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### **Usage of the Syntor Frequency Prom Adapter:**

- 1.) This adapter is useful **only for VHF and UHF Motorola Syntor radios**. It is **not useful for Syntor X, Syntor X9000** or other radios.
- 2.) **Exercise great care when installing the adapter into the radio.** The adapter plugs into the existing Syntor PROM socket. Be sure to align the adapter correctly with the socket. The extra row of pins on the adapter (used for jumper wires, etc.) should be very close to the VCO module. Also be sure that all of the pins on the adapter line up with the holes in the socket. It is possible to plug the adapter into the socket “out of line” (to one side or the other – so that all of the header pins are not connected to all of the socket pins). Because of the confined space, it is difficult to see if this is done correctly so be very careful. **If the adapter is not plugged in correctly, it is possible for damage to occur to the adapter and/or the radio. NOTE that mis-alignment will cause the radio to be inoperative and may result in damage. Be sure to inspect this carefully to insure that the adapter is plugged in correctly before you apply power to the radio.**
- 3.) **The optional retainer wires.** There are five pins on the circuit board that are all together and not wired to anything. They are at one end of the circuit board and on the edge that is close to the VCO module of the radio. These are intended to be used for “retainer” wires. These can be used to secure the mounting of the adapter in cases where the radio is subjected to strong vibration forces. To use this feature first attach a small piece of bare circuit board to the VCO module with 3M mounting tape. (This is white double sided sticky tape with a strong adhesive and can be found at most hardware stores and office supply stores, etc.) Attach the piece of circuit board so that bare copper is exposed and the piece is next to the five retainer wire pins on the adapter board. Solder five solid wires (appx 22 AWG or use the lead wires from some ¼ watt resistors or similar components) to the five pins on the adapter. Then form these wires and solder them to the piece of circuit board mounted in the step above. This will form a strong mechanical connection between the adapter and the VCO module and prevent the adapter coming loose from the radio in the event of a strong mechanical shock or vibration. They should not be necessary for most normal users – only those who have the radio in a vehicle which is often driven over very rough roads, etc.
- 4.) **Configuring the adapter to match your EPROM or EEPROM:** The adapter can be used with a wide variety of EPROMs and EEPROMs. There are some small jumpers on the board to adapt the adapter to the various (EEPROM/EPROM) devices. Refer to the attached diagram to be sure that your adapter is wired correctly for the device you plan to use. Due to the large number of EEPROM/EPROM types with can be used, the following is a little bit complicated. Be sure you have it figured out correctly before you proceed. When a 24 pin device is used with this adapter, it can be used with either a 24 or a 28 pin socket. The 24 pin device uses the lower 12 pins on each side – so pin #1 of the device goes into pin #3 of the 28 pin layout. Be sure to install the 24 pin socket or device accordingly.
- 5.) **Expansion of the number of channels:** The Syntor radio can come from the factory with either 16 or 32 channel capability. To convert a 16 channel syntor to a 32 channel one, remove JU-1101

on the Syntor's main circuit board. This jumper is located fairly close to the frequency PROM socket. When you do this you will need to add a "bank" switch to the control head of the radio. The control head needs to be a 16 channel one (**note: Syntor control heads with less than 16 channels and their normal control cables are not easily converted for more channels since this requires replacement of the frequency select switch and the necessary switch is no longer available from Motorola. The replacement switch needs to be a special binary coded switch and there are some other changes that need to be made to the control head.** This is beyond the scope of this document but there is some information on the internet about this or you can contact me (W9FIU) if necessary).

6.) **Expansion of the number of channels beyond 32 channels:** This adapter can be used to expand the number of channels beyond the normal 32 channel limit of the normal Syntor radio. Several issues are involved, however.

