#### 33-centimeter Kenwood TK-941 Conversion

The following documentation is largely based on a set of separate documents that are already available on the internet. While performing a conversion of two Kenwood TK-941 radios, I found the available documentation to be both incomplete and somewhat incoherent. I performed the radio programming sequence a total of five times, discovering nuances at each programming instance, before the radios were operational.

This document attempts to gather all other information regarding the Kenwood TK-941 the conversion process in a single stand-alone document. It is hoped that having a single stand-alone document will make the conversion process easier others who wish to perform the conversion process. This disclaimer is not an attempt to discredit those who have provided most of the conversion process online, but is meant to gather those sources into a single document and fill in information that had not been disclosed.

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#### **Programming Requirements**

Programming of the Kenwood TK-941 radio requires the Kenwood KPG4 programming cable and the following software:

- Kenwood KPG-25D Programming Software
- KwID or equivalent table data for channel / frequency conversion
- KW900EZP
- HxD or any Hex Editing program

The radios will be programmed to the following specification:

Kenwood TK-941 33cm Radio Programming Information									
Receiv	e	Transmit							
Frequency	Decode	Frequency	Encode						
902.2125	None	927.2125	None						
902.2125	DCS023	927.2125	DCS023						
902.2250	None	927.2250	None						
902.2250	DCS023	927.2250	DCS023						

Two frequencies were chosen in order to provide a back-up pair for frequency allocation in the event that the primary frequency is not available. The primary frequency pair is 927.2250 / 902.2250 with the back-up pair of 927.2125 / 902.2125. Each frequency was programmed into two memory channels with one channel operating in carrier only and the second channel operating in digital coded squelch. This was done, in part, to provide easy access to a receiver configuration where a -12 dB SINAD measurement could be performed (by selecting the carrier only channel).

The frequency must be converted to a Kenwood Channel Number prior to programming. The following table, obtained from the KW900EZP program documentation by K2MCI, is used to obtain the channel number for the target frequencies:

Kenwood TK-941 33cm Radio Frequency to Channel Conversion											
927	919	920	921	926	Frequency						
902	907	908	909	903	MHz						
	80	160	240	320	0.0000						
1	81	161	241	321	0.0125						
2	82	162	242	322	0.0250						
3	83	163	243	323	0.0375						
4	84	164	244	324	0.0500						
5	85	165	245	325	0.0625						
6	86	166	246	326	0.0750						
7	87	167	247	327	0.0875						
8	88	168	248	328	0.1000						
9	89	169	249	329	0.1125						
10	90	170	250	330	0.1250						
11	91	171	251	331	0.1375						
12	92	172	252	332	0.1500						
13	93	173	253	333	0.1625						
14	94	174	254	334	0.1750						
15	95	175	255	335	0.1875						
16	96	176	256	336	0.2000						
17	97	177	257	337	0.2125						
18	98	178	258	338	0.2250						
19	99	179	259	339	0.2375						
20	100	180	260	340	0.2500						
21	101	181	261	341	0.2625						
22	102	182	262	342	0.2750						
23	103	183	263	343	0.2875						
24	104	184	264	344	0.3000						
25	105	185	265	345	0.3125						
26	106	186	256	346	0.3250						
27	107	187	257	347	0.3375						
28	108	188	258	348	0.3500						
29	109	189	259	349	0.3625						
30	110	190	260	350	0.3750						
31	111	191	261	351	0.3875						
32	112	192	262	352	0.4000						
33	113	193	263	353	0.4125						
34	114	194	264	354	0.4250						
35	115	195	265	355	0.4375						
36	116	196	266	356	0.4500						
37	117	197	267	357	0.4625						
38	118	198	268	358	0.4750						
39	119	199	269	359	0.4875						
40	120	200	270	360	0.5000						
41	121	201	271	361	0.5125						
42	122	202	272	362	0.5250						
43	123	203	273	363	0.5375						
44	124	204	274	364	0.5500						
45	125	205	275	365	0.5625						
46	126	206	276	366	0.5750						
47	127	207	277	367	0.5875						
48	128	208	278	368	0.6000						
49	129	209	279	369	0.6125						

