

SP75

SPEECH
PROCESSOR

by  **DRAKE**

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SP75

I. GENERAL DESCRIPTION

The SP75 Speech Processor is designed to provide an increase in average power and readability of a single sideband voice signal during weak signal or high interference conditions. The SP75 is connected between the microphone and microphone input of the single sideband transmitter, thus requiring no modification of the existing transmitter or transceiver. A front panel switch allows the processor to be switched in or bypassed as conditions warrant. Two additional inputs, such as a tape player or phone patch, may be front panel selected in place of the normal microphone input.

The amount of RF envelope clipping is adjustable between zero and twenty decibels by a front panel control. A LED indicates proper audio input level. Because of the pre-clipping audio compression, small changes in voice levels do not widely affect the clipping level.

Muting circuitry reduces gain during speech pauses, thus reducing undesirable background noise pickup and allowing VOX operation with the processor on.

The SP75 was designed for optimum performance using the Drake model 7077 microphone and the Drake TR7 transceiver or Drake 4-line transmitters. However, excellent performance can be obtained with most other transmitters which have a microphone input impedance of approximately 50 K ohm or greater. Microphones other than the Drake 7077 may be used successfully. However, microphones with a more sharply rising frequency response may produce a less pleasant response than a microphone with a flatter response.

II. SPECIFICATIONS

Processing Type:	Preclipping audio compression followed by RF envelope clipping at the processor intermediate frequency.
RF Clipping Range:	Adjustable 0 to 20 dB from front panel control.
Input Level (Microphone Input):	3.5 mV minimum for full processing. Gain adjustable to accommodate up to 300 mV maximum.



Input Level (Tape & Patch Inputs):	15 mV minimum for full processing, 30 mV maximum.
Input Impedance (Microphone):	1 Megohm
Input Impedance (Tape & Patch):	50 K ohm
Output Level w/Processing:	0-50 mV adjustable into 50 K ohm load.
Output Impedance:	50 K ohm
Muting (Microphone Input Only):	10 to 20 dB attenuation during speech pauses.
Frequency Response:	400-6000 Hz @ -6 dB
Distortion:	Less than 5% T.H.D. @ 1 kHz, 20 dB clipping.
Supply Requirements:	11-16 VDC @ 95 mA
Size:	7" L x 6-1/4" W x 2-1/4" H (17.8 cm x 15.9 cm x 5.4 cm)
Weight:	1.4 lb. (.63 kg)

III. INSTALLATION

Locate the SP75 at a convenient location. If the SP75 is placed on top of the TR7 transceiver, the microphone cable from the rear of the SP75 can be routed along the side and underneath the TR7. DO NOT block the power amplifier cooling slots on the right side of the TR7.

The SP75 may be secured to the top of a RV7, MS7, or equivalent cabinet with the two retaining clips provided. First, remove the screw-in mounting feet on the SP75 and replace with the four number 6 screws provided. Place the four stick-on rubber feet on the bottom of the SP75 next to the cover mounting screws on the cover. Remove the top screws on each front extrusion end cap of the MS7 or RV7 and the bottom screws on each SP75 end cap. Place a retaining clip between the end cap and extrusion. Position so that the hole is properly aligned and replace end cap screws. Repeat retaining clip installation on the other side.

Plug the SP75 output cable into the TR7 microphone input connector. Plug the phono plug on the SP75 supply cable into the 13.6 volt accessory output jack on the PS7 power supply. The microphone may then be connected to the SP75 input.

If another transmitter other than the TR7 is used, the proper mating connector can be installed on the SP75 cable replacing the TR7 microphone plug supplied. Connect the red wire to the PTT connection, the white center conductor of the shielded cable to the microphone audio connection, and the shield and black wires to the ground connection.

When using a transmitter/power supply combination other than the TR7/PS7, connect the positive SP75 supply (11-16 V) lead to the tip of the SP75 supply cable plug. Connect the negative supply lead to the *chassis of the transmitter*. Do not connect the negative supply lead to the shield of the SP75 supply cable as this shield is not internally connected in the SP75. *The SP75 must receive its supply negative connection through the output cable ground by way of the transmitter or transceiver chassis.* This is done to prevent ground currents from being introduced across the SP75 output cable which could result in an RF feedback condition.

