THAT Corporation

Digital BTSC Audio System Encoder

THAT DBAS01E/SAP01E

FEATURES

- **Analog inputs and outputs**
- **DSP processing throughout**
- **Turnkey solution — no trims or adjustments required**
- **Completely stable performance over time and temperature**
- **Bessel null test tone mode**

APPLICATIONS

- **CATV BTSC Encoders**
- **Broadcast TV BTSC Encoders**
- **Re-transmission Equipment**

Description

The THAT Digital BTSC Audio System ("DBAS") Encoder is a complete, state of the art BTSC audio processor on a single printed circuit board. With all signal processing carried out in the digital domain, the DBAS01E requires no internal alignment, is completely stable over time and temperature, and delivers outstanding stereo separation and frequency response performance.

Equipped with its own on-board ADCs and high-speed DAC, the THAT DBAS01E accepts analog Left, Right, and (optionally) SAP input signals, and delivers a complete composite BTSC analog output including the L+R signal, the AM-DSB-SC L-R signal, and a pilot signal locked to an external video signal at the horizontal scanning frequency (fH).

The DBAS01E is a compact solution, as well, measuring only 4.75" x 6.75". Its optional high-quality SAP daughterboard mounts on top of the main DBAS board, resulting in no change to the horizontal board space required. The entire assembly fits easily in a 1U high chassis.

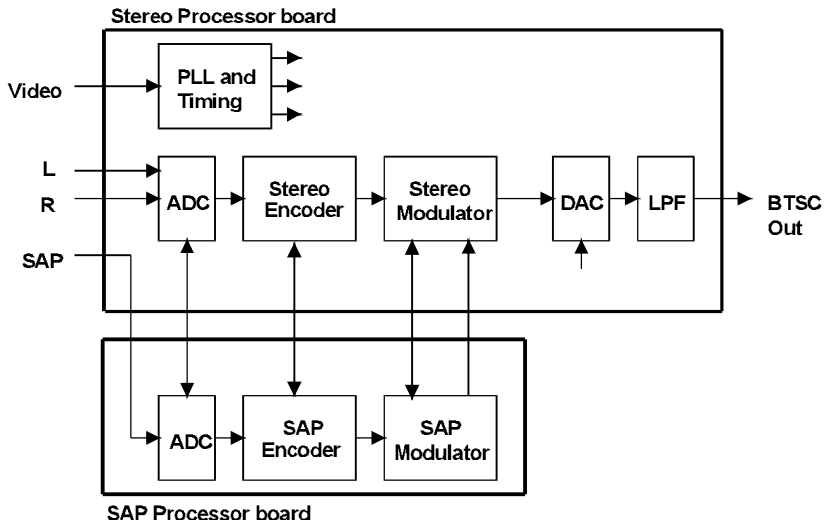

Figure 1. DBAS block diagram

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SPECIFICATIONS[1]

Absolute Maximum Ratings (T_A = 25°C)

Operating Temperature Range (T_{OP})	0 to +70°C	Storage Temperature Range (T_{ST})	-40 to +125°C

Electrical Characteristics[1,2]

Stereo Processor

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Power						
Power Supply 1	V_D	365 mA max	+4.75	+5	+5.25	VDC
Power Supply 2 (pos.)	V_{CC}	60 mA max	+11.4	+12	+12.6	VDC
Power Supply 2 (neg.)	V_{EE}	20 mA max	-12.6	-12	-11.4	VDC
Audio						
Input Overload Level	V_{IN}	L and R inputs	2.7	3.0		Vp-p
Input Impedance	Z_{IN}	L and R inputs		10.0		kΩ
Output Overload Level	V_{OUT}	BTSC Comp. Out; 10kΩ load		3.0	2.0	dBV
Output Impedance	Z_{OUT}	BTSC Comp. Out	71	75	79	Ω
Minimum Resistive Load	R_L				600	Ω
Maximum Capacitive Load	C_L		100			pF
Separation 1[3]	SEP1	50 Hz to 200 Hz	35	40		dB
Separation 2[3]	SEP2	200 Hz to 2 kHz	35	40		dB
Separation 3[3]	SEP3	2 kHz to 14.5 kHz	30	35		dB
Dynamic Range[3]	DR	max L=R input signal at 400Hz 50 Hz ~ 15 kHz unweighted	80	85		dB
THD+N		at 66.7% EIM[4]				
	THD1	100 Hz		0.07	0.1	%
	THD2	1 kHz		0.15	0.2	%
	THD3	10 kHz		0.5	1.0	%