Kenwoo	d TK-941 33ci	m Radio Frequ	ency to Chann	el Conversion	(continued)
927 902	919 907	920 908	921 909	926 903	Frequency MHz
50	130	210	280	370	0.6250
51	131	211	281	371	0.6375
52	132	212	282	372	0.6500
53	133	213	283	373	0.6625
54	134	214	284	374	0.6750
55	135	215	285	375	0.6875
56	136	216	286	376	0.7000
57	137	217	287	377	0.7125
58	138	218	288	378	0.7250
59	139	219	289	379	0.7375
60	140	220	290	380	0.7500
61	141	221	291	381	0.7625
62	142	222	292	382	0.7750
63	143	223	293	383	0.7875
64	144	224	294	384	0.8000
65	145	225	295	385	0.8125
66	146	226	296	386	0.8250
67	147	227	297	387	0.8375
68	148	228	298	388	0.8500
69	149	229	299	389	0.8675
70	150	230	300	390	0.8750
71	151	231	301	391	0.8875
72	152	232	302	392	0.9000
73	153	233	303	393	0.9125
74	154	234	304	394	0.9250
75	155	235	305	305	0.9375
76	156	236	306	396	0.9500
77	157	237	307	397	0.9625
78	158	238	308	398	0.9750
79	159	239	309	399	0.9875

The target frequency pairs of 927.2125 / 902.2125 and 927.2250 / 902.2250 use FCC channels 17 and 18 respectively.

# **Programming Procedure**

I. Launch **KPG-25D.exe** and start with an empty template by selecting **New** from the **File** menu.

C:\DOCUME~1\ADMINI~1\Deskto	op\RADIOP~1\KPG25D.EXE	- 🗆 🗙
File Model Edit Progra	m Setup	F1=Help
New   TK-940[800M     Load   5888 bytes     Save(=F4)   TK-940[800M	Hz] Data File : Source File : ——< System Information >—	KPG25D.810 KPG25D.818
save As = Fixed > Delete Name d	LockOut No. Format Na 17 : Not Used	ume LockOut
Print(=F5) d d Go to dos d	18 : Not Used 19 : Not Used 20 : Not Used	
Exit (=F3) d d	21 : Not Used 22 : Not Used 23 : Not Used	
8 : Not Used 9 : Not Used	24 : Not Used 25 : Not Used 25 : Not Used	
10 : Not Used 11 : Not Used 12 : Not Used	26 : Not Used 27 : Not Used 28 : Not Used	
13 : Not Used 14 : Not Used 15 : Not Used	29 : Not Used 30 : Not Used 31 : Not Used	
16 : Not Used Arrows:Move Enter:Select	32 : Not Used 	

**II.** Set the **Model** to **TK-941**.

ev C:\D	🔤 C:\DOCUME~1\ADMINI~1\Desktop\RADIOP~1\KPG25D.EXE 📃 🗖 🗙											
File	Model Edit Program	) Setup	F1=Help									
Mod Fre	1.TK-940[800MHz] 2.TK-941[900MHz] 3.TK-840[400MHz]	z]	KPG25D.810 KPG25D.818									
No. 1 2 3 4 5 6 7 8 10 11 12 13 14 15 16 16 16	Not Used Not Used	LockOut No. Format Na 17 : Not Used 18 : Not Used 19 : Not Used 20 : Not Used 21 : Not Used 22 : Not Used 23 : Not Used 24 : Not Used 25 : Not Used 26 : Not Used 27 : Not Used 28 : Not Used 30 : Not Used 31 : Not Used 32 : Not Used 33 : Not Used 34 : Not Used 35 : Not Used 36 : Not Used 37 : Not Used 37 : Not Used 39 : Not Used 30 : Not Used 30 : Not Used 31 : Not Used 32 : Not Used 32 : Not Used 33 : Not Used 34 : Not Used 34 : Not Used 35 : Not Used 35 : Not Used 36 : Not Used 37 : Not Used 37 : Not Used 38 : Not Used 39 : Not Used 39 : Not Used 30 : Not Used 30 : Not Used 30 : Not Used 31 : Not Used 32 : Not Used 32 : Not Used 33 : Not Used 34 : Not Used 35 : Not Used 35 : Not Used 36 : Not Used 37 : Not Used 37 : Not Used 38 : Not Used 38 : Not Used 39 : Not Used 30 : Not Used 30 : Not Used 30 : Not Used 30 : Not Used 31 : Not Used 31 : Not Used 32 : Not Used 31 : Not Used	ame LockOut									
Arrow	s:Move Enter:Select	Alt:Abort Esc:Main										



**IV.** Set the **T.O.T. (Dispatch)** parameter to **600**. This is the transmission time limit, in dispatch mode, expressed in 15 seconds per step with a range of from 15 seconds to 600 seconds. The default is 60 seconds. These are set to 10 minutes (600 seconds) so that the timers in the repeater controller can be used.

**V.** Set the **T.O.T. (Tel)** parameter to **600**. This is the transmission time limit, in telephone mode, expressed in 15 seconds per step with a range of from 15 seconds to 600 seconds. The default is 180 seconds. These are set to 10 minutes (600 seconds) so that the timers in the repeater controller can be used.

**VI.** Set the **Drop out delay time** parameter to **1**. This sets the time between carrier detect drop out and the resumption of scanning. This parameter can be set from 0 to 254 seconds at 1 second per count. The default is 3 seconds.