ADDITIONAL GROUNDING NOTES

In addition to the above supply connection the following must be observed to prevent any possibility of creating undesirable ground currents through the SP75 which could result in RF feedback.

- 1) Any microphones or other inputs connected to the SP75 **MUST NOT** be grounded through any other path other than through the SP75 input connector.
- 2) When a phone patch or tape recorder are connected to the SP75, they should **NOT** be grounded elsewhere, such as through a three wire AC supply cord. If the patch or recorder must be grounded, then the audio connection to the SP75 may need to be isolated by a transformer.
- 3) *See* the following diagrams for examples.

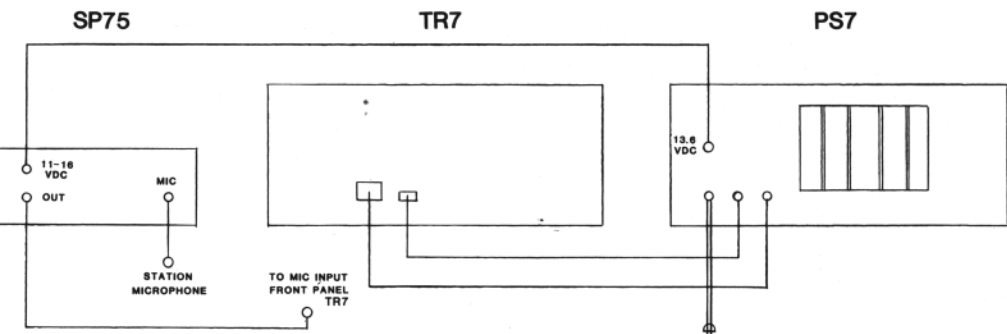


Figure 1 Connecting SP75 to TR7 and PS7

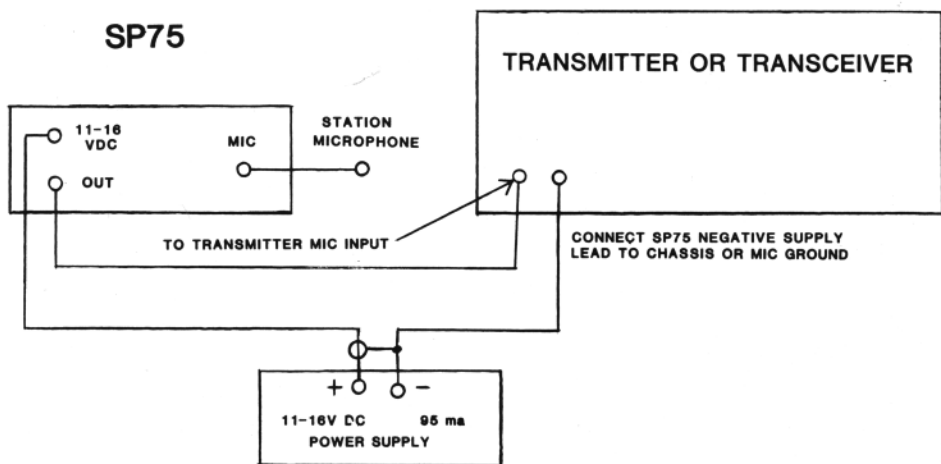


Figure 2 Connecting SP75 to Systems Other Than TR7 and PS7

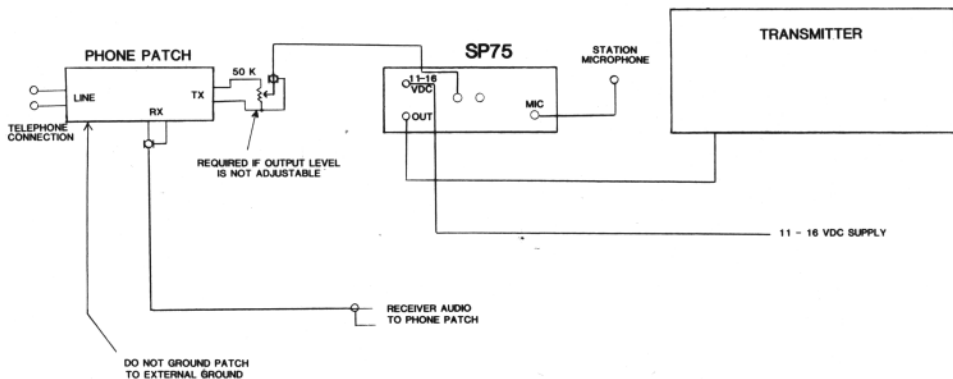


Figure 3 Phone Patch Connection to SP75

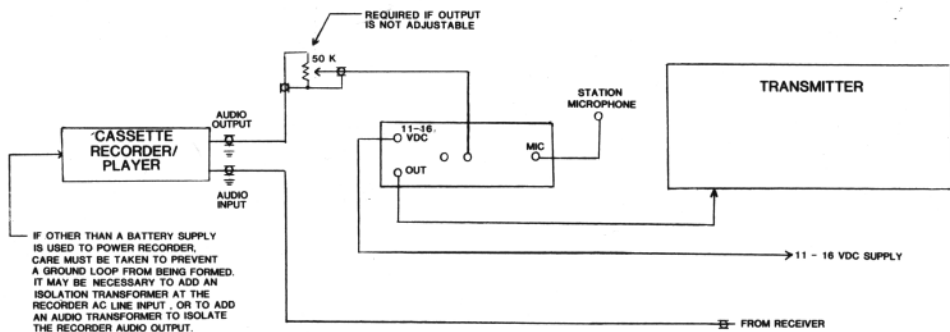


Figure 4 Tape Player Connection to SP75



POWER SWITCHING OPTION

As supplied from the factory (jumper option A) the SP75 is always connected the DC supply regardless of the position of the ON/OFF pushbutton. This is true even though the green "ON" LED is switched. This is done to allow instant IN/OUT audio switching. If it is desirable to eliminate all power consumption when the ON/OFF pushbutton is OFF, the power jumper can be moved as shown in the schematic, jumper option B. When this change is made, there will be a slight delay before the processor is operational when the unit is turned ON. Unless battery power is used it is usually desirable to leave the jumper in the factory supplied position. See figure 5 for power jumper location.

