1. GENERAL

1.1. The function of the Adapter Panel is to interface a 75Ω analog microwave baseband to a 600Ω VF service channel. In addition, the Panel provides a 75Ω port for connection to an Order Wire terminal.

1.2. A 41685 4-Way/4-Wire Active Bridge is utilized to provide the various interconnections. The 41685 4W/4W Bridge is an active conference bridge with 23dB of through path adjustment available. Operational amplifiers with potentiometer level adjustment on each input and output provide impedance isolation as well as level coordination.

1.3. A 41657 Dual Low Pass Filter is installed between the conference bridge and the connection point for the analog baseband for frequency isolation. The 41657 module provides >55dB attenuation of out of band signals.

1.4. A signaling tone oscillator and detector provide conversion of the 3825Hz supervisory tone to a logic level. This allows the supervisory tone to be passed through a digital microwave link as an RS-232 data level. The data level is re-converted to a 3825Hz tone for transmission through an analog microwave link. The tone oscillator and tone detector are on separate plug-in modules, and typically only one is installed, depending upon site requirements.

2. SPECIFICATIONS

4-Wire Interface	
Analog Baseband (Transmit & Receive)	-15to -35dBm continuously adjustable ≥ 3000Ω single-ended on female BNC connectors
VF Service Channel (Transmit & Receive)	+7 to -16dBm continuously adjustable 600Ω balanced on screw lug terminal strips
Order Wire port (Transmit & Receive)	-15 to -35dBm continuously adjustable 75Ω single-ended on female BNC connectors
Bridge Isolation	≥ 70dB 300Hz to 4.0KHz
Digital Interface (for 3825Hz "data")	Input +8 VDC (on) -8 VDC (off) Output Relay Closure (on) open (off) on 9 pin D-type connector
3825Hz Supervisory Tone	
Oscillator Accuracy	± .5%
Detector Bandwidth	± 2% nominal
Level	0 to -30dBm0

Power	
Input Voltage	-21 to -56VDC
Current Drain	.1 amp max
Environmental	
Ambient Temperature	0° to 50°C
Relative Humidity	95% max, non-condensing
Operating Altitude	15,000 ft. max.
Mounting Dimensions	
Height (1 EIA mps)	1.75 inches
Depth	14.75 inches
Width	17.25 inches (19- or 23-inch rack mount)
Weight	12 pounds max.

3. SIGNAL FLOW

3.1. The 41685 4-Way/4-Wire Active Bridge is the "conference interconnect" for the 3825Hz oscillator and detector, the Order Wire port, the analog baseband, and the VF service channel. An input on any given port will be routed to the other three outputs, while a minimum of 70dB isolation is maintained to the output of that same port. This allows the co-located Order Wire, the analog baseband, and the VF service channel to communicate on a "party line" basis.

3.2. The 3825Hz supervisory tone detector is dedicated to a bridge port so that the tone can be received from the co-located Order Wire or the analog baseband and cause the logic output to be asserted. The bridge is also a convenient means of summing the supervisory tone oscillator output into the signal path. Since the 3825Hz tone is out of band to the VF service channel and cannot be passed through it, no special filtering is provided on that port.

3.3. To provide frequency isolation for the analog baseband, the 41657 4KHz Dual Low Pass Filter is installed in the transmit and receive paths of this port. Frequencies of 5KHz and higher are attenuated a minimum of 55dB, while the 3825Hz supervisory tone is not affected.

4. INSTALLATION

4.1. Refer to Wiring Diagram 0401-4656-04 and Table B for the required rear panel terminal block and BNC connections for system operation.

5. ALIGNMENT

The 40111-656-04 Adapter Panel has been aligned at the factory for the levels specified in Attachment A. After installation, these parameters should be checked and adjusted as required.

NOTE: *Caution must be exercised during alignment to insure that proper test levels & impedances are maintained*.

A signal generator may double terminate a port causing a reduced signal level. When injecting a test tone into a port, bridge the port with an AC voltmeter and set the signal generator output according to the AC voltmeter reading.

When taking output level readings, the voltmeter will either be terminated or bridged. When it is not known if an output reading should be terminated or bridged, compare the two readings. If a 3.5dB difference is noted, the bridged measurement is correct. If a 6dB difference is noted, then the terminated measurement is correct.