1. **All specifications are subject to change without notice.**
2. **Unless otherwise noted, T_A= 25°C, V_{CC} = + 12V, V_{EE} = -12V, VD = + 5V**
3. **Measured through encode/decode cycle.**
4. **EIM = Equivalent Input Modulation (as defined in FCC Bulletin OET-60).**

Electrical Characteristics[1,2] (Cont'd)

Stereo Processor (Cont'd)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Frequency Response[3]	FR1	50 Hz to 14 kHz	-0.3	0.0	+0.3	dB
	FR2	20 Hz to 15.2 kHz	-3.0		+3.0	dB
Video						
Input Impedance	$Z_{INvid}1$	Jumper selectable		10.0		kΩ
	$Z_{INVID}2$			75		Ω
Input Overload Level	V_{INvid}			1.5		Vp-p
Pilot						
Pilot Frequency	F_{PILOT}	lock range @ 15.734 kHz (locked to video input at f_h)	-3		+3	Hz
Pilot Injection	INJ_{PILOT}		4.7	5.0	5.3	kHz

SAP Processor

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Power Supply 1	V_{Dsap}	260 mA max	+4.75	+5	+5.25	VDC
Power Supply 2 (pos.)	V_{CCsap}	40 mA max	+11.4	+12	+12.6	VDC
Input Overload Level	V_{INsap}			3.0	2.0	dBV
Frequency Response[3]	$FR1_{sap}$	50 Hz to 10 kHz	-0.3	0.0	+0.3	dB
	$FR2_{sap}$	20 Hz to 10.5 kHz	-3			dB
Dynamic Range[3]	DR_{sap}		65	70		dB
THD+N		at 66.7% EIM[4]				
	$THD_{sap}1$	100 Hz		0.2	0.3	%
	$THD_{sap}2$	1 kHz		0.4	0.5	%
	$THD_{sap}3$	5 kHz		0.5	0.6	%

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Application Information

The core of the THAT Digital BTSC Audio System Encoder is a Motorola 56002 DSP running at 66 MHz. This DSP provides complete BTSC baseband signal processing including the matrix function, sum-channel and difference-channel processing (including dbx-TV™ Noise Reduction encoding), and low-pass filtering. A separate 20 MHz Analog Devices 2104 DSP performs the AM double-side-band suppressed carrier (DSB-SC) modulation of the dbx-TV encoded difference channel and pilot tone injection.

An internal test tone mode generates the precise frequency and amplitude signal necessary for performing a Bessel null calibration to align the output signal level to an external FM modulator.

The pilot tone and sub-carrier are phase-locked to an external video reference by way of an external video signal input.

Power and signals interface to the board by way of a number of connectors. In addition, there are five general purpose I/O pins which can be customized to provide an interface for control and indicator functions. The board ships in a default configuration, and the pinouts and external circuit information are shown in Figures 2 and 3. Interested customers should contact THAT Corporation for more information on alternative interfaces, and on adapting the DBAS01E encoder firmware for particular applications.

Note that all input signals should be AC coupled to the DBAS board. A 22µF value for the coupling capacitors is recommended.