IV OPERATION

Before operating with the SP75 it may be necessary to set the SP75 microphone gain and output audio levels. Once these adjustments are made it should not be necessary to readjust them unless a microphone with a different output level is used. The SP75 set up procedure is as follows:

- 1) With the SP75 bypassed, ("ON" button out) adjust transmitter microphone gain for normal transmitter operation. Select the microphone input by depressing the MIC pushbutton.
- 2) Set the SP75 clipping level to 0 dB.
- 3) Turn SP75 on by depressing "ON" pushbutton. While speaking normally, advance the SP75 microphone gain, accessible through SP75 rear panel, with a small screwdriver until the green "AUDIO" LED on the SP75 just stays on while speaking. Do not advance-beyond this point. NOTE: Observing from the rear panel, full CCW setting is minimum gain. Advancing the potentiometer CW increases gain. The LED should not blink while speaking continuously, but should start dropping out if you back away from the microphone a few inches farther than normal and should go out completely when you stop speaking.
- 4) Place transmitter in transmit. -With the SP75 at 0 dB clipping level, talk normally into the microphone and advance the SP75 output level control, accessible through rear panel, starting at minimum level (CCW), for normal

transmitter operation With the TR7 this means advancing the SP75 output level until the green TR7 ALC indicator just lights to full brilliance. Do not advance output level beyond this point. NOTE: Transmitter microphone gain should not be changed from the setting determined in step 1.

