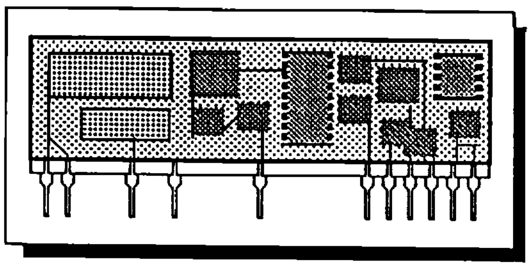
aptek technologies

AMS 2050
2-WIRE INTERFACE

PRELIMINARY DATA SHEET



The AMS2050 from Aptek Technologies is both a Central Office and Telephone Station interface for two wire PABXs using smaller and less expensive transformers than was heretofore possible. It virtually eliminates the insertion losses associated with the transformer and the on-resistance of the crosspoint switch.

The basic connection configuration of the AMS2050 is illustrated in figure 1. With component values shown the device is essentially transparent; that is, the impedance seen across the A and B wires of the circuit equals the impedance with which the circuit is terminated at the matrix.

In an actual operating circuit (figure 2 shows a station to line connection) the impedance that each AMS2050 sees at its matrix connection is affected by the on-resistance of the crosspoint switch (represented by transistor Q1 in the figure). In traditional systems this resistance introduces loss in the speech path and deterioration of return loss at either end of the connection. With the AMS2050, proper selection of resistor R_{SET1} eliminates the loss associated with Q1 for signals transmitted from line to station, and restores the return loss at the station interface. Proper selection of R_{SET2} achieves the same in the other direction.

The AMS2050 requires split (positive and negative) 5 to 15 volt power supplies for operation. It meets the regulatory requirements of most countries worldwide with no external protective devices. For proper operation, it must be used with the transformers specified.

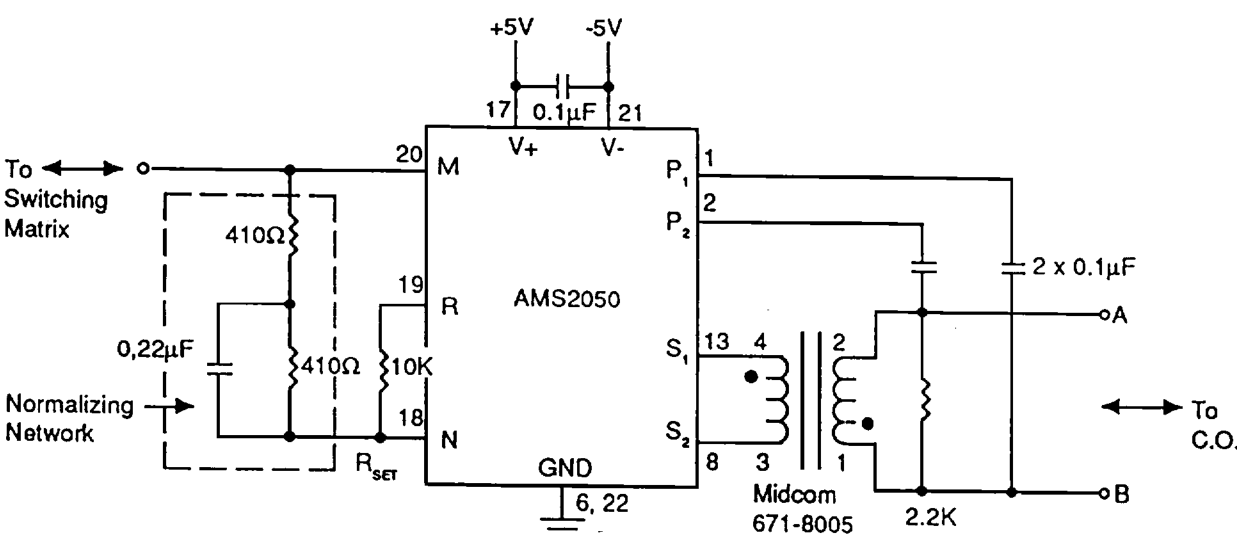


Figure 1. **Basic Connection**

Normalizing network sets ratio of matrix port impedance to line port impedance (1:1 with values shown)

R_{SET} adjusts gain in matrix-to-line direction and return loss at line port, to correct for finite crosspoint switch resistance.