5.1. POWER SUPPLY

5.1.1. Monitor test points TP1 and GND on the front of the 41620 Power Supply with a DC voltmeter. The meter should read -20.0VDC. Adjust R15, if required.

5.2. VF PATH

5.2.1. Turn power OFF and remove the 41685 Bridge from J4. Insert an Extender Card in its place and insert the 41685 Bridge into the Extender Card. Turn power ON.

5.2.2. Connect a signal generator to pins 21 and 22 of the 41685 Bridge. Set the frequency to 1KHz at the level specified by Attachment A for LEG 1 IN.

5.2.3. Connect an AC voltmeter (terminate if required) to pins F and H of the 41685 Bridge. Read the level specified by Attachment A for LEG 2 OUT. Adjust R2 on the 41685 Bridge, if required.

5.2.4. Connect the AC voltmeter (terminate if required) to pins K and L of the 41685 Bridge. Read the level specified by Attachment A for LEG 3 OUT. Adjust R3 on the 41685 Bridge, if required.

5.2.5. Connect the AC voltmeter (terminate if required) to pins M and N of the 41685 Bridge. Read the level specified by Attachment A for LEG 4 OUT. Adjust R4 on the 41685 Bridge, if required.

5.2.6. Connect the signal generator to pins 19 and 20 of the 41685 Bridge. Set the level to that specified by Attachment A for LEG 2 IN. Read on the AC voltmeter the same level as that obtained in step 5.2.5. Adjust R8 on the 41685 Bridge, if required.

5.2.7. Connect the AC voltmeter (terminate if required) to pins D and E of the 41685 Bridge. Read the level specified by Attachment A for LEG 1 OUT. Adjust R1 on the 41685 Bridge, if required.

5.2.8. Connect the signal generator to pins 16 and 17 of the 41685 Bridge. Set the level to that specified by Attachment A for LEG 3 IN. Read on the AC voltmeter the same level as that obtained in step 5.2.7. Adjust R9, if required.

5.2.9. Connect the signal generator to pins 14 and 15 of the 41685 Bridge. Set the level to that specified by Attachment A for LEG 4 IN. Read on the AC voltmeter the same level as that obtained in step 5.2.7. Adjust R10, if required.

5.3. LOW PASS FILTERS

5.3.1. Turn power OFF. Remove the Extender Card with the 41685 Bridge and reinsert the 41685 Bridge in J4. Remove the 41657 Dual Low Pass Filter in J3 and insert an Extender Card in its place. Insert the 41657 Dual Low Pass Filter into the Extender Card and turn power ON.

5.3.2. Connect the signal generator to pins T and U (pin U is ground) of the 41657 Dual Low Pass Filter. Set the frequency to 1KHz and the level to that specified by Attachment A for BASEBAND RCV. Connect the AC voltmeter (bridging) to pins P and R of the 41657 Dual Low Pass Filter. Read the level specified by Attachment A. Adjust R30 on the 41657 Dual Low Pass Filter, if required.

5.3.4. Connect the signal generator to pins F and H of the 41657 Dual Low Pass Filter. Set the frequency to 1KHz and the level to that specified by Attachment A. Connect the AC voltmeter (terminated if required) to pins M and L (pin L is ground) of the 41657 Dual Low Pass Filter. Read a level specified by Attachment A. Adjust R7 on the 41657 Dual Low Pass Filter, if required.

5.4. RS-232 CONTROL

5.4.1. Turn power OFF and remove the Extender Card in J3 with the 41657 Dual Low Pass Filter. Reinsert the 41657 Dual Low Pass Filter in J3. Remove the 41651 Transmit in J1 and insert an Extender Card in its place. Insert the 41651 Transmit into the Extender Card and turn power ON.

5.4.2. Connect +8VDC to pin D of the 41651 Transmit. Connect the AC voltmeter to pins K and L of the 41651 Transmit and read the level specified by Attachment A.

1. REFERENCES

1416-1202 Regulated Power Supply Schematic

2. GENERAL

The Raven 41620 Regulated Power Supply provides a regulated -20 Volt DC (@ 1.2A max.) output from an unregulated supply.

The 41620 has two input power options available. The 41620-01 regulates an input voltage ranging from -24 to –56 VDC. The 41620-02 provides a regulated output from either a 110 VAC or a 220VAC (50/60Hz) source.

