS, in order to allow a package with appreciably reduced dimensions. For operation, they require only input data, dc power, and trimmer potentiometers for zero and gain.

INPUT OPTIONS

The input storage register built into the DAC-QM can be provided for a variety of codes. Binary, 2's complement and Binary-Coded-Decimal are all offered. Special input coding is not required for Offset codes, such as Offset Binary. The DAC-QS, having no input register, accepts complementary binary code and complementary BCD.

OUTPUT PROGRAMMING

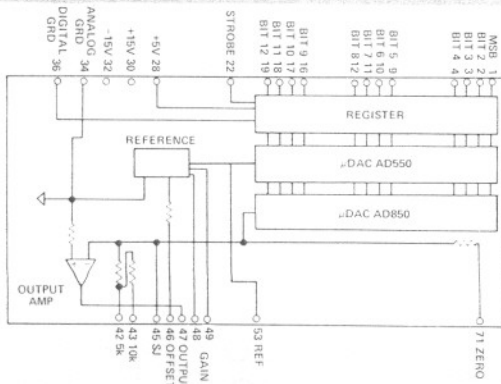
Provisions for variations in output characteristics are exceptionally versatile. By means of jumpers between terminals of the module, the user can select any one of five combinations of range and offset, to comply with the needs of the application. The choices are:

Unipolar: 0 to +5V, 0 to +10V

Bipolar : $\pm 2.5V$, $\pm 5V$, $\pm 10V$

ALL MONOLITHIC COMPONENTS

Construction of the new DAC-QM and DAC-QS series centers around the new monolithic μ DAC IC D/A components. The Model AD550 quad current switches are used in conjunction with thin film AD850 resistor networks. The AD550 IC switches are designed for optimal temperature tracking. The thin film resistor network includes all the critical gain-determining resistors. A high gain reference amplifier assures that all variations in switch parameters are ideally compensated. The interquid attenuation network is 16:1 for binary and 10:1 for BCD.



Block Diagram
DAC-QM

DAC-QM AND DAC-QS

DIGITAL-TO-ANALOG CONVERTERS

a
**SECRET
INGREDIENTS**
product



COMPLETE

FEATURES

8-, 10-, 12-Bit Resolutions
and Accuracies

Low TC ($\pm 7\text{ppm}/^\circ\text{C}$)

Complete with Register (DAC-QM)

Binary or BCD Coding

Output Range Customer Programmed

Output Ranges Available:

+5V, +10V, $\pm 2.5V$, $\pm 5V$, $\pm 10V$

Excellent Power Supply Rejection
(0.002%/V_S)

Low-Profile Modules



ROUTE ONE INDUSTRIAL PARK
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DAC-QM AND DAC-QS Digital-to-Analog Converters

SPECIFICATIONS (Typical @ +25°C unless otherwise noted)

MODEL	DAC-QM	DAC-QS
RESOLUTION	- 8QM 8-bits - 10QM 10-bits - 12QM 12-bits	- 8QS 8 bits - 10QS 10 bits - 12QS 12 bits
DIGITAL INPUTS		
"0" $E < +0.8V$	@ -3.2mA	@ -1.6mA
"1" $+2 < E < +6V$	@ +80µA	@ +100µA max
	TTL Compatible	*
STROBE	Data transfers from inputs to register on "0" to "1" change. Width at least 50ns, "0-1" transition at least 100ns after data change	No Strobe
INPUT CODES	Binary, 2's Compl., BCD	Compl. Binary & Compl. BCD
OUTPUT RANGES (User programs with jumpers)	0 to 5V } @ 10mA +2.5V, ±5V } 0 to +10V } @ 5mA ±10V }	* * *
OUTPUT IMPEDANCE	0.025Ω	*
CONVERSION SPEED	5µs to 0.01%	*
Slewing Rate	20V/µs	*
LINEARITY	±½LSB	*
TEMP. COEFFICIENT		
Linearity	±3ppm/°C of Reading max	*
Gain	±7ppm/°C max	*
Zero	±15µV/°C max	*
TEMP. RANGE		
Standard	0°C to +70°C	*
Optional	-55°C to +125°C ¹	*
POWER REQUIRED	+15VDC @ +25mA -15VDC @ -30mA +5VDC @ +150mA	* * +5VDC @ +35mA
POWER SUPPLY SENSITIVITY	0.002%/ % supply ΔE (±15VDC supplies only)	*
ADJUSTMENTS (User Provides)		
Gain Adj.	100Ω pot	20kΩ pot
Zero Adj.	20kΩ pot	*
PRICES (1-9)		
DAC- 8	\$170.	\$140.
DAC-10	\$210.	\$170.
DAC-12	\$230.	\$190.
DAC- 8-ET	\$340.	\$280.
DAC-10-ET	\$420.	\$340.
DAC-12-ET	\$460.	\$380.