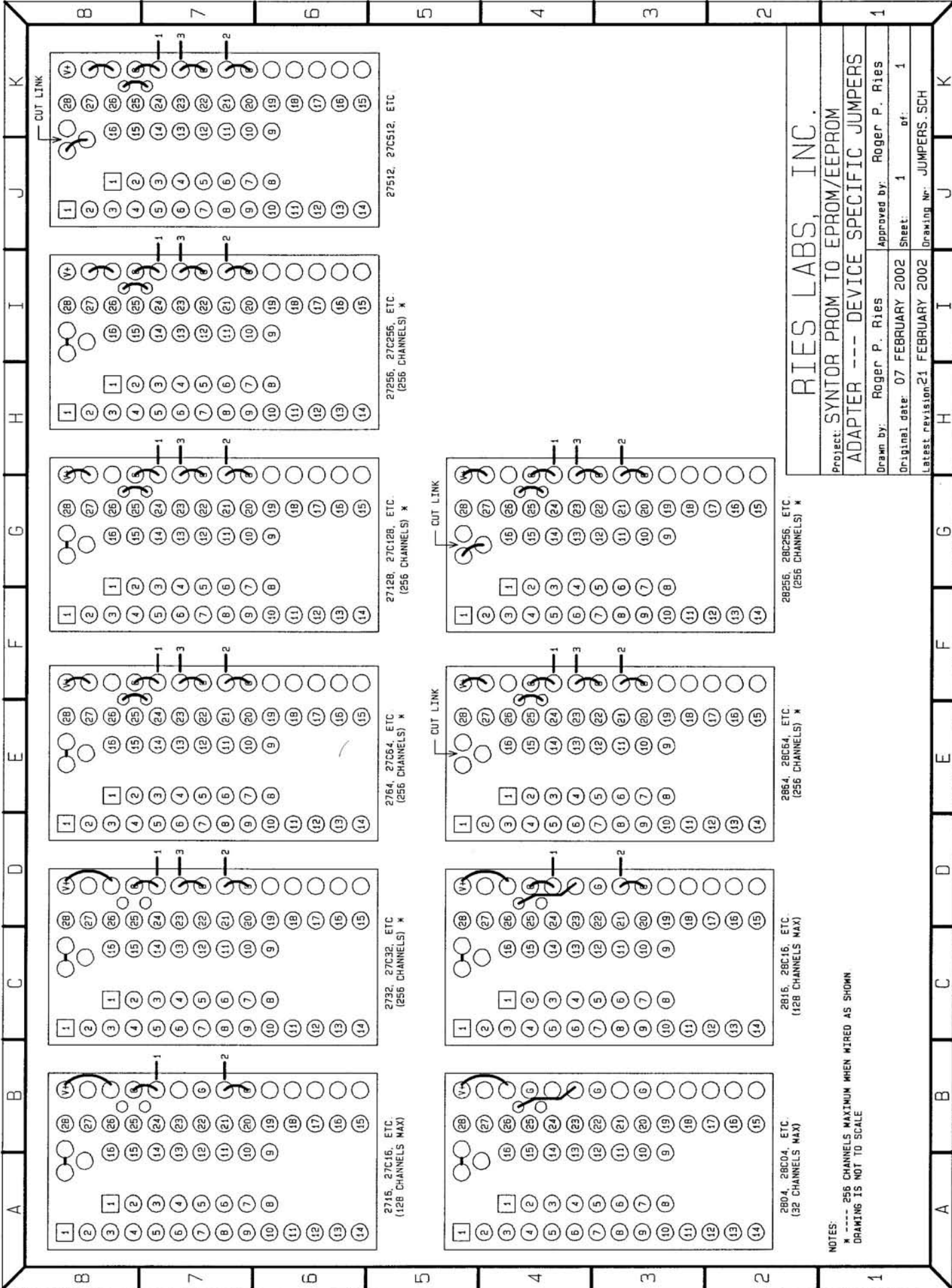
- a.) The radio needs to be modified slightly to support further "bank" switching. Refer to the attached schematic diagram (SYNMODS1.SCH thru SYNMODS4.SCH) which shows how to expand up to 1024 channel capability. Expansion beyond 1024 channels is possible, but involves much more modification and is not covered here. The modification to the radio (for up to 1024 channels) consists of adding the five wires shown. Connect these wires to the appropriate pins of U1 (the "interface" IC of the radio). You can add all five wires when you do this if you like – even if you only plan to use some of them. It is a little difficult to gain access to the pins of U1, so you might want to all five when you have the front part of the radio apart. You can use fairly small wires. I used 26 AWG stranded hookup wire with irradiated PVC insulation. I also put a small 5 pin connector on the end of this cable. Another short cable with the mating connector goes to the EPROM adapter. The connector makes it possible to remove the EPROM adapter from the radio without having to unsolder any wires, etc.
- b.) The adapter circuit board also needs to be modified slightly before it can be used with more than 32 channels. Remove the small wire links (jumpers) indicated at "1", "2", and "3" on the diagram of the adapter circuit board. Note: to expand to 64 channels, remove only the link "1" and add only the brown wire. To expand to 128 channels, remove links "1" and "2" and add the brown and red wires. To expand to 256 