The 41620 provides foldback current limiting at an output current of approximately 1.2 amperes. The 41620 can be modified at the factory to increase the maximum output current if required. Included on the 41620 is an ON/OFF power switch and a fuse in series with the input. The output is factory set at –20 VDC but is adjustable from –18 VDC to –24 VDC.

3. SPECIFICATIONS

Input Voltage	
Option -01	-24 VDC TO –56 VDC
Option -02	110 VAC or 220 VAC (50/60 Hz)
Output Voltage	-20 VDC regulated -18 VDC to –24 VDC adjustment range
Output Current	1 ampere @ -20 VDC foldback current limiting occurs @ approximately 1.2A
Output Voltage Ripple	≤ 75 mv (full load)

4. THEORY OF OPERATION

Power input to the 41620 is derived from either a -24 to –56 VDC source in the 41620-01 version or from a 110VAC or 220VAC 50/60Hz source in the 41620-02 version.

4.1. 41620-01 DC OPTION

The DC input voltage is applied between pins R, S, (optionally pin D or pin N) and Ground (pin B) through CR8, fuse F1, power switch S1 and the "DC" strap. The input voltage is then applied to the emitter of the series pass transistor Q1 via R9.

4.2. 41620-02 AC OPTION

The AC input is applied to pins U and W with the external ground connected to pin Y or Z. The input voltage completes the circuit through "AC" strap, fuse F1 and power switch S1 to the primary of transformer T1. T1 steps down the incoming 110 VAC or 220 VAC to a nominal 32 VAC.

The 32 VAC is full wave rectified by the silicon bridge rectifier CR1. Capacitor C1 helps eliminate the ripple component on the unregulated DC. The unregulated DC is applied to the emitter of the series pass transistor Q1 via R9.

4.3. DC REGULATOR

U1 is a 723 Integrated Circuit voltage regulator which provides a regulated output to the base of transistor Q2. Q2 provides the current drive to the base of the series pass transistor Q1.

Resistors R11 and R12 form a voltage divider that is referenced to the –20 V regulated output and driven by the "Voltage Reference Output" of the 723. This combination provides a voltage that is fixed in reference to the –20 V regulated output. This voltage drives the "Inverting Input" of the 723. The voltage for the "Non-inverting Input" of the 723 is determined by the setting of R15 in combination with R13 and R14. R15 is used to adjust the –20 V regulated output, which can be monitored at TP1. Both R15 and TP1 are near the switch at the front of the board for easy access.

4.4. FOLDBACK CIRCUITRY

R9, R1, R2, and Q4 comprise a current sensing circuit and determine when foldback occurs. R5 and R6 provide a reference voltage to the inverting input of comparator U2.

A –16 VDC supply is derived from the input voltage via R8, CR2, and C3 to power comparator U2. R3, R4, and CR4 provide a secondary reference voltage to the inverting input of comparator U2. These components insure control over the foldback circuitry even when the regulated output voltage drops to 0.

When the output current exceeds 1.2A, transistor Q4 will turn on, causing the output of comparator U2 to switch. This turns transistor Q3 on which turns transistor Q2 off and limits current flow through the series pass transistor Q1. Diode CR5 protects the output of the 723 regulator when foldback occurs.

4.5. CR7 is a "Power On" LED indicator. This LED will be illuminated when the 41620 is turned ON and the regulated output voltage is present.

1. REFERENCES

1416-1501 Receive Schematic

2. GENERAL

2.1. The Raven 41650 Receive module provides wideband (data), voice and speaker outputs from a single balanced input. Amplification is provided on all ports, with a 3-stage low pass filter inserted in the voice and speaker paths. A wide range of input levels can be accepted through the use of level adjustment for all ports. An audible call alert generator is typically included, providing a call indication through the speaker output when enabled. Relay contacts (2 Form C) are available as a simultaneous call indication. The relay is enabled concurrent with audible alert and can be programmed to energize continuously or to cycle on and off with the audible alert.

2.1.1. The -01 option of the 41650 module includes a single frequency signaling detector for use in E&M signaling systems.

2.1.2. The -02 option of the 41650 module makes the output of SF detector (option -01 above) available for off-board use.

2.1.3. The -03 option adds a single-ended voice output.

2.1.4. The -04A option converts the RCV input to a single-ended 75Ω port.

2.1.5. The -04B option converts the RCV input to a single-ended high impedance bridging port (typically 10KΩ).

2.1.6. The -05 option adds capacitors to the feedback loop of both input amplifier stages for high frequency attenuation.