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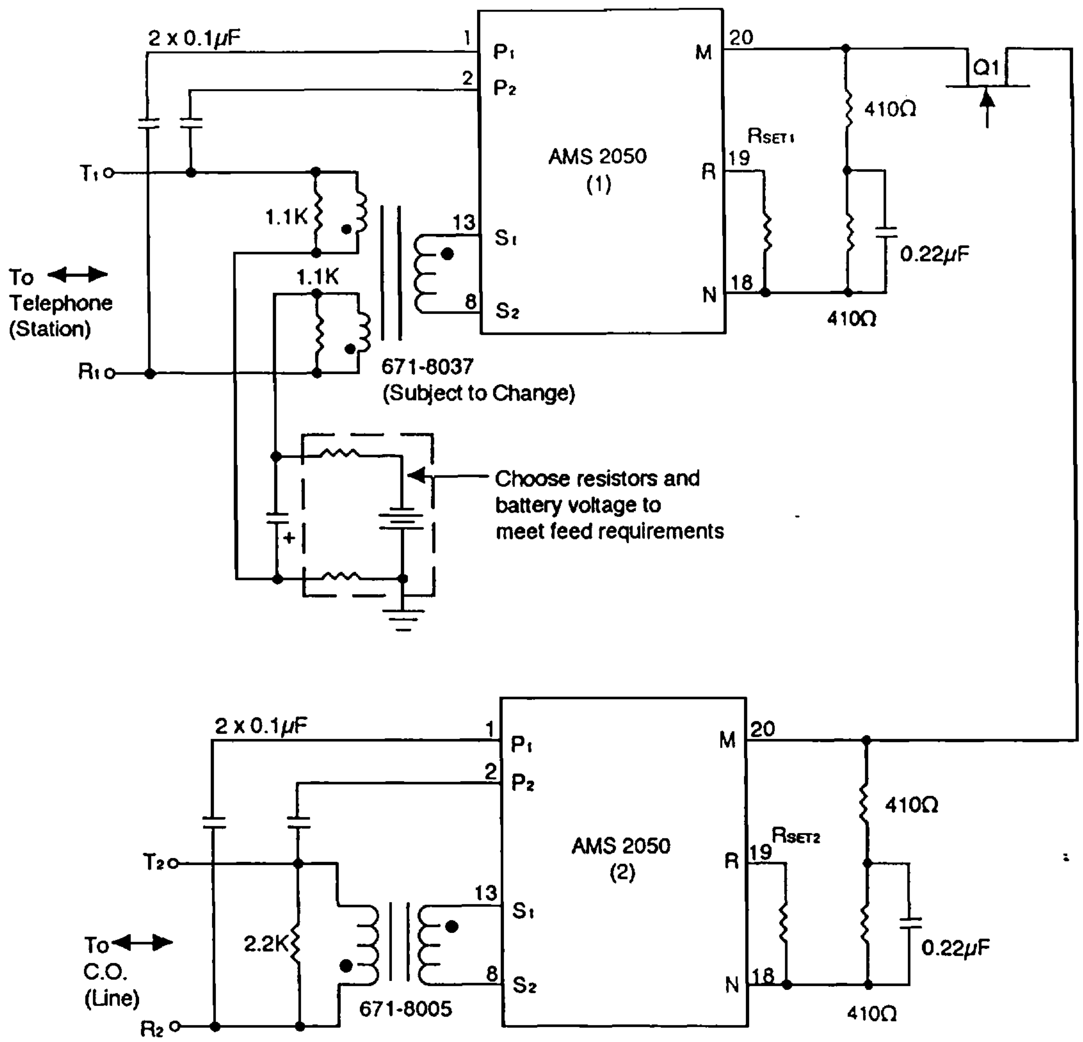
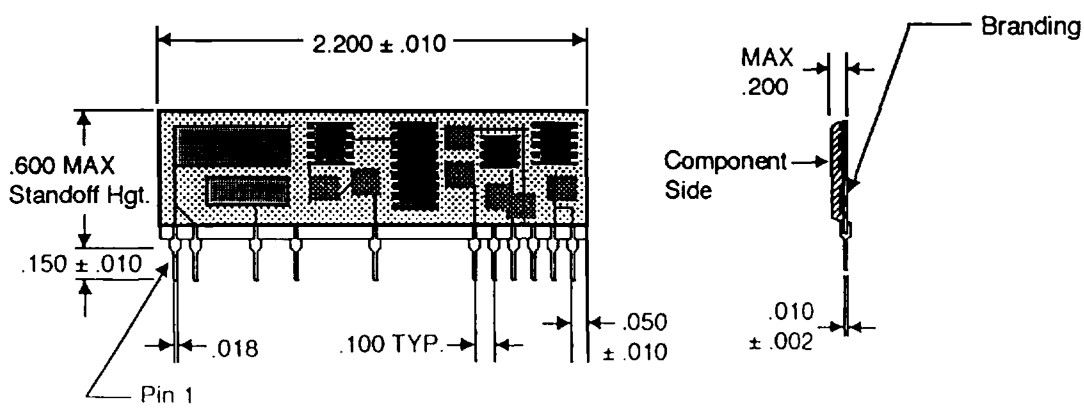


Figure 2. **Operating Circuit - Station to Line Connection**

Q_1 Symbolizes crosspoint switch

R_{SET1} & R_{SET2} are chosen to eliminate the effects of Q_1 on insertion loss and return loss

PACKAGE OUTLINE



PINOUTS

NAME	PIN #	DESCRIPTION
P_1	1	Transformer pin 1 (primary) through 0.1μF cap
P_2	2	Transformer pin 2 (primary) through 0.1μF cap
G	6, 22	Ground and power supply common
S_2	8	Transformer pin 3 (secondary)
S_1	13	Transformer pin 4 (secondary)
V+	17	Positive power supply; 5 to 15 volts
N	18	Connection node for impedance normalizing network and resistor R_{SET}
R	19	Connection for resistor R_{SET}
M	20	Connection to PABX switching matrix and impedance normalizing network
V-	21	Negative power supply; 5 to 15 volts

DC and ENVIRONMENTAL LIMITS

PARAMETER	MIN	MAX	UNIT
Temperature, storage	-55	125	°C
Temperature, operate	0	70	°C
Absolute limits, V+	0	18	V
Absolute limits, V-	-18	0	V
Supply current, ±5V*		12	mA
Supply current, ±12V*		15	mA

*Same limits apply to both positive and negative power supplies.