**VII.** Set the **dwell time** parameter to **1**. This sets the time between the end of transmission and the resumption of scanning. This parameter can be set from 0 to 254 seconds at 1 second per count. The default is 15 seconds.

**VIII.** Set the **Transpond delay time** parameter to **3**. This sets the delay from the decode of a transpond enabled ID to the beginning of a transpond transmission. This parameter can be set from 0 to 254 seconds at 1 second per count. The default is 3 seconds. If this parameter is set to a value greater than the **Drop out delay time** then the **Drop out delay time** will be used as the **Transpond delay time**.

**IX.** Set the **TX inhibit time** parameter to **5.0**. This parameter sets the period of time that the transmitter is inhibited after an inhibited ID is detected. The value can be set from 0.5 seconds to 8.0 seconds in 0.5 second steps.

## **X.** Set the **Aux switch** parameter to **N/A**. This parameter toggles the following functions off:

- A. **N/A:** No function
- B. **Option Sig:** Option signaling board reset switch.
- C. **Manual Relay:** Auxiliary output signal ON/OFF.
- D. Horn Alert: Horn Alert ON/OFF
- E. **Telephone Search:** Automatically searches for a vacant telephone channel (trunked system).
- F. **ALP/Sys.Grp.:** Toggle display between alphanumeric or the system & group number.
- G. **Fixed Call:** Reset radio to a pre-programmed system & group.
- H. **Del/Add:** Provides the user system Delete / Add button.
- **XI.** Set the **Scan switch** parameter to **List scan**. This parameter sets the scan type selection as follows:
  - A. **N/A:** Disables the scan switch function and sounds an alert tone (if programmed) when the scan key is pressed.
  - B. List Scan: Automatic roaming scan.
  - C. Fix System Scan: Operator selectable system scan.

**XII.** Set the **Revert sys type** parameter to **Last Use**. This parameter sets the programmable transmit destination system & group during scanning. Options include:

- A. **Last Used:** Last transmitted system & group.
- B. Last Called: Last received system & group.

**XIII.** Set the **Free System ring back** parameter to **No**. This feature is only active during telephone use (trunked system). The radio will beep when the telephone interconnect line is not busy.

**XIV.** Set the **Clear to talk beep** parameter to **Yes**. Upon successful access of a trunked system, this beep tone sounds to alert the user they can begin speaking.

**XV.** Set the **System search** parameter to **None**. While a selected system is busy (the radio sounds an intercept tone) then release the PTT key, the radio will start to search for an available system automatically or manually. Options include:

- A. **None:** Disable system search.
- B. **Auto:** During the intercept tone, keep the PTT key held down and press the SCAN key. Upon release of the SCAN key, system search begins.
- C. **Manual:** During the intercept tone, releasing the PTT will initiate auto system search.

**XVI.** Set the **Display Character** parameter to **Grp Name**. This parameter selects the display character Group name (Alphanumeric) or System & Group number. If you select the AUX switch as the display character, this selection will be just as default. Options include:

- A. **Sys Grp:** Set the display character as System & Group number.
- B. **Grp Name:** Set the display character as alphanumeric (pre-programing necessary).

**XVII.** Set the **Minimum volume** parameter to **0**. The minimum volume is the level which will be set automatically every time you turn on the radio. If the volume is adjusted below this level prior to turning the radio off, the volume will be set to this level the next time the radio is turned on. In order to ensure that the speaker is quiet at the repeater site, this value is set to zero. The default value is 8.

**XVIII.** Set the **Off hook scan** parameter to **Disable**. The radio is able to scan, even with the mic off hook. Options include:

- A. **Enable:** Scan start & stop is independent of the mic hook switch.
- B. **Disable:** Mic must be on hook for scanning to start.

**XIX.** Set the **Off hook horn alt** parameter to **Disable**. Horn alert is auto disabled when the microphone goes off hook Options include:

- A. **Enable:** Off hook auto disable.
- B. **Disable:** Manual disable only.

**XX.** Set the **Off hook decode** parameter to **Enable**. The radio is still tone squelched, even though the mic is in the off hook condition (valid for QT, DQT and Option Signaling board decode). Options include:

- A. **Enable:** Decode signaling active even in the off hook condition.
- B. **Disable:** Decode signaling is disabled during off hook.

Setting this parameter to **Enable** allows the radio to operate in decode without having to wire the off-hook signal to the on-hook position.

**XXI.** Set the **Access logic sig** parameter to **Sngl. Pulse**. This logic signal is useful for external radio control unit (i.e. Mobile Data Terminal, Computer Aided Dispatch or Over The Air Re-Programming etc) that require a signal at the time of successful trunked repeater access. Options include:

- A. **Continuous:** Logic Level high during length of access.
- B. **Sng. Pulse:** Logic level high pulse at the time of a successful handshake.