- 5) To use the processor with a tape or phone patch input, depress the appropriate pushbutton. Do not change the processor output level or transmitter microphone gain control from the settings determined above. Adjust the output level *on the patch or* tape player for proper audio level using the same general procedure as step 3 above. The SP75 microphone gain control is not operative in the TAPE or PATCH mode and the level *must be set by the control on the tape player or patch.*

Once the SP75 has been adjusted as per the above procedures it is ready for operation. One of the three possible inputs can be selected by depressing the appropriate interlocking pushbutton. Any input can be fed directly to the transmitter, bypassing the processor, by leaving the ON pushbutton in the out position. When the ON pushbutton is depressed, the processor is switched in. The clipping control can be advanced to obtain the desired amount of clipping. The best setting will depend on band conditions and the individual operator, however 9 to 12 dB is usually a good setting.

V. THEORY OF OPERATI'ON

Refer to the schematic diagram. The audio input is amplified by the microphone preamp when the microphone input is selected. Gain control R5 allows the gain to be set properly for the particular microphone being used. The output from the microphone preamp is then routed to the audio compressor stage. When selected, tape or phone patch inputs are routed directly to the compressor. The audio compressor compresses the dynamic range thus providing a more constant level to the RF clipper. This compression also allows more RF clipping of the softer speech passages.

The audio compressor output is fed through the clipping level potentiometer and muting circuitry to the input of a MC1496 balanced modulator integrated circuit. A double sideband output signal is generated by the balanced modulator at an intermediate carrier frequency of 459 kHz. This signal then passes through two cascaded ceramic filters, leaving only a single sideband signal at

their output. This SSB signal is then RF clipped by the clipper and after buffering, is again filtered by a third ceramic filter to remove undesired harmonics induced by the clipping process. The resulting clipped signal has a much higher average to peak power ratio than the original signal before clipping. This processed SSB signal is converted back to audio by the product detector circuitry. Use of the same local oscillator for the balanced modulator and product detector assures that no audio frequency shift is produced. The processing also reduces some of the lower audio frequencies resulting in a rising response which adds to the processing effectiveness.

During audio pauses when the output from the audio compressor falls below the input threshold of the threshold detector circuitry, additional attenuation is inserted in the audio path by the FET audio attenuator circuitry to reduce background noise pickup.

VI. ALIGNMENT AND TROUBLESHOOTING

The following procedures may be used to align the SP75 if there is good reason to believe alignment is required. There are only two adjustments in addition to the normal microphone gain and output level set-up.

- 1) Turn unit on.
- 2) Attach a counter to test point 13. Refer to the photo in figure 5. Adjust the variable capacitor C44 for a frequency of 459.0 kHz. Remove frequency counter connection.
- 3) Connect an RF voltmeter or scope capable of measuring an RF voltage of approximately 10 to 25 mV to test point 6. Disconnect all audio inputs and select the TAPE or PATCH switch position. While observing the scope or RF voltmeter adjust R26 for a minimum RF indication.

This completes the alignment procedure.

If the SP75 fails to work properly the following signal levels may be checked. Refer to the schematic, figure 6, and pictorial, figure 5.

With an input signal of 10 mV at the microphone input and with the microphone gain, R5, set to maximum, the following audio levels should result. All values are r.m.s, AC volts.

- 1) At test point 2,50 mV.
- 2) At test point 3,200 mV.
- 3) At test point 4,1.0 volt.
- 4) At test point 5,70 mV with clipping control at 20 dB.
- 5) Approximately 25 mV at test point 12.

VII. SERVICE DATA

The SP75 will be checked and aligned at the factory for a nominal fee if there is no evidence of tampering. Transportation charges are extra. Any necessary repairs will be made on a time and materials basis. Please write or call the factory for authorization before returning your unit for alignment or service. Address your requests for authorization to:

R. L. DRAKE COMPANY
540 Richard Street
Miamisburg, OH 45342
ATTN: Customer Service Department.
Telephone: (Area Code 513) 866-3211
Telex: 288-017

