

	Ulrich Graf, DK4SX November 1999
<h1 style="text-align: center;">Speech Processor Option</h1> <h2 style="text-align: center;">for Collins KWM-380</h2>	All Rights Reserved

<p>1. Description</p> <p>This speech processor is a new development around a modern IC of high integration degree. It increases the average talk power with extremely little distortion. It is based on an audio dynamic compression principle with adjustable compression level, background noise expansion and clipping of excessive voice peaks.</p> <p>Due to it's low distortion level the processor may remain activated even under strong signal conditions. The increase of average talk power is in excess of 5 dB; peak power output will remain constant due to AGC action to prevent PA overload and output signal distortion.</p> <p>2. Installation</p> <p>Perform the following for installation in the KWM/HF-380:</p> <ol style="list-style-type: none"> a. Remove the KWM/HF-380 dust cover by removing four screws from the bottom of the transceiver. b. remove the card cage cover to expose the plug-in circuit cards. c. Refer to figure 1. Insert the speech processor PCB into the card guides. <p style="text-align: center;">Note</p> <p>Do not make any connections between the PCB ground foil and the card cage ground! Hum return loops will result.</p> <p style="text-align: center;">Note</p> <p>Refer to figures 1, 2, 3 and 4 while performing steps d through l.</p>	<ol style="list-style-type: none"> d. Route the cables from the speech processor card through the slot on the side of the card cage to the front of the unit between the power transformer and the card cage, then down the front panel behind the loudspeaker and loop back across the receiver-exciter chassis under the existing ribbon cables. e. Connect P17 of the ribbon cable assembly into J17 of the receiver-exciter board on the bottom of the chassis (4 wire ribbon). Attention: Make shure pin #1 wire from the speech processor board ends at J17, pin #1 (Fig.3, detail A). f. Unplug the wire from the front panel potentiometer which plugs into J26 (white) of the receiver-exciter board. g. Plug P26 of the speech processor cable (input, orange) into J26 on the receiver-exciter board. h. Plug J26 of the speech processor cable (output, white) into P26 of the cable from the front panel. i. Disconnect the wire from the front panel potentiometer which plugs into J28 on the receiver exciter board (black). j. Plug P28 of the speech processor cable (input, black, „centre“) into J28 on the receiver-exciter board. k. Plug J28 of the speech processor cable (output, red) into first P28 „spare“ connector of processor input cable (black). l. Plug P28 of the cable from the front panel potentiometer (black) into second „spare“ connector of processor input cable (black). <p style="text-align: center;">Note</p> <p>Ensure that the speech processor card is fully inserted into the card cage.</p>
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Note

The speech processor is precisely aligned. With the SM-280 or any comparable dynamic microphone connected to the microphone jack of the transceiver, optimum performance is obtained with all three trimm-potentiometers in a 6 o'clock position.

Note

Take care not to overdrive the microphone amplifier. Adjust microphone gain w/o speech processor to an S5, maximum S7 ALC reading.

If adjustments to individual speech processor settings are desired follow these steps:

3. Adjustments

- a. Connect a dummy load to the rear panel RF connector.
- b. Connect a microphone to the MIC input
- c. Set the transmitter frequency to 14.300.00 MHz
- d. On the front panel set MODE switch to USB, PROC out, MOX in and METER to ALC.
- e. Turn trimm-potentiometer P1, GAIN, right, fully ccw, P2, COMPRESSION, middle, fully ccw and P3, ROTATION POINT (output level), left, to a 6 o'clock position.

- f. Push PROC switch in.
- g. While speaking into the microphone at a normal speech level, adjust P1 on the speech processor card for a same S5 to S7 indication (microphone level adjustment).
- h. Adjust P2 to a 6 o'clock position (compression factor = 4). This adjustment leads to an increase of average talk power by about 3 dB ... 6 dB. Further clockwise adjustment will increase dynamic compression. Maximum compression factor = 5. Fully ccw position results in a minimum compression factor = 2.

Note

Adjustments according to h and i are not critical!

- i. P3 sets the maximum SP output signal level and limiting level of voice peaks. Excessive SP signal output stresses ALC and may lead to a distorted audio signal. It does not increase peak RF output power. Exact distortion free adjustment only possible with lab test setup. Therefore it is recommended to set P3 to a 6 o'clock, maximum 4 o'clock position.
- j. Reinstall the card cage cover and dust cover.