**XXII.** Set the **Horn alt logic sig** parameter to **Pulse**. The Horn Alert logic can be used to drive a vehicle horn relay, light or other device. The logic level signal can be set for a continuous (EX: light) or momentary pulse output (EX: vehicle horn relay). Options include:

- A. **Continuous:** Continuous logic level low output until reset.
- B. **Pulse:** Momentary logic level low output.
- **XXIII.** The options should now appear as:

C:\DOCUME~'	\ADMINI~1\Desktop\RADIOP~1\KPG	G25D.EXE _ 🗆 🗙										
File Model	Edit Program Setup	F1=Help										
Model Type Free Area	Test frequency Feature option System merge tem In	Data File : KPG25D.910 Source File : KPG25D.91S formation >										
	Feature Option											
T.O.T.(Di T.O.T.(TE Drop out Dwell time Transpnd TX inhibi Aux switc Scan switc Revert sys Free sys Clear to	<pre>spatch) : [600] sec L&gt; : [600] sec lelay time : [ 1] sec e : [ 1] sec e : [ 1] sec lelay time : [ 3] sec t time : [5.0] sec h : [N/A ] ch : [Scan list ] s type : [Last Use ] ring back : [No ] talk : [Yes]</pre>	Sys search : [None ] Display character : [Grp Name] Minimum volume : [_0] Off hook scan : [Disable] Off hook horn alt : [Disable] Off hook decode : [Enable ] Access logic sig : [Sngl.Pulse] Horn alt logic sig : [Pulse ] Option signalling										
15 : Not Used 31 : Not Used 16 : Not Used 22 : Not Used												
†↓:Move En	ter:Open Tab : <> Alt:	Abort Esc:Main										

**XXIV.** Layout all of the repeater input frequencies in the first group. Setup each repeater output frequency in a separate system. Using the **Kenwood3.exe** program, the hexadecimal representation of each frequency can be determined (as seen in the table below).

	Group & System Configuration													
System	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8						
1	KC7MCC	KC7MCC	KC7MCC	KC7MCC	KC7MCC	KC7MCC	KC7MCC	KC7MCC						
	TX A	TX A	RX A	RX A	TX B	TX B	RX B	RX B						
	927.2125	927.2125	902.2125	902.2125	927.2250	927.2250	902.2250	902.2250						
	Carrier	Encode	Carrier	Encode	Carrier	Encode	Carrier	Encode						
	CH. 17	CH. 17	CH. 17	CH. 17	CH. 18	CH. 18	CH. 18	CH. 18						
	0xD197	0xD197	0x0190	0x0190	0xD297	0xD297	0x0290	0x0290						

The carrier access groups are not intended for active use but support test configurations, such as performing a -12 dB SINAD measurement on a receiver.

C:VDOCUME~1VADMINI~1VDeskto	NRADIOP~1\KPG25D.EXE			- 🗆 ×
File Model Edit Program	Setup			F1=Help
Model Type : TK-941[900MH Free Area : 5888 bytes	z] —< System Information	Data File Source File >	: KPG25D : KPG25D	.910 .918
No. Format Name	ScanList No. F	ormat	Name	ScanList
1 : Not Used 2 : Not Used 3 : Not Used 4 : Not Used 5 : Not Used 6 : Not Used 7 : Not Used	System Format Not Used Trunking Conventional	Used sed sed sed sed sed sed	-	
9 : Not Used	25 : N	sea lot Used		
10 : Not Used	2 <u>6</u> : N	ot Used		
11 : Not Used 12 : Not Used	27 : N 28 : N	ot Used of Used		
13 : Not Used	29 : N	ot Used		
14 : Not Used	30 = N	ot Used		
15 : Not Used 16 : Not Used	31 = N 32 = N	ot Used ot Used		
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**XXVI.** Hit **Enter** to edit the system configuration.

**XXVII.** Program each group as follows:

- A. Set the **FCC** field to **200**.
- B. Set the transmit **Encode** field as appropriate.
- C. Set the receive **Decode** field as appropriate.
- D. Set the **Grp-Name** field as appropriate. Use unique text that will help you identify the group name when using the **HxD** program at a later step.
- E. Set the **TlkArnd** field to **Yes**.
- F. Leave all other fields at their default values.