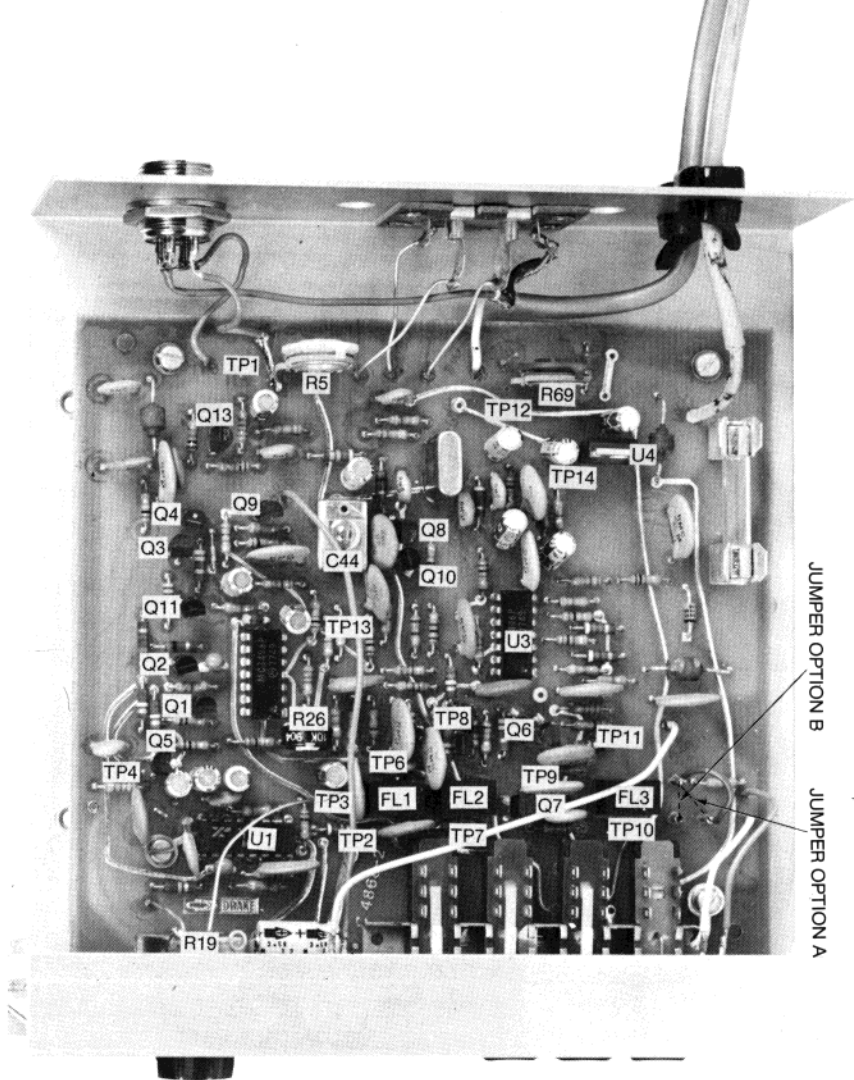
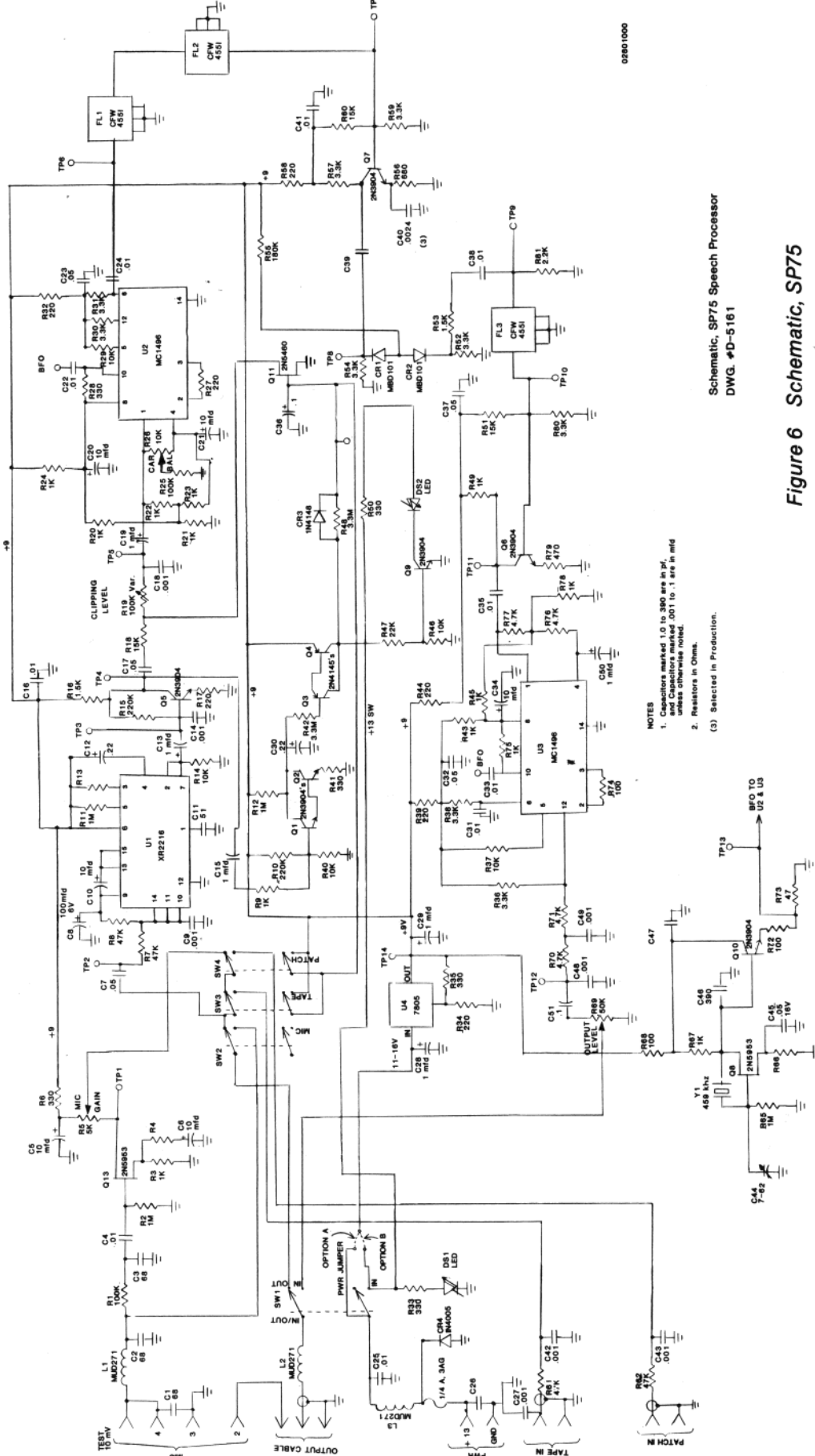