Parts List

PCB Part #	Description
C1	Capacitor, Foil, 1000 pF, 63 V
C2	Capacitor, Foil, .1 uF, 63 V
C3	Capacitor, Foil, .22 uF, 63 V
C4	Capacitor, Foil, .22 uF, 63 V
C5	Capacitor, Foil, .47 uF, 63 V
C6	Capacitor, Foil, .47 uF, 63 V
C7	Capacitor, Foil, .1 uF, 63 V
C8	Capacitor, Foil, .01 uF, 63 V
C9	Capacitor, Ceramic, .01 uF, 63 V
C10	Capacitor, Ceramic, 1000 pF, 63 V
C11	Capacitor, Ceramic, 470 pF, 63 V
C12	Capacitor, Ceramic, 470 pF, 63 V
C13	Capacitor, Foil, 1000 pF, 63 V
C14	Capacitor, Ceramic, 1000 pF, 63 V
C15	Capacitor, Ceramic, 1000 pF, 63 V
C16	Capacitor, Ceramic, 1000 pF, 63 V
C17	Capacitor, Foil, 2200 pF, 63 V
C18	Capacitor, Ceramic, .01 uF, 63 V
C19	Capacitor, Ceramic, .01 uF, 63 V
C20	Capacitor, Electrolytic, 100 uF, 25 V
C21	Capacitor, Electrolytic, 22 uF, 25 V
C22	Capacitor, Foil, 560 pF, 63 V
C23	Capacitor, Electrolytic, 10 uF, 25 V
C24	Capacitor, Electrolytic, 10 uF, 25 V
C25	Capacitor, Electrolytic, 10 uF, 25 V
D1	Diode, Silicon, 1N4004
D2	Diode, Silicon, 1N4148
IC1	Integrated Circuit, CMOS, MC4066
IC2	Integrated Circuit, Linear, Voltage Regulator, 78L05
IC3	Integrated Circuit, Linear, Microphone Processor, SSM2166
L1	Inductor, Molded, 100 uH
L2	Inductor, Molded, 100 uH
L3	Inductor, Molded, 100 uH
L4	Inductor, Molded, 100 uH
L5	Inductor, Molded, 100 uH
P1	Trimm Potentiometer, Film, ¼ W, 10 k
P2	Trimm Potentiometer, Film, ¼ W, 100 k
P3	Trimm Potentiometer, Film, ¼ W, 50 k
Q1	Transistor, NPN, 2N2222A
Q2	Transistor, PNP, 2N2907A
R1	Resistor, FXD, Film, ¼ W, 100 k
R2	Resistor, FXD, Film, ¼ W, 1 M
R3	Resistor, FXD, Film, ¼ W, 1 M

R4	Resistor, FXD, Film, ¼ W, 10 k
R5	Resistor, FXD, Film, ¼ W, 10 k
R6	Resistor, FXD, Film, ¼ W, 10 k
R7	Resistor, FXD, Film, ¼ W, 10 k
R8	Resistor, FXD, Film, ¼ W, 10 k
R9	Resistor, FXD, Film, ¼ W, 220 k
R10	Resistor, FXD, Film, ¼ W, 330 M
R11	Resistor, FXD, Film, ¼ W, 1 M
R12	Resistor, FXD, Film, ¼ W, 1 k
R13	Resistor, FXD, Film, ¼ W, 330 k
R14	Resistor, FXD, Film, ¼ W, 22 k, not installed
R15	Resistor, FXD, Film, ¼ W, 1 k
R16	Resistor, FXD, Film, ¼ W, 4.7 k
R17	Resistor, FXD, Film, ¼ W, 15 k
R18	Resistor, FXD, Film, ¼ W, 47 k
R19	Resistor, FXD, Film, ¼ W, 1 M
R20	Resistor, FXD, Film, ¼ W, 150 k
	P17/J01 Ribbon Supply Cable Assembly
	P26/28 Shielded Input Cable Assembly
	J26/28 Shielded Output Cable Assembly
	Printed Circuit Board

Technical Specifications:

Compression factor: 2 ...5, adjustable, (default value 4)
Compression factor 4: 40 dB input signal dynamic range will be compressed to 10 dB output signal dynamic range
Input signal gain range: 40 dB
Maximum undistorted output level: 600 mVPP, (default value 350 mVPP)
Supply Voltage: 15 V
Current consumption: 18 mA

Additional notes:

Original circuitry of the microphone amplifier in the KWM-380 is of very high impedance. This clearly documents it's origin in tubes circuitry but proves to be inconvenient in a modern solid state RF apparatus design because it is extremely sensitive to RF interference. Any additional cable length inserted into the microphone path may be cause of such interference and without appropriate measures for prevention the speech processor (SP) may not work, independent of being the Collins original or this new version.

The original way of contacting the SP relates the processor input ground to the microphone amplifier ground, leaving the SP output ground connected to the gain potentiometer but open, i. e. without connection to the receiver/exciter board ground. In all cases I tested, this connection scheme proved to be more sensitive to either interference or hum excitation. I therefor created another connection version with common ground for microphone amplifier, SP input and output. Confectioning of cables allows both versions of interconnection, so you may try to confirm my findings by yourself. My drawings present the new connection scheme. To provide a quick comparison with the originally proposed interconnections I used the same cable colours as the Collins SP.

Since shielding braids of the two interconnection cables are both connected to ground at the input and output you might suggest to use a single shielded cable with two wires. I tested this version as well but diameter of such a cable is considerably larger and you have to use a very large ferrite core as an RF choke, too. To realize minimum 6 ... 8 turns on the core the overall diameter will be more than 1". The presented version with two cables is more complicated to manufacture but more convenient to install. Furthermore, shielding factor of high quality PTFE coax cable is by far better than of dual wire audio line.

July 1999, Ulrich Graf, DK4SX