C	C:\DOCUME~1\ADMINI~1\Desktop\RADIOP~1\KPG25D.EXE												
	File Model Edit Program Setup F1=Help												
	Model Type : TK-941[900MHz]Data File : KC7MCC_2.910Free Area : 5722 bytesSource File : KPG25D.918												
	System No. : 1 Format : Conventional												
	F Grp FCC -12.5 Encode Decode Grp-Name Call Horn OptSig TXInh Bsy TlkArnd 1 200 **** TXA-COS No No No No No Yes												
	2 200 *** D023N D023N TXA-DCS No No No No No Yes 3 200 *** RXA-COS No No No Yes No Yes												
	4 200 **** D023N D023N RXA-DCS No No No Yes No Yes 5 200 ****												
	6 200 <del>****</del> D023N D023N TXB-DCS No No No No No Yes 7 200 <del>***</del>												
	8 200 *** D023N D023N RXB-DCS No No No Yes No Yes												
	FCC Grp.9 : No Data >												
	14 : Not Used30 : Not Used15 : Not Used31 : Not Used												
Ľ	16 : Not Used 32 : Not Used												
	Arrows:Move Enter:Input F9:Sys Data Alt:Abort Esc:Main												

### **XXVIII.** Save the **KPG25D** configuration file.



XXIX. Exit the KPG25D.exe program.

**XXX.** The **KPG25D.exe** program will have inserted a value of **0x089B**, corresponding to channel 200 or 937.5000 MHz, into each of the frequency slots. The channel numbers are stored as a 16-bit word in little endian format. Endian swapping the default channel value results in a value of **0x9B08**, which converts to a decimal value of 39688. The decimal channel value can be determined by subtracting the target frequency from 937.5000 MHz and then dividing by the channel frequency step size of 0.0125 MHz. The resulting value is then subtracted from a value of 38923, converted back to hexadecimal and then endian swapped into little endian format before storing the frequency. *This is apparently what the* **Kenwood3.exe** program does (except that the conversion to decimal and endian swapping is not required in programming since little endian is the native format for x86 processors).

**XXXI.** Launch the **HxD.exe** program.

📧 HxD - [C:\K	с7м	cc_	2.9	10]														
🔣 File Edit S	Search	Vie	wΑ	Analys	sis E	xtras	; Wi	ndow	1 ?									- 8 ×
- 🔂 - 🗐	Sum	03	E	• 16	;	~	AN	SI		•	h	ex		~				
■ KC7MCC 2.9	910																	
ing Kernee_en																		
Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	OB	0C	OD	OE	OF		-
00000000	4B	50	47	32	35	2 D	39	31	00	67	FF	FF	FF	FF	FF	FF	KPG25-91.gÿÿÿÿÿÿ	_
00000010	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	=
00000020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000030	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000040	FF	FF	FF	FF	FF	FF	FF	FF	01	08	FF	FF	FF	FF	FF	FF	<u> </u>	
00000050	FF	FF	FF	F.F.	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000060	FF 01	FF OI	FF	FF	FF	F F	F F 1 F	FF	F F	27	27	U1 88	U1 85	03	09	F F	<u>хухи</u> х	