3. SPECIFICATIONS

Power	-20VDC @ 200mA max.
Environmental	
Operating Temperature	0° to 50° C
Relative Humidity	0° to 95% non-condensing

Input/Output Impedance	600Ω balanced, standard
Input Level (RCV)	-46 to +7dBm @ 600Ω
VF Frequency Response	± 1dBm0 500Hz to cutoff frequency, (Ref. @ 1KHz) -3dBm0 @ 300Hz, ≥55dB down @ ¼ octave above cutoff frequency.
Wideband Frequency	± 1dBm0 500Hz to 30KHz, -3dBm0 @ Response (Ref. @ 1KHz) 300Hz, -4dBm0 @ 60KHz.
Harmonic Distortion	<1%
Signaling Frequency (SF)	Customer specified from 1000Hz to 3825Hz
Speaker Output	1W max into 45Ω
Receive Signaling Relay	Dual Form C rated @ 1A @ 125VAC or (E-Lead) 2A @ 30VDC.

4. THEORY OF OPERATION

The 41650 Receive module provides two 600Ω balanced outputs from one RCV input. One output is for VF, and one is the wideband (data) output. A VF speaker amplifier, an alert tone generator E-Lead relay contacts, and when the -01 option is installed, a signal detector are included on the module.

4.1. INPUT AMPLIFIER

The 41650 Receive module has a single 600Ω balanced input which is split into two 600Ω balance outputs as well as a speaker amplifier output. Transformer T1 provides the balanced input as well as excellent common mode rejection and DC isolation. Input amplifier U6A provides the first stage of gain and its output level is adjusted by potentiometer R36. Amplifier U6B is the second stage of gain and its output level is always set to +6dBm nom. (optimum input level into the low pass filter) by potentiometer R40. This output drives the wideband amplifier, the VF path, and, when the -01 Option is installed, the Signaling Detector. Option -05 adds capacitors to the feedback loop of amplifiers U6A and U6B to attenuate their output at frequencies above 16KHz.

4.2. WIDEBAND AMPLIFIER

Amplifier U7A is the wideband amplifier and its output level is adjusted by potentiometer R43. This output drives transformer T2 via impedance matching resistor R41. Transformer T2 provides a balanced output as well as DC isolation for the EXT RCV OUT port.

4.3. VF AMPLIFIER

4.3.1. The signal at the output of amplifier U6B is routed through the low pass filter. The low pass filter used on the 41650 Receive module is a 3 D-element active filter which provides a response of +1, -3dB over a frequency range of 300Hz to the cutoff frequency (Fc, customer specified), and attenuation of ³55dB of signals one quarter octave above Fc. The low pass filter consists of Operational Amplifiers U1, U2, U3 and associated circuitry.

4.3.2. The output of the low pass filter is routed to the input of amplifier U8A. The path from the low pass filter to U8A is strappable such that with ST-9 removed and ST-E1 & ST-F1 installed, the signal can be routed through other modules via pin F, & return via pin E into U8A. U8A is a fixed gain amplifier & drives the 4W OUT via impedance matching resistor R58 & transformer T3, as well as the speaker amplifier.

4.3.3. Option -03 provides a single-ended input (if ST-11 is installed), or single-ended output (if ST-10 is installed) on pin K via resistors R59 and R74 from amplifier U8A. The values of R59 and R74 are factory selected according to the application.

4.4. SPEAKER AMPLIFIER

The speaker amplifier consists of U8B, Q5, Q2, Q3, Q4 and associated circuitry. Inputs from the VF path, the sidetone input (from the 41651 Transmit module), and the alert tone generator are summed into the speaker amplifier. An off-board potentiometer (typically a 1KW 1W potentiometer on the front panel of the Order Wire) connected to pins U and V acts as a shunt to provide a volume control for the VF and sidetone signals. The volume of the alert tone is not affected by the volume control. The speaker amplifier has a maximum output of 1W into a 45Ω speaker with <2% harmonic distortion.

4.5. ALERT TONE GENERATOR

4.5.1. The Alert Tone Generator is an option that is more commonly installed than not. It is deleted in cases where another source for the alert tone is more desirable.

4.5.2. Two alert tone frequencies are available & are selected via 3 programming jumpers. When the jumpers are in the "LO" position, the frequency is 360Hz. When the jumpers are in the "HI" position, the frequency is 1940Hz. Potentiometer R72 can be used to adjust the alert tone volume(1 watt max. to .1 watt min.).