channels, remove links "1", "2", and "3" and add the brown, red, and orange wires. To expand beyond 256 channels, refer to section "c" below. Connect a brown 26 AWG wire to the indicated adapter pin at "1". Connect a red wire to the indicated adapter pin at "2". Connect a orange wire to the indicated adapter pin at "3". These wires should be connected to the mating connector indicated in section "a" above (pins #1 thru #3).
- c.) To expand beyond 256 channels, some more wires must be added to the adapter. Since the adapter was intended to go up to a maximum of 256 channels, you will have to make some additional minor modifications to the adapter itself. To expand to 512 channels you need to cut a circuit board trace – the one that goes to pin #2 of the EPROM socket from pin #26 of the socket. This trace is difficult to access once the EPROM socket has been soldered to the adapter circuit board. You can see this trace near pins #26 and #27 of the EPROM socket, and can cut it if you are very careful. A better choice is to have this trace cut before the socket is attached to the adapter. Add a yellow (26 AWG stranded) wire to pin #2 of the EPROM socket and connect this wire to the mating connector indicated above (pin #4). To expand to 1024 channels, you will have to remove the tiny link that is very close to the EPROM socket, next to pin #25 of the socket. This will free up pin #26 of the EPROM (A13) which is used for this expansion. Connect a green wire to pin #26 of the EPROM and also to pin #5 of the connector indicated above.