The Video Input impedance is controlled by the jumper at P8:

Jumper open	**High impedance**
Jumper installed	**75Ω impedance**

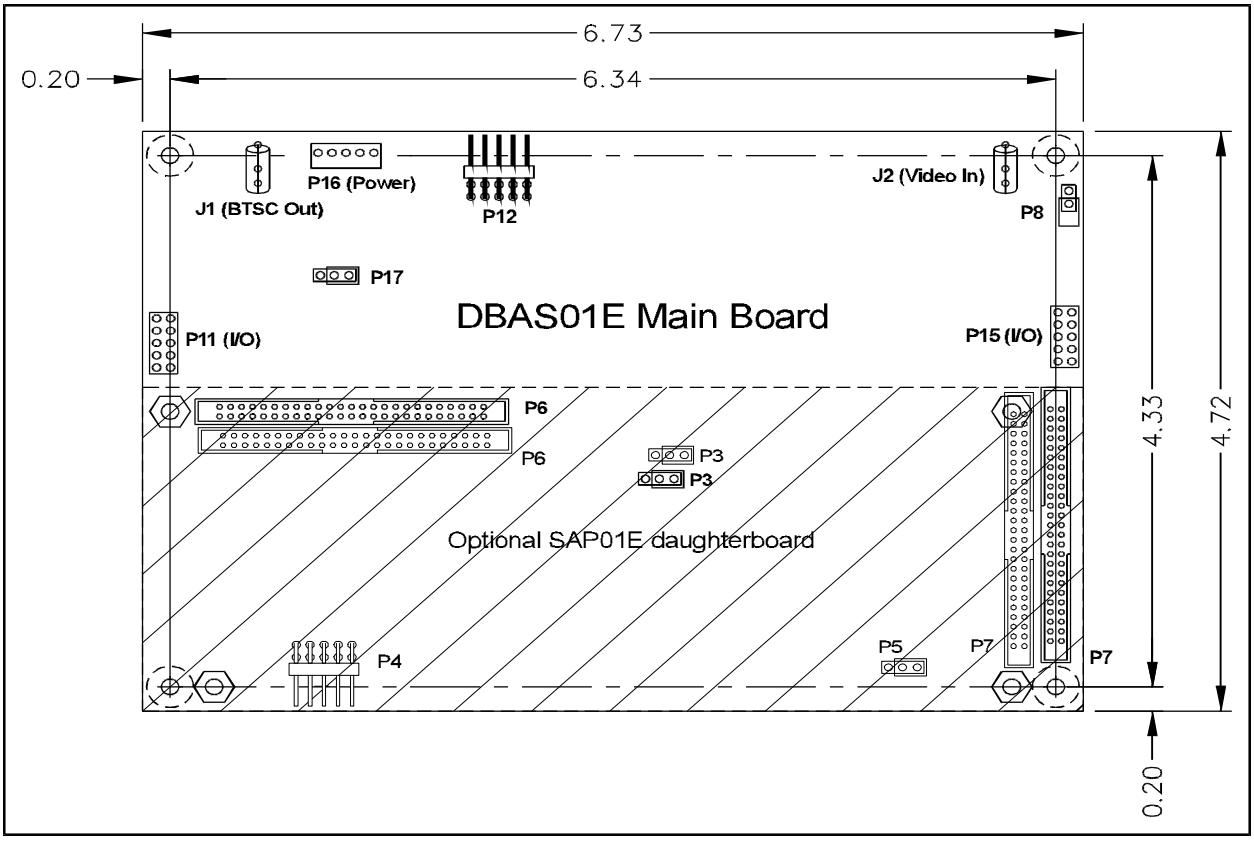

Figure 2. DBAS01E main board layout
SAP01E components and labels are drawn lighter; dimensions are in inches.