4.5.3. The Alert Tone Generator consists of U11, U9, and associated components. U11 is a free running oscillator which generates the alert tone (360Hz or 1940Hz) as well as the output to gate the tone ON and OFF at preset rates through U9. The outputs of U9 are coupled to the speaker amplifier. The ALERT tone is activated by grounding pin R. The ALL CALL tone is activated by grounding pin S (ST-4 installed). The ALL CALL tone is gated at approximately .5 secs. OFF and .5 secs. ON, while the ALERT tone is gated at approximately 1.5 secs. OFF and 1.5 secs. ON.

4.5.4. Activating either the ALERT or ALL CALL energizes relay K1. This two form C relay provides an E-Lead indication as well as driving the ALERT indicator on the Order Wire front panel (when provided). Two modes of operation can be selected, 1) the relay is continuously energized for the duration of the alert tone (CO position of the programming jumper), or 2) the relay will cycle on and off at the same rate as the alert tone (CY position of the programming jumper).

4.6. SIGNALING DETECTOR

When the -01 option is installed, a signaling detector is included as a part of the 41650 module. The signaling detector consists of a narrow band pass filter (U5A, U4A, U4B, and associated circuitry), a peak detector (D1, R29, R30, C14, C15), and a comparator (U5B). Potentiometer R25 adjusts the overall gain and potentiometer R24 adjusts the center frequency of the filter. When the voltage across C15 exceeds the comparator reference voltage (pin 6 of U5B), the comparator output switches high activating the alert tone generator (U11,U9) and the receive relay K1 via transistor Q1.

4.7. Option -02 pins out the signal detector output (pin 7 of comparator U5B) on pin W. If strap ST-5 is installed, the output is routed directly from comparator U5B and is active high (GND). If ST-5 is deleted and transistor Q6 and its associated resistors are installed, Q6 inverts the output of U5B, making the output at pin W active low (-20VDC).

4.8. Option -03 provides a single-ended voice input or single-ended voice output when R59, R74, and C36 are installed. The value of each component is determined by the application. A typical use for the input is to sum an auxiliary tone or voice path into the speaker amp. A typical use for the output is to drive the earpiece from a remotely located headset or telephone.

4.9. Option -04 changes the configuration of the input amplifier for a single-ended 75Ω input (terminating or bridging). Transformer T1 is deleted and a .33μf ceramic capacitor is installed in its place for DC isolation. Pin C of the 41650 module is the signal input, and pin D is ground. For a 75Ω terminating input, a 75Ω resistor is installed across pins C and D. For a high impedance bridging input, the 75Ω resistor is deleted.

4.10. Option -06 adds capacitance to the feedback loop of both stages of the input amplifier, U6A and U6B. The capacitance value is selected to attenuate frequencies above the spectrum utilized by the wideband (data) port.

1. REFERENCES

1416-1511 Transmit Schematic

2. GENERAL

2.1. The Raven 41651 Transmit Module provides a single balanced output from multiple VF inputs, a wideband (data) input, and a signaling oscillator. Amplification is provided on all ports, with a 3-stage low pass filter inserted in the voice path. All ports have potentiometer level adjustment and can accommodate a wide range of output levels.

2.1.1. The -01 Option of the 41651 Module includes a single frequency signaling oscillator for use in E&M signaling systems.

2.1.2. The -02 Option of the 41651 Module includes a ringback tone oscillator for call acknowledgment (typically used only in DTMF selective signaling systems).

2.1.3. The -03A Option converts the XMT output to a single-ended 75Ω port.

2.1.4. The -03B Option converts the XMT output to a single-ended high impedance bridging port.

2.1.5. The -04 Option supplies talk battery for a remote MIC at pins M and N (4-wire input).

2.1.6. The -05 Option XMT relay will prevent any transmission at pins K and L until the transmit path is enabled at pin Y (typically DTMF correct address) or at pin Z (typically off hook condition).