00000070	UI FF	UI FF	90	15 55	10 55	11 55	TF	00	r r 4 1		r r 4 1	гг 0 М	77 70	rr Oð	гг 7 М		uoyyyyyyyyy	
000000000	rr B3		rr B3		rr FC	rr Oð	F F	rr Oð	24	9A OB	24	JA OR	(A 5D	9A OB	(A 5D	9A OB	34344444	
00000030	96	9B	96	9R QR	CF	9R	CF	9R	म य म म	यट नन	म्य मन्	यह ब	पट नन	त् च	पट नन	य ट न न	= \_ \Î \Î \ <del>00000000</del>	
00000080	ग्र च	नन	गन	य र न न	नन	नन	<u>а</u>	नन	<u>न</u> न	<u>न</u> न	<u>न</u> न	 		7 T	тт 77		000000000000000000000000000000000000000	
000000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	000000000000000000	
00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	444444444444444444444444444444444444444	
000000E0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	******	
000000F0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000100	FF	FF	FF	FF	FF	FF	FF	FF	FΕ	FF	FΕ	FF	FF	FF	FF	FF	ΫΫΫΫΫΫΫΫϷΫϷΫΫΫΫΫ	
00000110	FF	FF	FF	FF	FF	FF	01	þ8	9B	08	9B	FF	FF	FF	FF	FD	<b>ΫΫΫΫΫΫΫ</b> ,	
00000120	FF	54	58	41	2D	43	4F	53	00	02	08	9B	08	9B	81	ЕC	ÿTXA-COS>.).ì	
00000130	81	ЕC	FD	FF	54	58	41	2 D	44	43	53	00	03	08	9B	08	.ìýÿTXA-DCS≻.	
00000140	9B	FF	FF	FF	FF	F9	FF	52	58	41	2 D	43	4F	53	00	04	>ÿÿÿÿÿùÿRXA−COS	
00000150	08	9B	08	9B	81	ЕC	81	ЕC	F9	FF	52	58	41	2 D	44	43	.>.>.ì.ìùÿRXA-DC	
00000160	53	00	05	08	9B	08	9B	FF	FF	FF	FF	FD	FF	54	58	42	S>.>ÿÿÿÿýÿŤXB	
00000170	2 D	43	4F	53	00	06	08	9B	08	9B	81	EC	81	EC	FD	FF	-COS>.).ì.ìýÿ	
00000180	54	58	42	2 D	44	43	53	00	07	08	9B	08	9B	FF	FF	FF	TXB-DCS>.>ÿÿÿ	
00000190	FF	F9	FF	52	58	42	2D	43	4F	53	00	08	08	9B	08	9B	yuyRXB-COS>.>	
000001A0	81	EC	81	EC	F9	FF FF	52	58	42 EE	2D EE	44	43	53		FF	F F	.1.1UYRXB-DCS.yy	
00000180	F F E E	rr FF	F F F F	11	11	11	rr FF	r r F F	r r F F	11	7 T	11	11	F F	F F	F F E E		
00000100	11 55	11 55	11	11	11 55	11	11 55	11 55	11 55	11	11 55	11 55	11 55	11 55	77 55	rr rr		
00000100	ר ז דד	יי דד	יי דד	יי דד	יי דד	יי דד	ר ד ר ד	ר בי רוד	יי דד	יי דד	יי דד	רת דד	יי דד	יי דד	יי דד	ר ר ד ד	······································	
000001E0	יי דד	ਾਾ ਸਸ	ਾਾ ਸਸ	ਸ ਸ ਸ ਸ	नन सम	गग निम	чч чч	ਾਾ ਸਸ	ਾਾ ਸਸ	ਸਸ ਸਸ	ਸ ਸ ਸ ਸ	ਸਸ	गग नन	чч тт	чч тт	ਸ ਸ ਸ ਸ	<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	
00000200	77 77	יי דד	тт тт	 न न	тт 77		тт Т	тт тт	тт 77	тт 77	тт тт	 	יי דד	T T	T T		000000000000000000000000000000000000000	
00000210	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	000000000000000000000000000000000000000	
00000220	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	444444444444444444444444444444444444444	
00000230	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	******	
00000240	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000250	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000260	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	~
Offset: 117																	Overwrite	.::