Typical current: 8.5mA (5V)

TRANSMISSION PERFORMANCE
note: Z_{DL} = 220Ω + (820Ω || 115nF)
transformer: Midcom 671-8005

PARAMETER	FREQ., Hz	Z=600Ω I=50mA	$Z=Z_{DL}$ I=35mA	UNIT	METHOD
Insertion Loss	1K	0 ± 0.2	0 ± 0.2	dB	Fig 3A, B
Response rel. 1kHz	300-3K	+0.1/-0.4	+0.1/-0.4	dB	Fig 3A, B
Response rel. 1kHz	200-3K4	+0.1/-1.0	+0.1/-1.0	dB	Fig 3A, B
Return Loss	300-3K	≥23	≥20	dB	Fig 3C
Return Loss	200-3K4	≥18	≥18	dB	Fig 3C
Longitudinal Balance	200-3K4	≥60	≥60	dB	Fig 3D
Max Signal Amplitude ±5 volt supplies	200-3K4	+1	+1	dBm*	
Max Signal Amplitude ±12 volt supplies	200-3K4	+9	+9	dBm*	
Idle Noise	C-Mssg.	≤3	na	dBrnC	Fig 3E, F
	Psoph.	na	≤4	dBmOp	

*0dBm=0.7746V_{RMS}; numbers refer to maximum signal input amplitude without clipping.

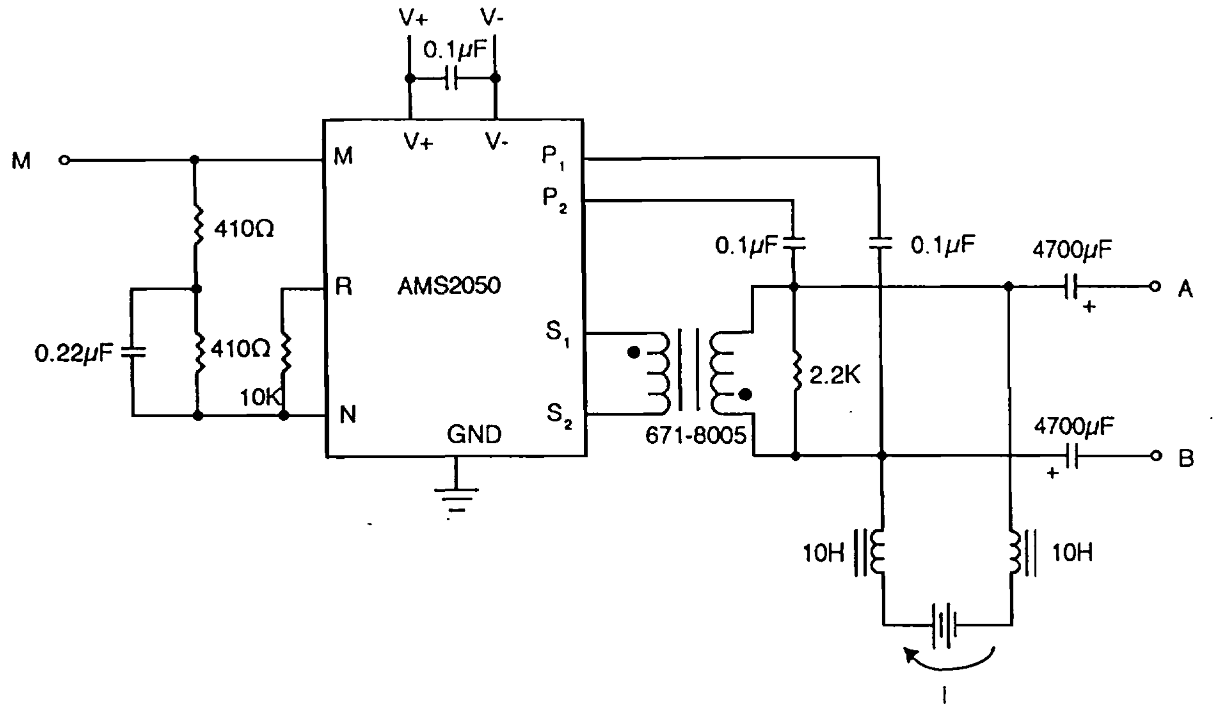


Figure 3. **Test Circuit**

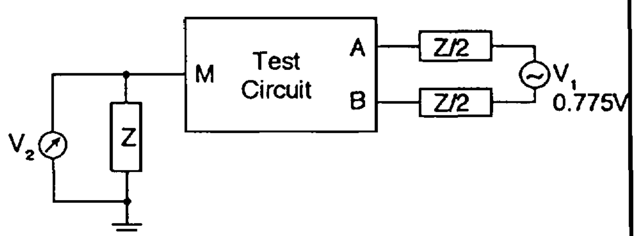


Figure 3A. Loss$_{\text{Line}\rightarrow\text{Matrix}}$ = 20 Log $\frac{V_1}{2V_2}$ (dB)

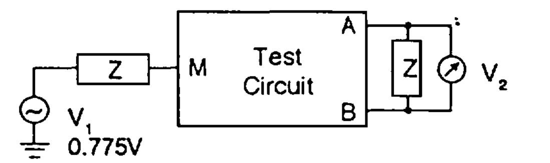


Figure 3B. Loss$_{\text{Matrix}\rightarrow\text{Line}}$ = 20 Log $\frac{V_1}{2V_2}$ (dB)

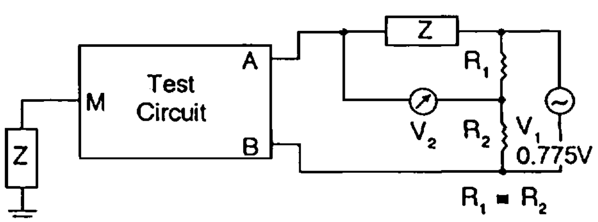


Figure 3C. Return Loss = 20 Log $\frac{V_1}{2V_2}$ (dB)