3. SPECIFICATIONS

Power	-20VDC @ 50mA max
Environmental	
Operating Temperature	0°C to 50°C
Relative Humidity	0% to 95% non-condensing
Input/Output Impedance	600Ω balanced, standard
Output Level (XMT)	+7 dBm max. -46 dBm min. @ 600Ω
Idle Noise (XMT)	<10 dBrnC0
VF Frequency Response (Ref. @ 1KHz)	±1 dBm0 500 Hz to cutoff frequency -3 dBm0 @ 300 Hz ≥55 dB down @ ¼ octave above cutoff frequency
Wideband Frequency Response (Ref. @ 1KHz)	±1 dBm0 500Hz to 30KHz -3dBm0 @ 300Hz, -4dBm @ 60KHz
Harmonic Distortion	<1%
Signaling Frequency (SF)	Customer specified from 1000 Hz to 3825 Hz

4. THEORY OF OPERATION

The 41651 Transmit Module has five 600Ω balanced inputs which are summed into one output. Four of these inputs are for VF and one is the wideband (data) input. In addition, the -01 Option signaling oscillator, and the -02 Option ringback oscillator are summed into the wideband path. Output amplifier U7B combines the VF and wideband paths and drives the output transformer T1 via impedance matching resistor R61.

4.1. VF AMPLIFIER

4.1.1. VF signals enter the module at the DTMF input (pins W and X), the 4-wire input (pins M and N), the TEST TONE input (pins U and V), and the MIC input (pins S and T) which also provides talk battery to the microphone. These inputs are all balanced with 600Ω impedance. Unused inputs need no external termination.

4.1.2. All VF signals are summed at pins 2 and 6 of the differential summing amplifier, U6. The signal at the output of U6B (pin 7) is coupled to the low pass filter and also to pin P which provides local sidetone. The path from U6B to the low pass filter is strappable such that with the strap removed, the signal can be routed through other modules via pin P, and return via pin R into the low pass filter.

4.1.3. The low pass filter used in the 41651 Transmit is a 3 D-element active filter which provides a response of +1, -3 dB over a frequency range of 300Hz to the cutoff frequency (Fc, customer specified), and attenuation of ≥55 dB of signals one quarter octave or more above Fc. The low pass filter consists of operational amplifiers U1, U2, U3 and associated circuitry. The output of the low pass filter is routed to the input of amplifier U7B via potentiometer R58.

4.2. WIDEBAND AMPLIFIER

Wideband signals enter the 41651 Transmit Module on pins F and H and are routed to transformer T2 which provides a balanced input as well as excellent common mode rejection and DC isolation. U7A is the wideband amplifier and potentiometer R65 adjusts the level of the wideband path.

4.3. OUTPUT AMPLIFIER

Amplifier U7B is a single stage amplifier which provides a maximum output of +7dBm into a 600Ω load at pins K and L. The gain of U7B is fixed at one of two levels, selected by a programming jumper. The "LG" jumper (ST6) sets the gain at 0 dB and should be used when the output level of the 41651 Module is -10 dBm (@ 600Ω) or less. The normal gain of U7B is +15 dB which is used when the output level of the 41651 Module is greater than -10 dBm (@ 600Ω), or when Option -03A or Option -03B is installed.

4.4. SIGNALING OSCILLATOR

When the -01 Option is installed, a signaling oscillator is included as a part of the 41651 Module. The signaling oscillator consists of U4, U5 and associated circuitry. The oscillator can be enabled by applying the appropriate voltage to pin D (if ST1 is installed) or pin J. If -01A is installed, -20VDC applied to pins D or J will enable the oscillator, or if -01B is installed, ground on pins D or J will enable the oscillator. The frequency of the signal oscillator is adjusted by R24. The output of the oscillator is coupled through C15 to R35. R35 is the coarse adjustment of the level of the oscillator, and R36 is the fine level adjustment. The oscillator signal then goes to pin 6 of output amplifier U7B and is summed into the transmit output.

4.5. RINGBACK OSCILLATOR

The -02 Option provides ringback tones for call acknowledgment. Oscillator/counter U8 digitally generates the required frequencies when enabled by a ground at pin Y. U9 gates the frequencies to create a ringback tone. The signal then goes to U7B and thus to the transmit output.

4.6. SINGLE ENDED OUTPUT

The -03 Option converts the output amplifier for a single-ended 75Ω output (terminating or bridging). Transformer T1 and resistor R61 are deleted and a .33μf ceramic capacitor and a 3.3KΩ resistor are installed. For Option -03A, a 75Ω 1% resistor is included to terminate the port. For Option -03B, the 75Ω resistor is deleted for high impedance (typically 3.3KΩ) bridging port.