**XXXIII.** Locate each frequency entry with a value of **0x089B** and edit the value to the appropriate value obtained from the **Kenwood3.exe** program. The **Grp-Name** field data will be visible in the window and will help to locate the **0x089B** value associated with a specific group name..

📧 HxD - [C:W	(С7М	cc_	2.91	10]														
🔣 File Edit S	5earch	Vie	w A	nalys	sis E	xtras	Wi	ndow	1 ?									_ 8 X
- 		œ۲	-	• • 16	;	~	AN	SI			h	ex		~				
	Abr.	- App	: -															
KC7MCC_2.	910																	
Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	OB	oc	OD	0E	OF		<u>^</u>
00000000	4B	50	47	32	35	2D	39	31	00	67	FF	FF	FF	FF	FF	FF	KPG25-91.qŸŸŸŸŸŸ	
00000010	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000030	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	_
00000040	FF	FF	FF	FF	FF	FF	FF	FF	01	08	FF	FF	FF	FF	FF	FF	<u> </u>	
00000050	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000060	FF	FF	FF	FF	FF	FF	FF	FF	FF	27	27	01	01	03	09	FF	<u> </u>	
00000070	01	01	98	FΒ	FO	FF	1E	00	FF	FF	FF	FF	FF	FF	FF	FF	~ûðÿÿÿÿÿÿÿÿÿ	
00000080	FF	FF	FF	FF	FF	FF	FF	FF	41	9A	41	9A	7Å	9A	7A	91	ÿÿÿÿÿÿÿÿÅšAšzšzš	
00000090	B3	91	B3	91	EC	9A	EC	9A	24	9B	24	9B	5D	9B	5D	9B	**************************************	
0A000000	96	9B	96	9B	CE	9B	CE	9B	FF	FF	FF	F.F.	F.F.	FF	F.F.	F.F.	->->1>1>йуйууууу	
00000080	11			rr FF	11	11				11	11	11			11	11	<u> </u>	
00000000	ר ר ד ד	ר ר ד ד	ר ר ד ד	rr rr	rr rr	77 55	7 7 5 5	ר ר ד ד	гг тт	ר ר ד ד	rr rr	ר ר ד ד	гг тт	ר ר ד ד	ר ר ד ד	ר ר ד ד	<u> </u>	
0000000000	ਸ ਸ ਸ ਸ	יי דד	יי דד	יי דד	ਸ ਸ ਸ ਸ	יי דד	יי דד	יי דד	יי דד	ਸ ਸ ਸ ਸ	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
000000000	ਸਾ	<u>ग</u> न न	тт тт	ਸਾ	ਸ਼ਾ	тт 77	11 77	<u>ग</u> न न	ਸ਼ਾ	ਸ਼ਾ	чч чч	ਸ ਸ ਸ ਸ	<u>ग</u> न न	ਸ਼ਾ	ਸ਼ਾ	ਸਾ		
00000100	<u>न</u> न		77 77	77 77	 77	 77	 77		т	 	<u>.</u> Э. Я			 	 7 - 7	 77	000000000h0h000000	
00000110	FF	FF	FF	FF	FF	FF	01	D1	97	D1	97	FF	FF	FF	FF	FD	000000.Ñ_Ñ_00000	
00000120	FF	54	58	41	2 D	43	4F	53	00	02	D1	97	D1	97	81	EC	ΨΤΧΑ-COSÑ-Ñì	
00000130	81	EC	FD	FF	54	58	41	2 D	44	43	53	00	03	01	90	01	.ìýÿTXA-DCS	
00000140	90	FF	FF	FF	FF	F9	FF	52	58	41	2 D	43	4F	53	00	04	.ÿÿÿÿÿùÿRXA-COS	
00000150	01	90	01	90	81	ЕC	81	ЕC	F9	FF	52	58	41	2 D	44	43	ì.ìùÿRXA-DC	
00000160	53	00	05	D2	97	D2	97	FF	FF	FF	FF	FD	FF	54	58	42	S <mark>Ò−Ò−ÿÿÿÿÿýÿ</mark> TXB	
00000170	2 D	43	4F	53	00	06	D2	97	D2	97	81	$\mathbf{E}\mathbf{C}$	81	ЕC	FD	FF	-COS <mark>Ò−Ò−</mark> .ì.ìýÿ	
00000180	54	58	42	2 D	44	43	53	00	07	02	90	02	90	FF	FF	FF	TXB-DCSÿÿÿ	
00000190	FF	F9	FF	52	58	42	2 D	43	4F	53	00	08	02	90	02	90	ÿùÿRXB-COS	
000001A0	81	ЕC	81	ЕC	F9	FF	52	58	42	2 D	44	43	53	00	FF	FF	.ì.ìùÿRXB-DCS.ÿÿ	
000001B0	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000100	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	
00000100	F.F.	FF	F.F.	FF	FF	FF	FF	F F	FF	FF	FF	F.F.	F F	FF	FF	F.F.	ааааааааааааааааааааааааааааааааааааааа	
000001E0	11	11	11 55	11 55	11	11	11	11 55	11	11	11	11	11 55	11	11	11		
000001F0	11 55	11 55	77 55	77 55	77 55	77 55	77 55	11 55	11 55	11 55	11 55	11 55	11 55	11 55	11 55	77 55	<u> </u>	
00000200	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	יי דד	ר ז ד ד	יי דד	<u> </u>	
00000210	गग नन	नन्त् सन्	नन्त सन्	नन नन	नन्त सन्	न्न सन्	न्न सन्	नन नन	नन नन	न्न नन्	नन्त् सन्	тт Т	नन नन	नन नन	न्न सन्	ਸਸ	<u> </u>	
00000220	नन	FF	FF	FF	т. ТТ	FF	FF	т. ТТ	नन	नन	FF	FF	т. ТТ	т. ТТ	FF	FF	000000000000000000000000000000000000000	
00000240	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	000000000000000000000000000000000000000	
00000250	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	444444444444444444444444444444444444444	
00000260	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	<u> </u>	~
Offset: 1A0																* M	odified * Overwrite	

- **XXXIV.** Save the file and exit the **Kenwood3.exe** program.
- **XXXV.** Launch the **KPG25D.exe** program.
- **XXXVI.** Load the KPG25D data file.

C:\DOCUME~1\ADMINI~1\Desktop\RADIOP~1\KPG25D.EXE											
File Model Ed:	it Program Setup	F1=Help									
New Ti	K-940[800MHz] Data File	e : KPG25D.810									
Save(=F4) save As Delete	Drive & Path : <u>C</u> :\										
Print(=F5)		Directory									
Go to dos d Exit (=F3) d	Load file name : KC7MCC.910	C7MCC.910									
d 8 : Not Used 9 : Not Used											
10 : Not Used 11 : Not Used	26 : Not Used 27 : Not Used										
12 : Not Used 13 : Not Used 14 : Not Used	28 : Not Used 29 : Not Used 30 : Not Used										
15 : Not Used 16 : Not Used	31 : Not Used 32 : Not Used [ 06/15/2012 14 31 ]										
Arrows:Move Ent	ter:Select Alt:Abort Esc:Main										