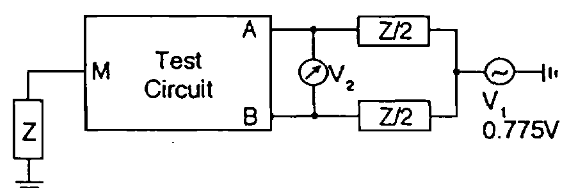


Figure 3D. Longitudinal balance = 20 Log $\frac{V_1}{V_2}$ (dB)

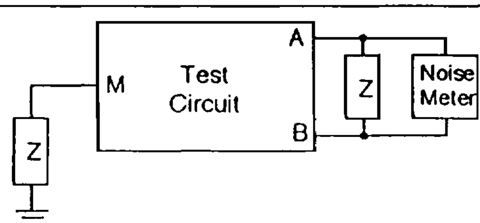


Figure 3E. Line Noise

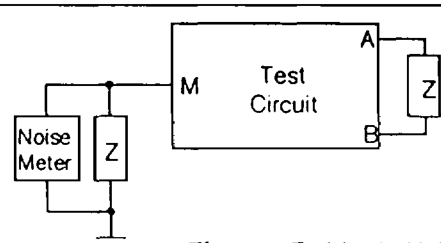


Figure 3F. Matrix Noise

If Z=600Ω, meter is C-Message weighted noise meter; If Z=Z_{DL}, meter is psophometer

TANDEM AMS2050s

Figures 4 through 9 illustrate the performance of a system consisting of two AMS2050s, connected either station to line, as in figure 2, or station to station. $R_{DS_{ON}}$ represents the resistance of the crosspoint switch typified by Q1 in figure 2. Variations with loop current are caused by transformer saturation; variations with amplitude are due to core hysteresis.