4.7. TALK BATTERY

The -04 Option provides talk battery for the use of a remote handset or headset microphone.

4.8. TRANSMIT RELAY

The -05 Option, relay K1, isolates the circuitry on the 41651 Module from the transmit port to minimize idle noise. The relay is energized and connects the transmit path when an off hook condition exists, or when ringback is being transmitted.

41657 DUAL LOW PASS FILTER MODULE REVISION A
DATE 19 JUL 04
UNIT DESCRIPTION, ISSUE 02 P1 APPROVED

1. **REFERENCES**

1416-1571 Dual Low Pass Filter Schematic

2. **DESCRIPTION**

The Raven 41657 Dual Low Pass Filter module provides two signal paths, each frequency limited by a 3-stage low pass filter. Standard cutoff frequencies range from 1.6 KHz to 60 KHz. Amplifiers U2 and U4 are incorporated to provide unity gain input to output, with a nominal ±6 dB adjustment available.

3. **POWER** -20 VDC @ 30 ma

Environmental	
Temperature	0° to 50° C
Humidity, relative	0 to 95%
Impedance, all ports (input & output)	600Ω standard; 75Ω or Hi Z optional
Gain, input to output	0 dBm nom. (± 6 dBm0 adjustment)
Filter rejection	- 50 dB @ 1/3 octave above cutoff frequency
Frequency response (300Hz to Fc)	± 1 dBm0 500 Hz to Fc, -3 dBm0 @ 300 Hz
Wideband Frequency Response (Ref. @ 1KHz)	± 1 dBm0 500 Hz to 60KHz, -3 dBm0 @ 300 Hz

4. **THEORY OF OPERATION**

4.1. Two independent signal paths exist on the 41657 Dual Low Pass Filter. The first signal path (IN 1) on pins F and H is a balanced 600Ω input and is routed to amplifier U2B. The output of U2B is routed through a Low Pass Filter consisting of L1-L3 and C1-C7. The filtered output is then presented to amplifier U2A. Typically gain is set for unity, but potentiometer R7 provides a range adjustment of −6 to +6 dBm0. Transformer T1 provides a balanced 600Ω output for the first signal path (OUT 1) on pins L and M.

4.2. The second signal path (IN 2) on pins T and U is also a balanced 600Ω input and is routed to amplifier U4B. The output of U4B is routed through a Low Pass Filter consisting of L4-L6 and C8-C14. The filtered output is then presented to amplifier U4A. Typically gain is set for unity, but potentiometer

R30 provides a range adjustment of - 6 to +6 dBm0. Transformer T4 provides a balanced 600Ω output for the second signal path (OUT 2) on pins P and R.

4.3. Operational amplifier U1A and resistors R4 and R5 provide a biasing voltage for amplifiers U2, U3, and U4 while C15, C16, and C17 provide filtering of the input voltage. Amplifier U1B provides signal ground for the optional wideband port.

5. OPTIONS

5.1. OPTION-02 75Ω PORT

Option-02 converts the impedance of OUT 1 on pins L and M and IN 2 on pins T and U for a 75Ω single ended interface. Option-02A is for a 75Ω terminating interface, and Option-02B is for a 75Ω bridging interface. This option is typically installed when the 41657 module is to be used as a roofing filter on a 75Ω baseband connection.

5.2. OPTION-03 AUXILIARY INPUTS/OUTPUTS

Option-03 adds two single ended 600Ω inputs to IN1 and two single ended 600Ω outputs to OUT 2. The auxiliary inputs are on pins D and E and are referenced to ground on pin B. The auxiliary outputs are on pins Y and X and are referenced to ground on pin Z.

5.3. OPTION-04 WIDEBAND PORT

Option-04 adds an unfiltered 600Ω balanced 4 wire port to OUT 1 and IN 2. The wideband input on pins J and K is routed through transformer T2 to amplifier U3A. Potentiometer R29 provides an adjustment range of + 13 to -16 dBm0 at the output of amplifier U3A. The wideband input is summed into the signal path by amplifier U2A and presented at OUT 1, pins L and M.

The signal path of IN 2, pins T and U, is split at the output of amplifier U4B. The wideband path is routed to amplifier U3B. Potentiometer R31 provides an adjustment range of + 8 to –16 dBm0 at the output of amplifier U3B. The wideband output on pins V and W is driven by amplifier U3B through transformer T3.