**XXXVII.** A view of the **Feature option** window will show the new channel data.

ex C:\DOCUME~1\ADMINI~1\Desktop\RADIOP~1\KPG25D.EXE	- 🗆 🗙
File Model Edit Program Setup	F1=Help
Model Type : TK-941[900MHz]Data File : KC7MCC.Free Area : 5722 bytesSource File : KPG25D	2.910 .918
System No. : 1 Format : Conventional	
F Grp FCC -12.5 Encode Decode Grp-Name Call Horn OptSig TXInh Bsy T   1 623 *** TXA-COS No No No No No No   2 -623 *** D023N D023N TXA-DCS No No No No No No   3 -2623 *** RXA-COS No No No No No No   4 -2623 *** D023N D023N RXA-DCS No No No No Yes No   4 -2623 *** D023N D023N RXA-DCS No No No No Yes No   5 -622 *** TXB-COS No No No No No No No   6 -622 *** D023N D023N TXB-DCS No No No No No No   7 -2622 *** RXB-COS No No No No No No   8 -2622 *** D023N D023N TXB-DCS No No No No Yes No   9 10  Yes No	lkArnd Yes Yes Yes Yes Yes Yes Yes Yes
14 : Not Used 30 : Not Used   15 : Not Used 31 : Not Used   16 : Not Used 32 : Not Used   [ 06/22/2012 22 13 ]	
Arrows:Move Enter:Input F9:Sys Data Alt:Abort Esc:Main	

🖎 C:\DOCUME~1\ADMINI~1\Desktop\RADIOP~1\KPG25D.EXE 📃 🕨			
File Model Edit	Program Setup		F1=Help
Model Type : TK- Free Area : 572	Read from radio Write to radio Test mode	Data File Source File nformation >	: KC7MCC.910 : KPG25D.918
No. Format		No. Format	Name ScanList
2 : Not Used 3 : Not Used 4 : Not Used 5 : Not Used 6 : Not Used 7 : Not Used 9 : Not Used 10 : Not Used 11 : Not Used 12 : Not Used 13 : Not Used 14 : Not Used 15 : Not Used 16 : Not Used	Write data fr Take radio ou Take radio ou Take radio ou IOM	ed d d d d d d d d d d d c cancel] d d d c cancel] d d d d d d d d d d c cancel] d d d d d c cancel] d d d c cancel] d d c cancel] c c cancel] c c cancel] c c cancel] c c cancel] c c cancel] c c cancel] c c cancel] c c c cancel] c c c c c c c c c c c c c c c c c c c	
Arrows:Move Enter	Select Alt:Abort	: Esc:Main	

### **Filter Installation**

Two TK-941 radios are used to implement the full-duplex link back-bone, with one radio acting as the transmitter and the other radio acting as the receiver. The front-end filter on the receive radio must be swapped out with a filter that has the bandpass frequency having the receive frequency fall within the bandpass.

A hot air SMD station was used to remove the pair of filters from the TK-941 receive radio front-end. 915 MHz filters were then installed using a standard soldering station. Note that the filter terminals did not align with the solder pads on the printed circuit board. The terminals had to be bent in to contact the pads prior to soldering. A check was made, using an Ohm meter, to verify that the terminals did not short to the ground traces surrounding the filter terminal pads.



Upon completion of the filter installation, the VCO was adjusted to obtain VCO lock.

### **Repeater Controller Interface - Receive Radio**

The repeater controller interface requires access to the COS signal and de-emphasized audio. The signal driving the BASE of Q20 presents an Active LOW COS. Further, the COS signal carries only the COS when programmed for COS access or the logical NAND of COS and Tone Decode when programmed for tone or DCS access. The observed logic level on the COS signal shows 3.6 volts when HIGH.

Squelch gated de-emphasized audio is available at the junction of C75 and IC6-13. The signal level of the audio, using a 1KHz tone with 3KHz deviation (as used for a -12 dB SINAD measurement), was observed to be 1.2 Vpp.



The following annotated PCB view shows where to connect the COS and Gated Audio signals to interface to the repeater controller.



The following image shows the repeater controller interface wires attached to the receive radio. The COS wire is blue. The squelch gated de-emphasized audio is orange. A black ground connection is made at emitter of Q20. A Dremel tool was used to grind a small slot to route the cable out of the RF shielded area where the interface signals are available. A Hot Glue gun was used to fasten down the wires, providing strain relief for the PCB pad connections.



The power cable chassis strain relief can be lifted, exposing a small but removable plug. Removing this plug allows for routing of the repeater controller interface wires out of the radio chassis.



## **Repeater Controller Interface - Transmit Radio**

The transmit radio requires access to the PTT and Microphone input signals. The front panel was removed in preparation to route wires from under the power cable and on to through the chassis to the front panel PCB.





The attachment points on the back of the front panel PCB are well marked as follows:

- 1. PTT: Push-to-talk (Green Wire)
- 2. ME: Microphone Return (audio-signal-ground Black Wire)
- 3. MI: Microphone Input (Red Wire)