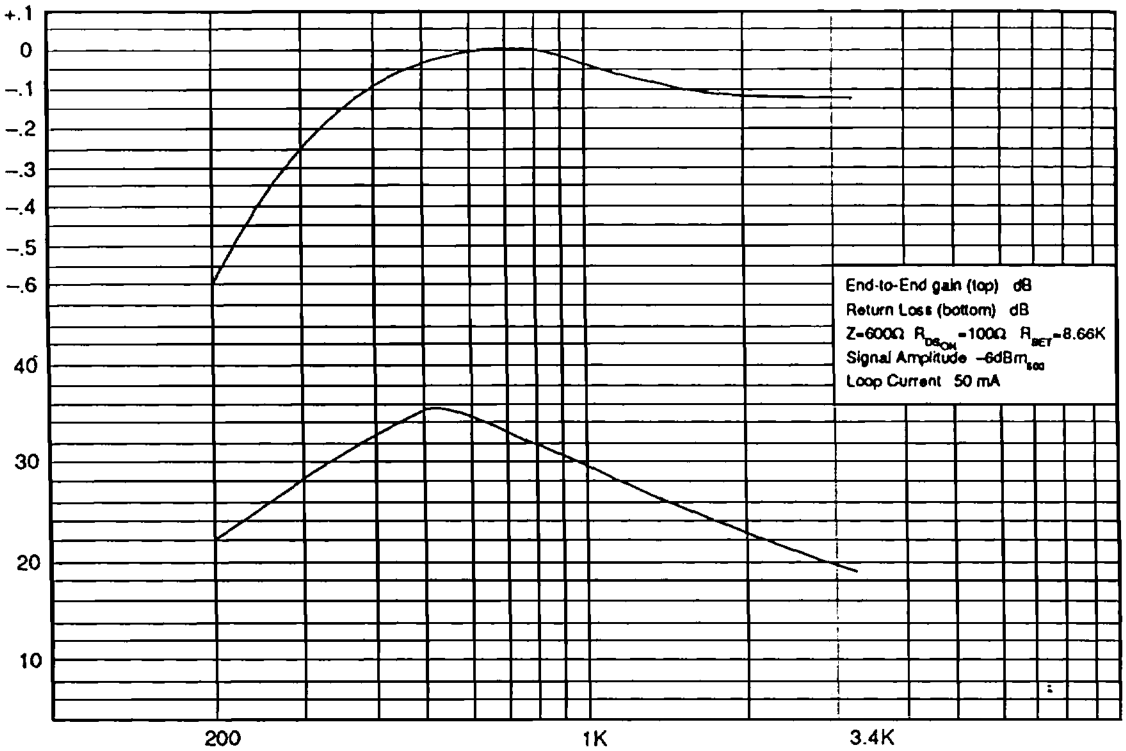


Figure 4

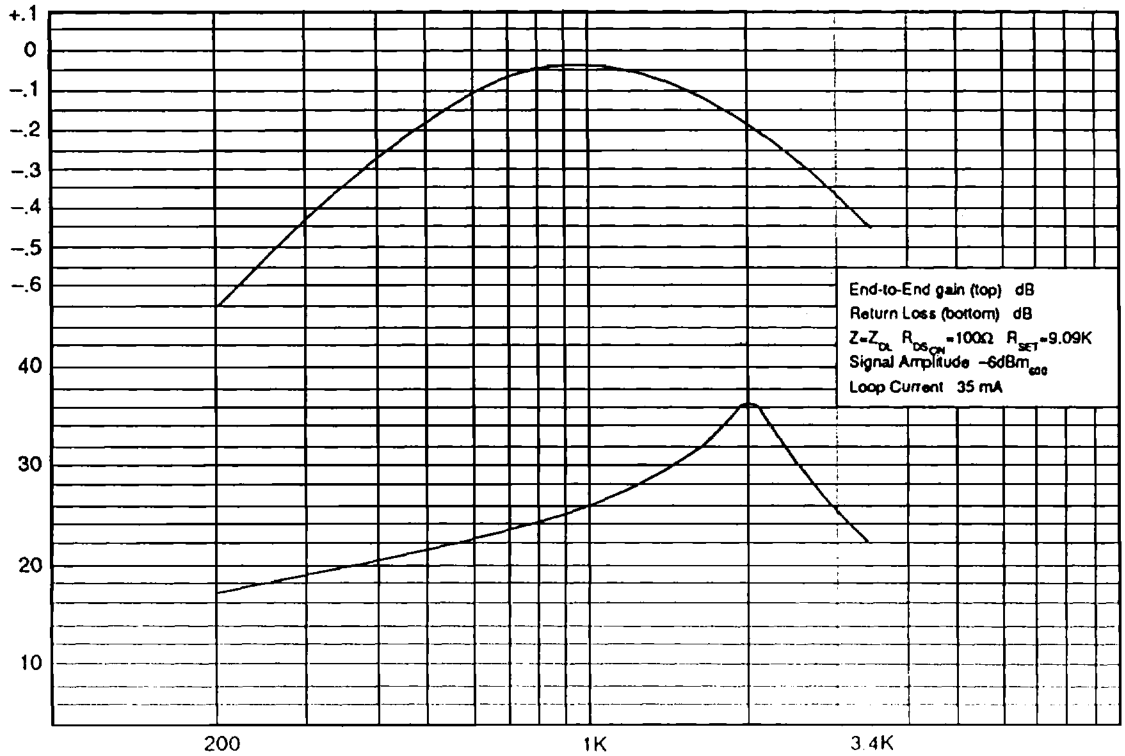


Figure 5

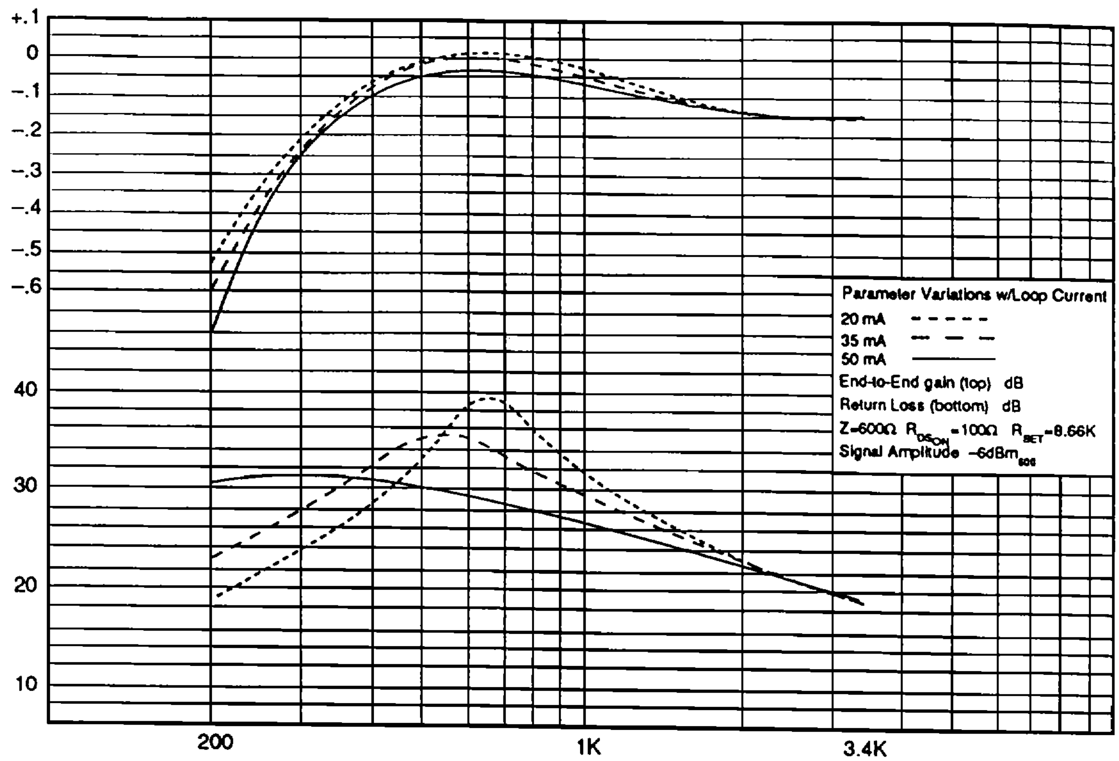


Figure 6

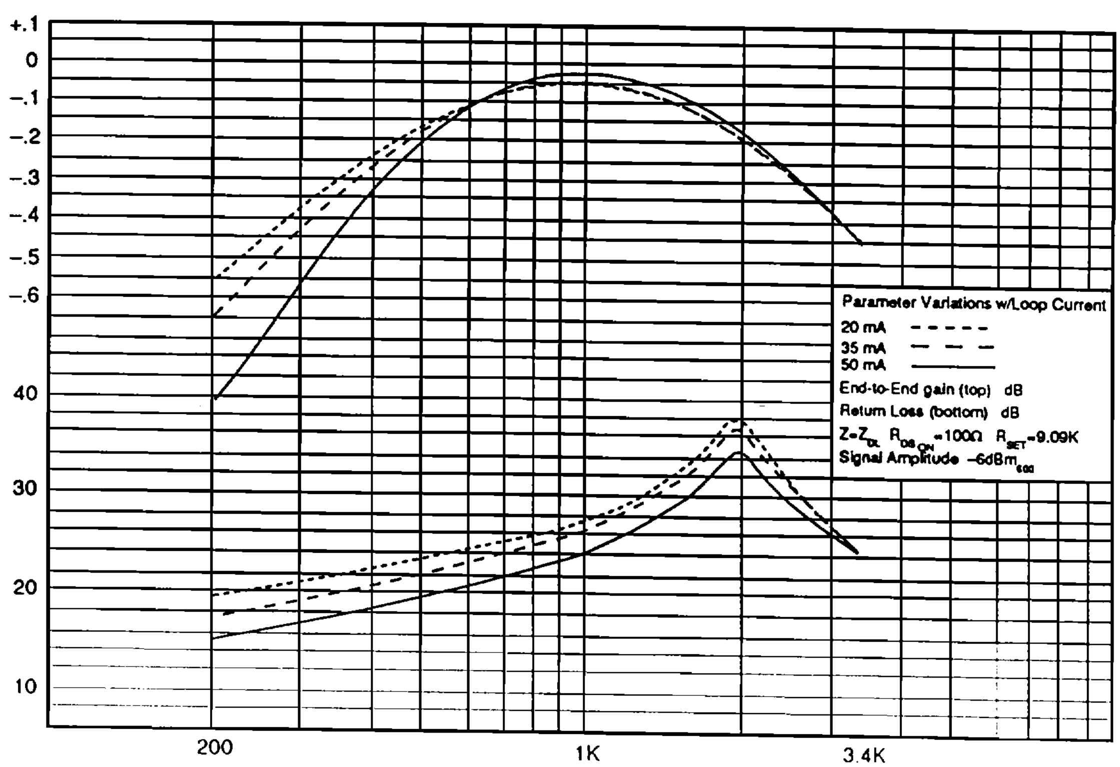


Figure 7

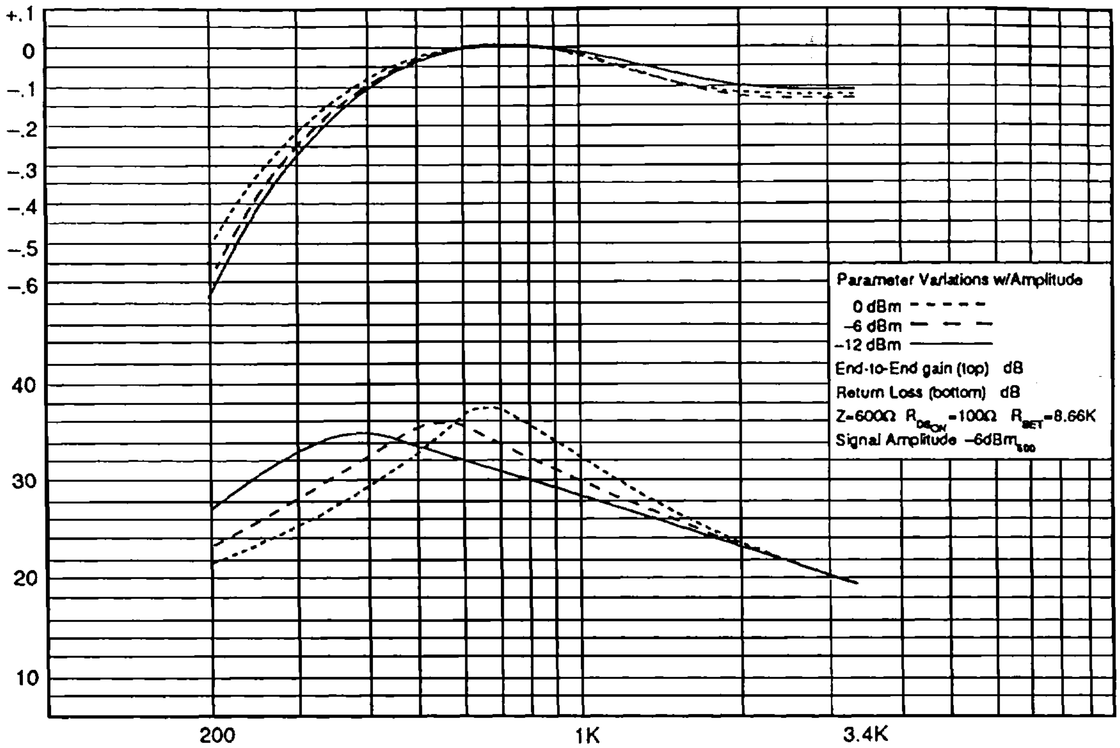


Figure 8

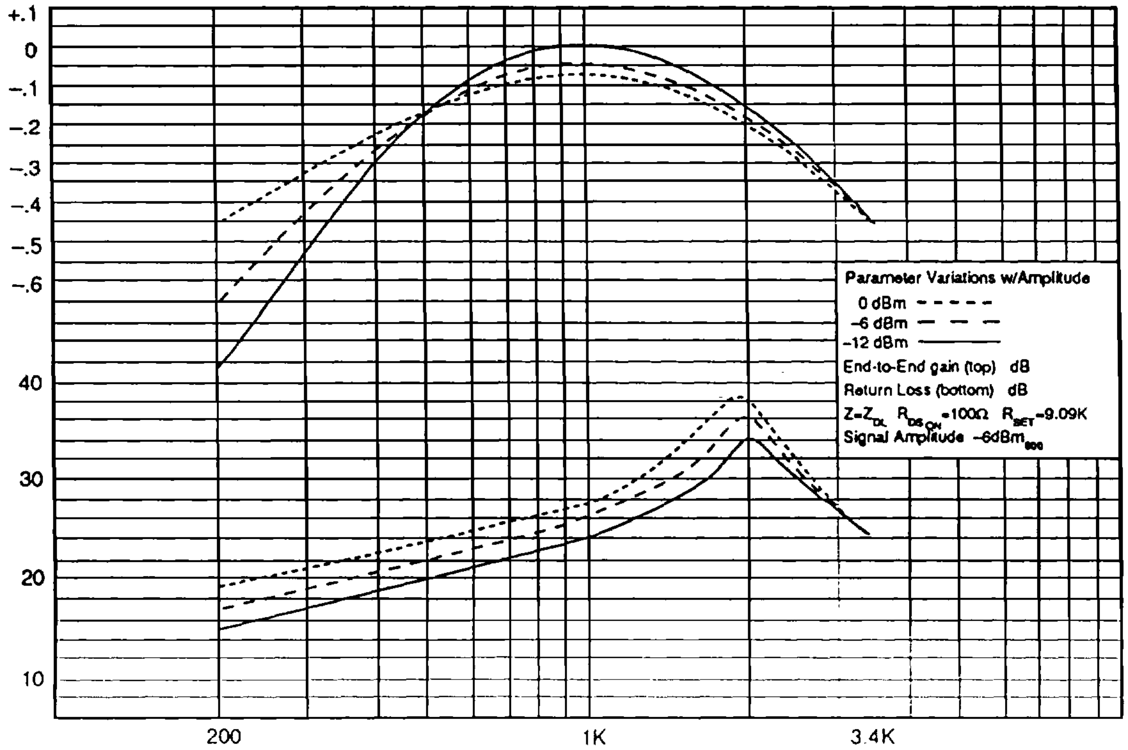


Figure 9

SELECTING R_{SET}

The optimum value of R_{SET} varies depending on the on-resistance of the crosspoint switch, and to a lesser extent on the impedance