*Specifications same as Model DAC-QM

¹ Use model number suffix ET (for extended temperature)

Specifications subject to change without notice

ORDERING GUIDE: DAC-QM AND DAC-QS

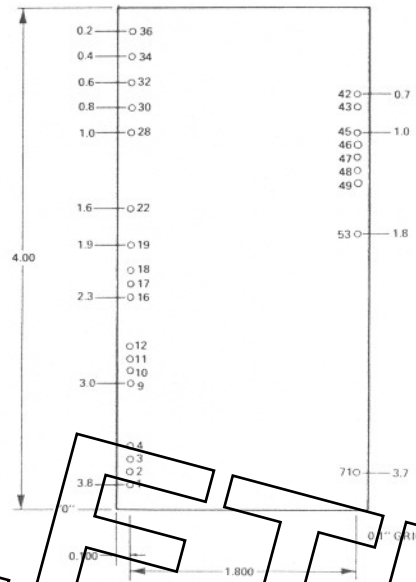
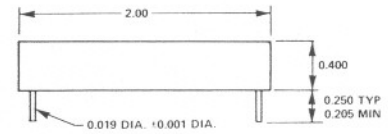
Model No.	DAC	XX	XX	/	XXX	/	XX
		No. of Bits	Series		Input Code		Temp Range
Conv. Type		8	QM		BIN (binary)		SN (Standard)
		10	QS ²		C-B (comp. binary) ²		ET (Extended) ¹
		12			2SC (2's comp.)		
					BCD		
					CBD (comp. BCD) ²		

¹ Use Model number suffix ET (for extended temperature)

² DAC-QS available ONLY with Complementary Binary or Complementary BCD. These codes not available in DAC-QM.

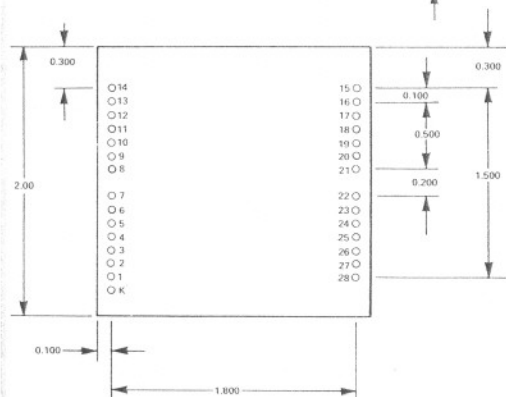
OUTLINE DIMENSIONS (In Inches)

DAC-QM



BOTTOM VIEW

DAC-QS



BOTTOM VIEW

JUMPER PROGRAMMING

The output amplifier circuit of the DAC-QM and DAC-QS is jumper programmed at the module terminals, allowing the user to determine which one of five possible output ranges will be used.

Feedback resistance value is determined by jumpers at C, D, E, and F. Jumpers allow using one 5k resistor, or both, either in series to provide 10k, or parallel to provide 2.5k.

Offset of exactly 1/2 of full scale is provided by connecting the jumper between A and B. To maintain constant load on the reference zener, it is necessary to jumper point B to ground whenever it is *not* jumpered to point A.

NOTES:

A bipolar output range must be used with bipolar input codes such as 2's complement or offset binary.

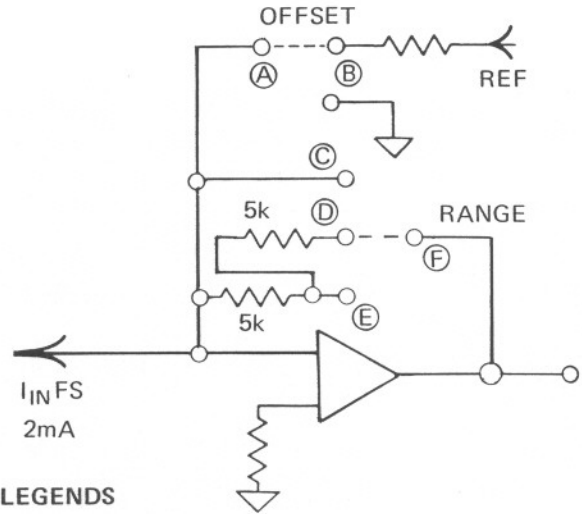
In BCD versions, value of the individual feedback resistors is 4k, allowing use of 8k feedback resistance to provide output range of 0 to +10V (direct reading).