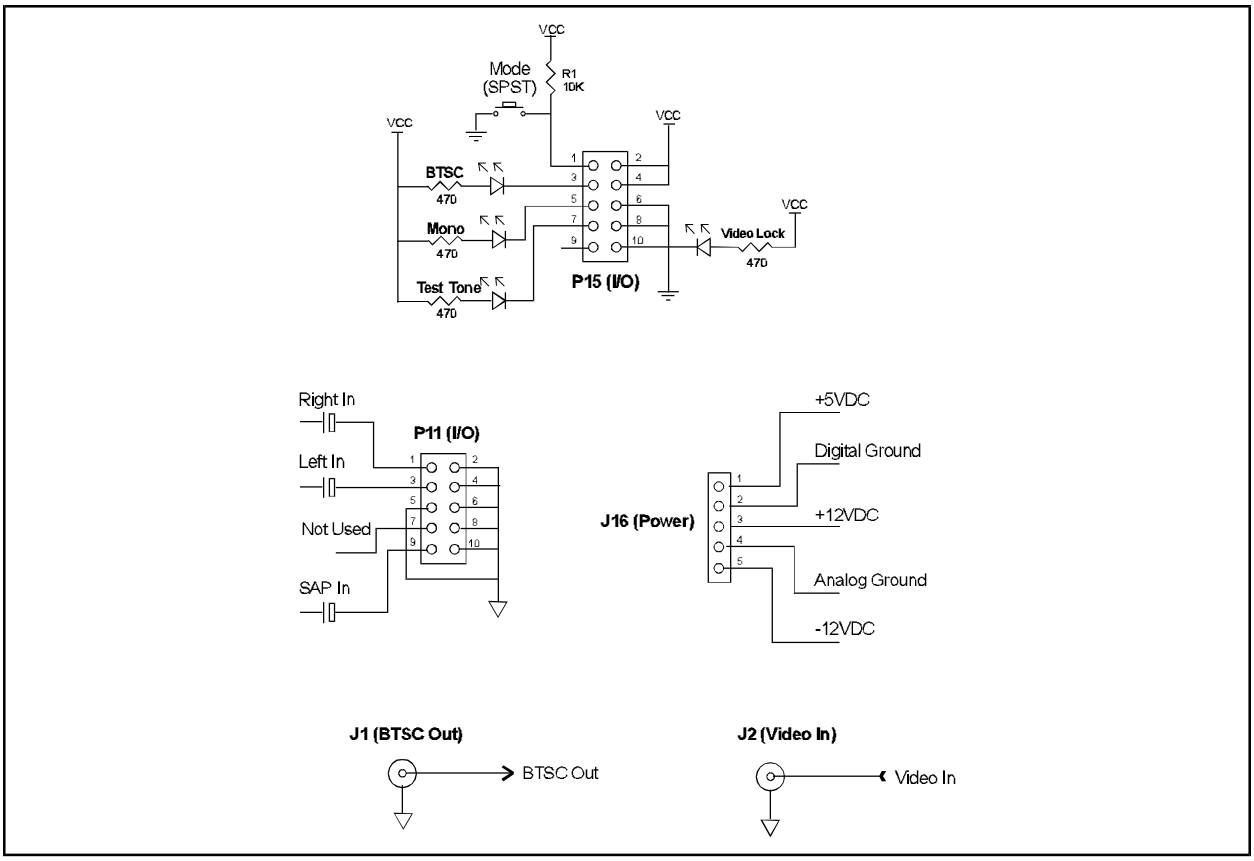

Figure 3. DBAS01E pinout and hookup information

An optional external daughtercard provides Second Audio Program (SAP) encoding capability. This board also uses a Motorola 56002 for audio processing (again including dbx-TV Noise Reduction encoding), and a separate Analog Devices 2104 for the FM modulation function.

To attach the SAP01E daughterboard to the DBAS01E main board, refer to Figure 4 and follow this procedure:

- **Attach the ribbon cable (supplied with the SAP01E) to connector P6 on the DBAS01E. Holding the SAP01E vertically in proximity to the DBAS board, attach the other end of the ribbon cable to connector P6 on the SAP board.**

- **Align the SAP01E with the spacers on the DBAS board, and attach using the supplied screws and washers.**

- **To inform the DBAS01E that a SAP board is present, install the jumper (shunt) supplied with the SAP01E so as to connect pins 3 and 4 of connector P9 on the DBAS01E board as shown in Figure 4.**

The SAP01E installation procedure is now complete. No other connections should be made between the DBAS01E and SAP01E.

NOTE: Aside from jumpers P8 and P9 on the DBAS01E, do NOT remove or change the jumper locations without instructions from THAT Corporation technical personnel. The correct positions for all jumpers (except for the P9 shunt, installed only when a SAP board is present) are shown in Figure 2, and the DBAS01E is shipped in this configuration.