environment in which the AMS2050 is used. Lower values of R_{SET} compensate for increased on-resistance by increasing the gain from the switch through the AMS2050 to the line; R_{SET} has minimal effect on signals going in the opposite direction. Figure 10 shows the appropriate value of R_{SET} for various on-resistances and two different impedance environments. A compromise value may be selected which offers satisfactory results under all expected conditions.

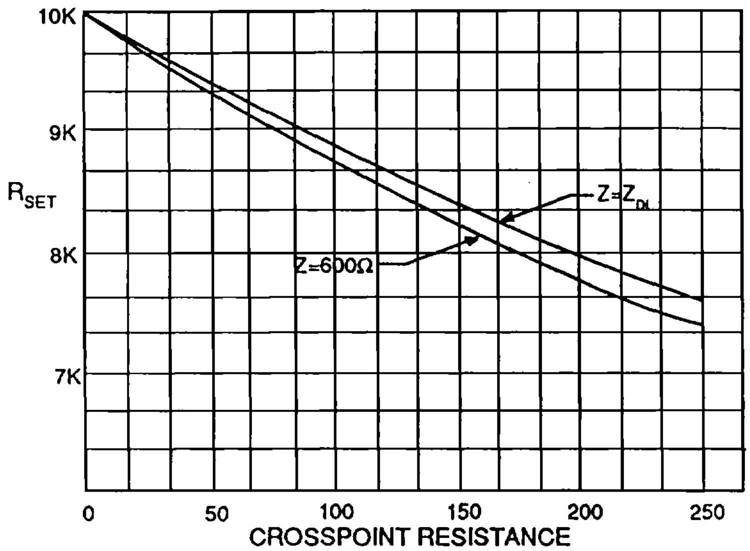


Figure 10. **R_{SET} VS. CROSSPOINT RESISTANCE**

STABILITY

When configured as shown in figures 1 or 2, the AMS2050 will be stable for all reasonable conditions of line termination. It will, however, oscillate if both ends (line and matrix) of the circuit are left unterminated. If it is not feasible to terminate the matrix connection at all times, the method illustrated in figure 11 will insure stability when the line connection is on-hook.