PROGRAMMING TABLE

RANGE	R _F	OFFSET	GND(B)
±10V	10k	Yes	No
+10V	5k	No	Yes
±5V	5k	Yes	No
+5V	2.5k	No	Yes
±2.5V	2.5k	Yes	No

PIN LEGENDS

	QM	QS
A	45	27
B	46	21
C	45	27
D	43	23
E	42	24
F	47	26

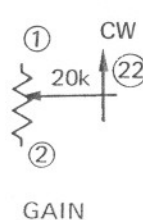
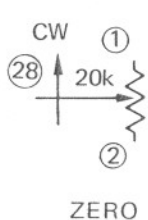
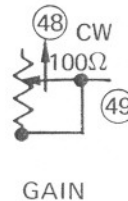
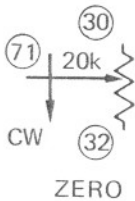


PIN CONNECTIONS AND ADJUSTMENT POT CONNECTIONS

TOP VIEW ACTUAL LABEL



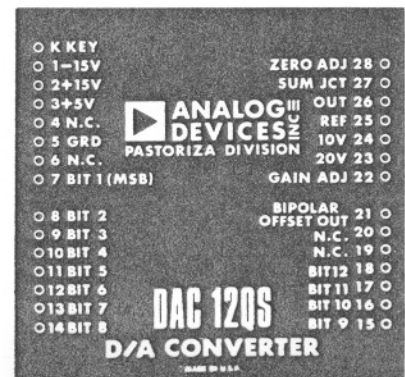
POTENTIOMETER CONNECTIONS for Zero + Gain Adj.



NOTES:

- Binary Units of less than 12 bits: MSB of input logic connects to labeled MSB input pin of DAC-QM/QS. The connections left off are those at the LSB end.
- BCD Units:
 - 8 and 12-bit—MSB to MSB pin.
 - 10-bit—MSB of input logic connects to Bit 3 pin. No connection to Bit 1 (labeled MSB) or to Bit 2 pin.

TOP VIEW ACTUAL LABEL



DAC-Q FAMILY CROSS COMPARISON

PARAMETER	DAC-Q	DAC-QS	DAC-QM
Resolution	8 / 10 / 12	8 / 10 / 12	8 / 10 / 12
Register	Optional	No	Yes
Strobe	Only with Register	No	Yes
Input Logic Codes	BIN C-B OBN COB 2SC C2C BCD CBD	Complementary Binary & BCD	BIN 2SC BCD
Output Range	+5, +10, ±2.5, ±5, ±10 Factory Wired	+5, +10, ±2.5, ±5, ±10 Customer Programs	+5, +10, ±2.5, ±5, ±10 Customer Programs
Speed – Standard – Optional	50µs to 0.01% 2.5µs to 0.01%	5µs to 0.01%	5µs to 0.01%
Power +15V 25mA –15V 30mA +5V at	with register 150mA	35mA	w/o register 25mA 150mA
Adjustments	Gain & Zero pots on unit	Customer provides 2 ea. 20kΩ pots for Gain and Zero Jumper programming provided for user to set 1. Output range, as indicated above 2. Output offset of ½FS, as needed for above ranges	Customer provides 100Ω gain adj. and 20kΩ Zero pots
Size	Card: 4.5" X 4.174" inc. edge connector 0.474H, Standard Ampl. 0.662H, Fast Option	Module: 2" X 2" X 0.36"	Module: 2" X 4" X 0.4"
Prices w/o register w/ register For Fast Amp, add	\$135. / \$165. / \$185. \$165. / \$205. / \$225. \$50.	\$140. / \$170. / \$190.	\$170. / \$210. / \$230.

MOUNTING BOARDS

Mounting boards are available for both the DAC-QM and the DAC-QS. These boards have pin sockets into which the modules are plugged, and input/output connections are brought to the edge connector. Mounting boards are complete with potentiometers for zero and gain adjustment.

Mounting Board	DAC-QM	Model 4494-1	\$40. each
	DAC-QS	Model 4516	\$40. each

Mating connector (supplied) is Cinch (250-22-30-170)

MINIMIZING SWITCHING TRANSIENTS DURING CONVERSION

All digital-to-analog converters have switching transients (usually called "glitches") in their outputs. These transients are caused by the fact that the turn-off time of the converter switches is not exactly the same as the turn-on time. Analog Devices has developed a "deglitcher" capable of limiting the amplitude of these switching transients to about 5 millivolts. It can be applied only to specific circuit configurations, and the DAC-QM is compatible.

The transient suppression circuit is an optional component of a manifold board (the DAC-QG) on which can be mounted an appropriate D/A converter of the DAC-QM series to provide "glitchless" conversion, with resolution of 8-, 10-, 12-, 14-, or 16-bits. If your application requires clean, transient limited output wave forms, we suggest that you call the factory for further information.