A separate demonstration fixture (DBASDEMO-E) is also available to facilitate power and signal connections to the DBAS (and SAP) boards. Equipped with convenient input and output connectors, pushbutton

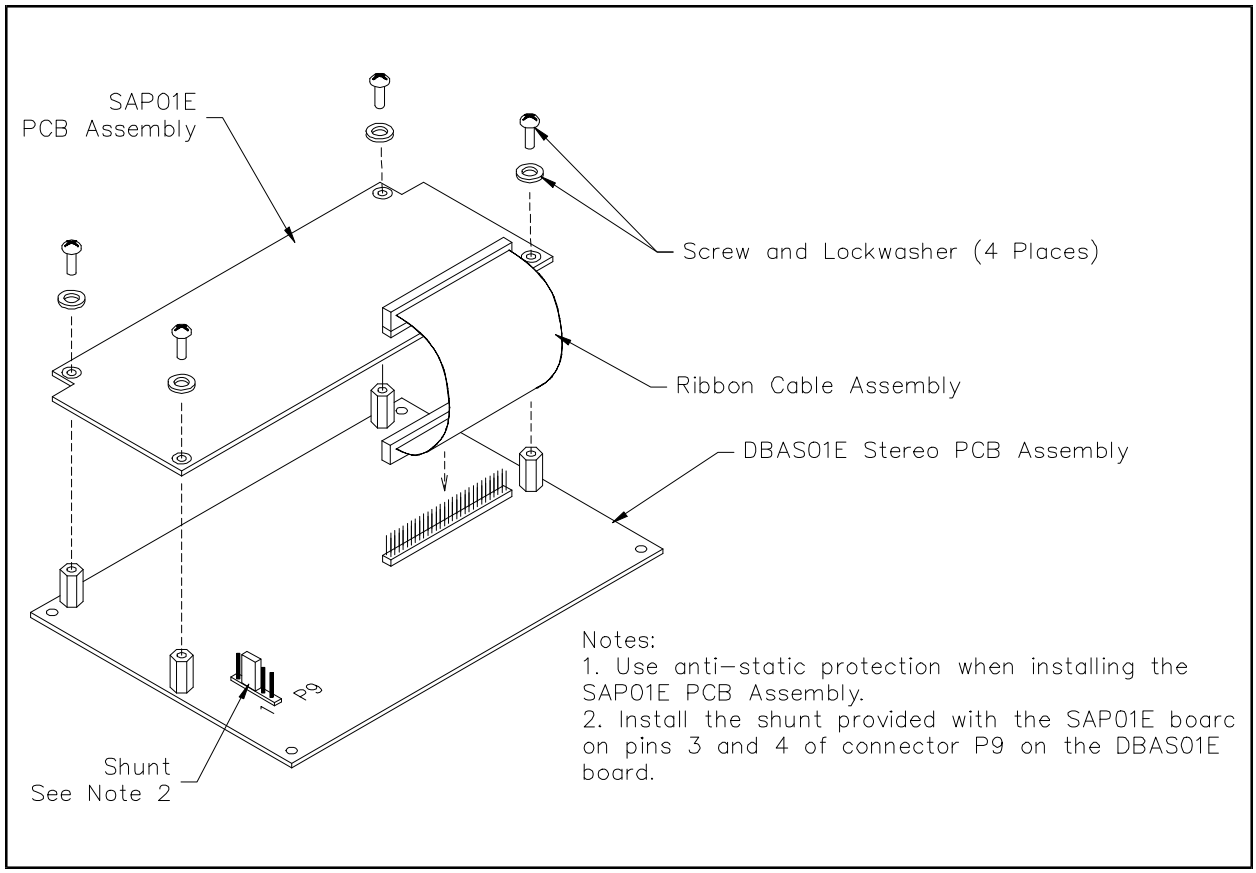

Figure 4. SAP01E installation diagram

mode switching, and LED indicators, the DBAS-DEMO-E fixture can greatly simplify the evaluation process.

In addition, an AGC board (AGC01) specifically designed for broadcast use is available as an external accessory.

For more information, contact THAT Corporation.