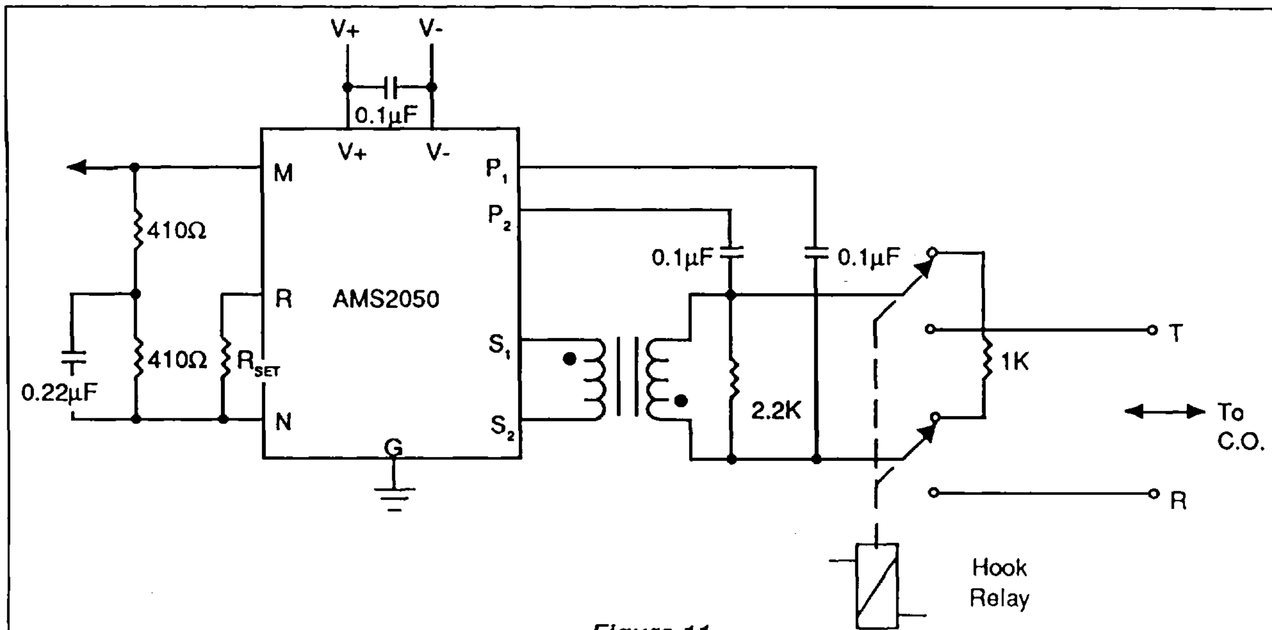


Figure 11.

Terminating the AMS2050 with a resistor when on-hook insures stability at all times

TONE INJECTION

It is sometimes desirable to inject brief alerting tones into a line circuit while a conversation is in progress. Figure 12A shows a method of doing this with the AMS2050. The resistor should be selected so as to yield the desired amplitude from the available tone source. The tone will be attenuated approximately 16dB at the other line. If more attenuation is required it is necessary to interrupt the speech path.

(note: This technique is intended for brief alerting tones only; transmission parameters including return loss are not guaranteed during the interval S_1 is closed. If continuous connection to a signal source is required, it should be achieved at the crosspoint interface from a source of the correct impedance, as in Figure 12B.)

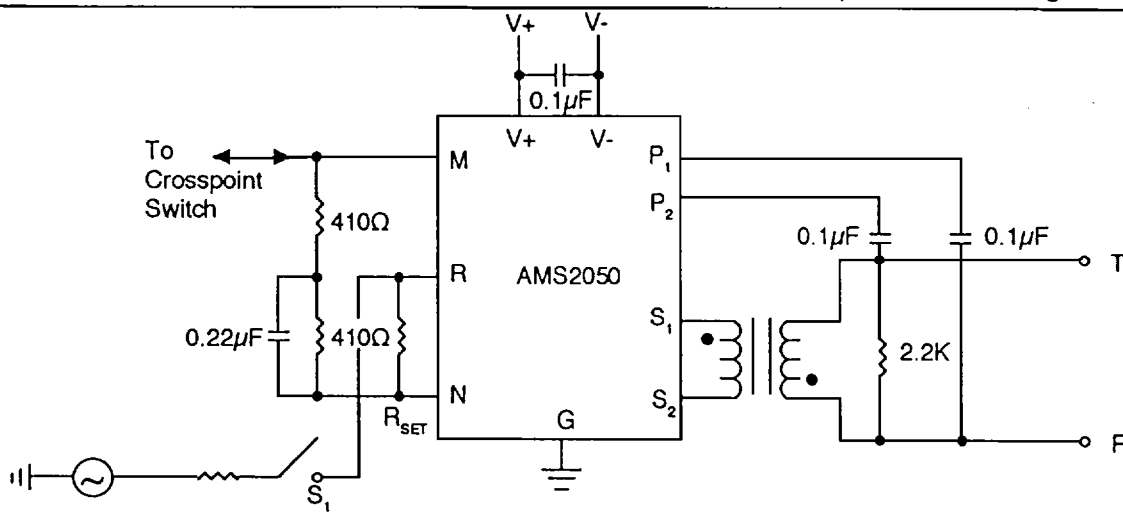


Figure 12A.

S_1 may be a CMOS switch

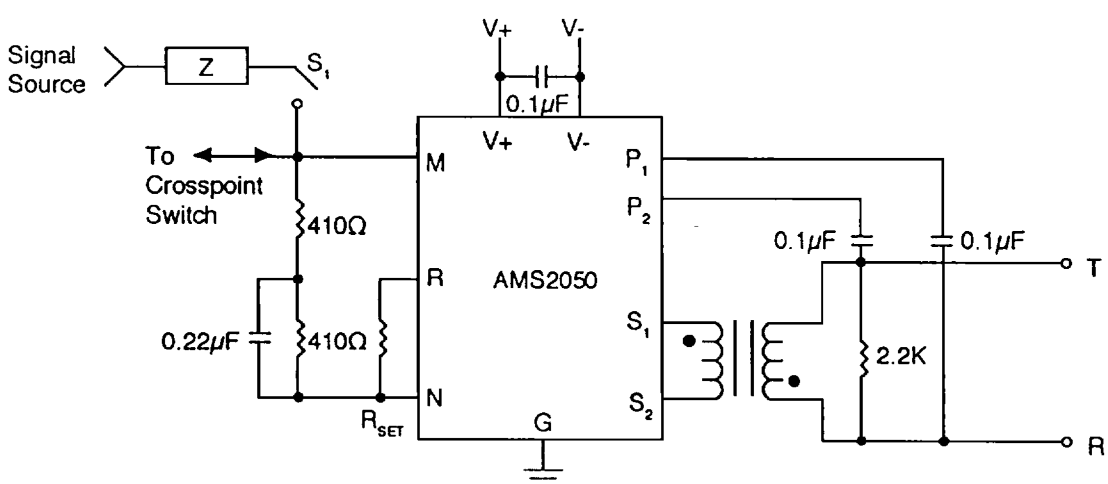


Figure 12B.

Signals may be injected at the connection to the crosspoint switch when closing S_1.

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