Figure 5 P. C. Board Pictorial, SP75



R	R01	R02	R03	R04	R05	R06	R07	R08	R09	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77	R78	R79	R80	R81	R82	R83	R84	R85	R86	R87	R88	R89	R90	R91	R92	R93	R94	R95	R96	R97	R98	R99	R00
C	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36	C37	C38	C39	C40	C41	C42	C43	C44	C45	C46	C47	C48	C49	C50	C51	C52	C53	C54	C55	C56	C57	C58	C59	C60	C61	C62	C63	C64	C65	C66	C67	C68	C69	C70	C71	C72	C73	C74	C75	C76	C77	C78	C79	C80	C81	C82	C83	C84	C85	C86	C87	C88	C89	C90	C91	C92	C93	C94	C95	C96	C97	C98	C99	C00
L	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20	L21	L22	L23	L24	L25	L26	L27	L28	L29	L30	L31	L32	L33	L34	L35	L36	L37	L38	L39	L40	L41	L42	L43	L44	L45	L46	L47	L48	L49	L50	L51	L52	L53	L54	L55	L56	L57	L58	L59	L60	L61	L62	L63	L64	L65	L66	L67	L68	L69	L70	L71	L72	L73	L74	L75	L76	L77	L78	L79	L80	L81	L82	L83	L84	L85	L86	L87	L88	L89	L90	L91	L92	L93	L94	L95	L96	L97	L98	L99	L00



NOTES

- Capacitors marked 1.0 to 390 are in pF, 470 to 1000 are in nF, .001 to .1 are in mfd unless otherwise noted.
- Resistors in Ohms.
- (3) Selected in Production.

Schematic, SP75 Speech Processor
DWG. #D-5161

Figure 6 Schematic, SP75

02801000