**IMPORTANT NOTE: Only wire the EPROM with wires for the actual number of channels you will actually use. If you use all five wires (for example) and program your EPROM for a smaller number of channels, the radio may not work at all or may work on only a few channels. This is because the extra wiring you added will switch the EPROM into a region that is not programmed.**

**IMPORTANT NOTE: Make sure that the EPROM you are using is capable of being programmed for at least the number of channels you intend to use. The attached diagram (JUMPERS.SCH) shows the maximum number of channels which can be programmed into each of the EPROM or EEPROM types which can be used with this adapter (when wired as shown). With modification of the adapter, the maximum capacities of the various EEPROMs and EPROMs are as follows:**

2764, 2864, etc.	512 channels
27128, 28128, etc.	1024 channels
27256, 28256, etc.	2048 channels
27512, etc.	4096 channels

**Note that expansion beyond 1024 channels is much more difficult and requires additional modification of the radio and its control cable. The degree of difficulty is such that I cannot honestly recommend doing it – so I am not attempting to provide information on how to proceed. Anyone capable of doing this successfully doesn't need further advice anyway.**

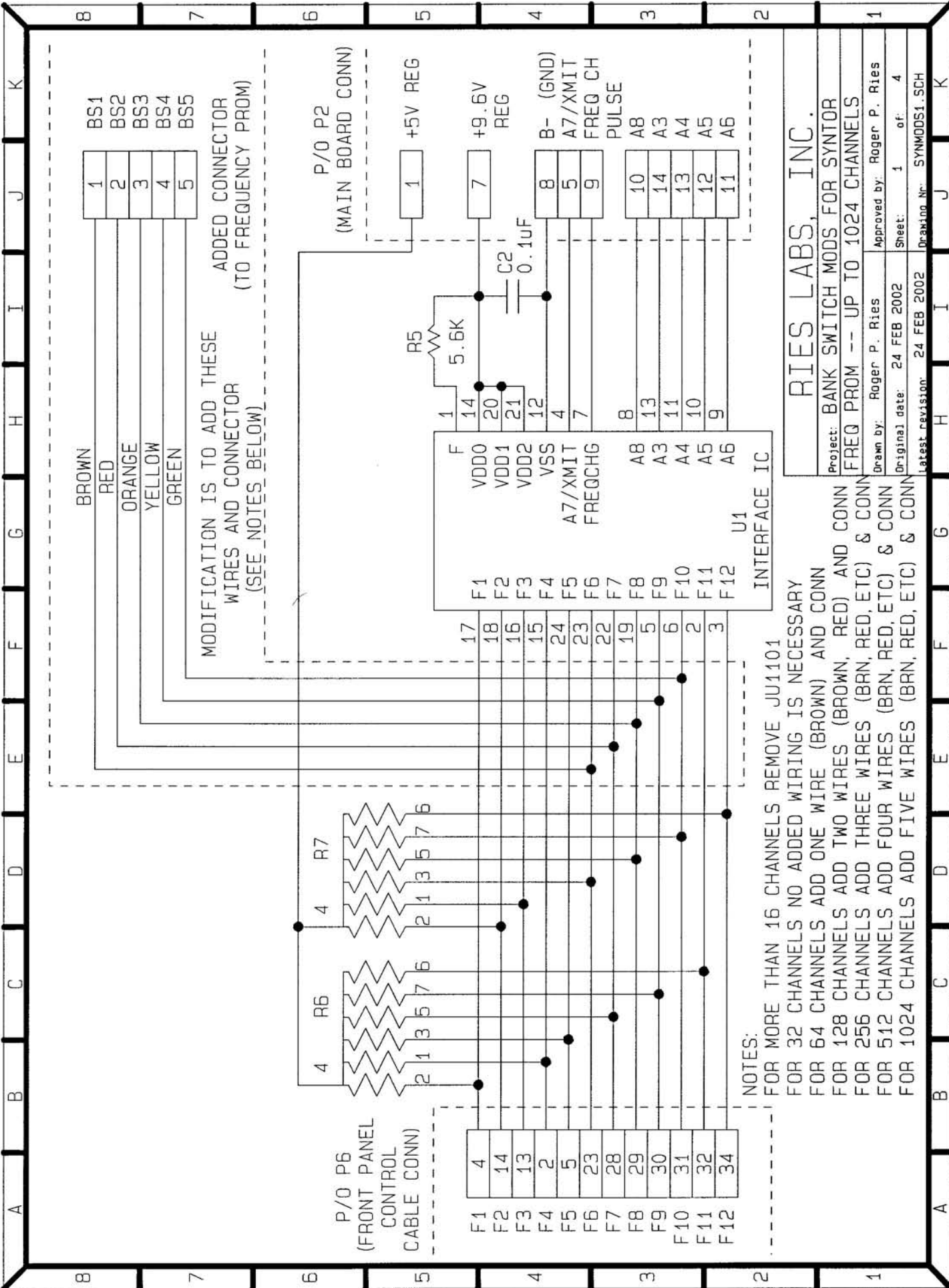


**RIES LABS, INC.**

Project: SYNTOR PROM TO EPROM/EEPROM  
 ADAPTER --- DEVICE SPECIFIC JUMPERS

Drawn by: Roger P. Ries  
 Approved by: Roger P. Ries  
 Original date: 07 FEBRUARY 2002  
 Sheet: 1 of 1  
 Latest revision: 21 FEBRUARY 2002  
 Drawing Nr.: JUMPERS.SCH

NOTES:  
 \* --- 256 CHANNELS MAXIMUM WHEN WIRED AS SHOWN  
 DRAWING IS NOT TO SCALE



**RIES LABS, INC.**

Project: BANK SWITCH MODS FOR SYNTOR  
 FREQ PROM -- UP TO 1024 CHANNELS

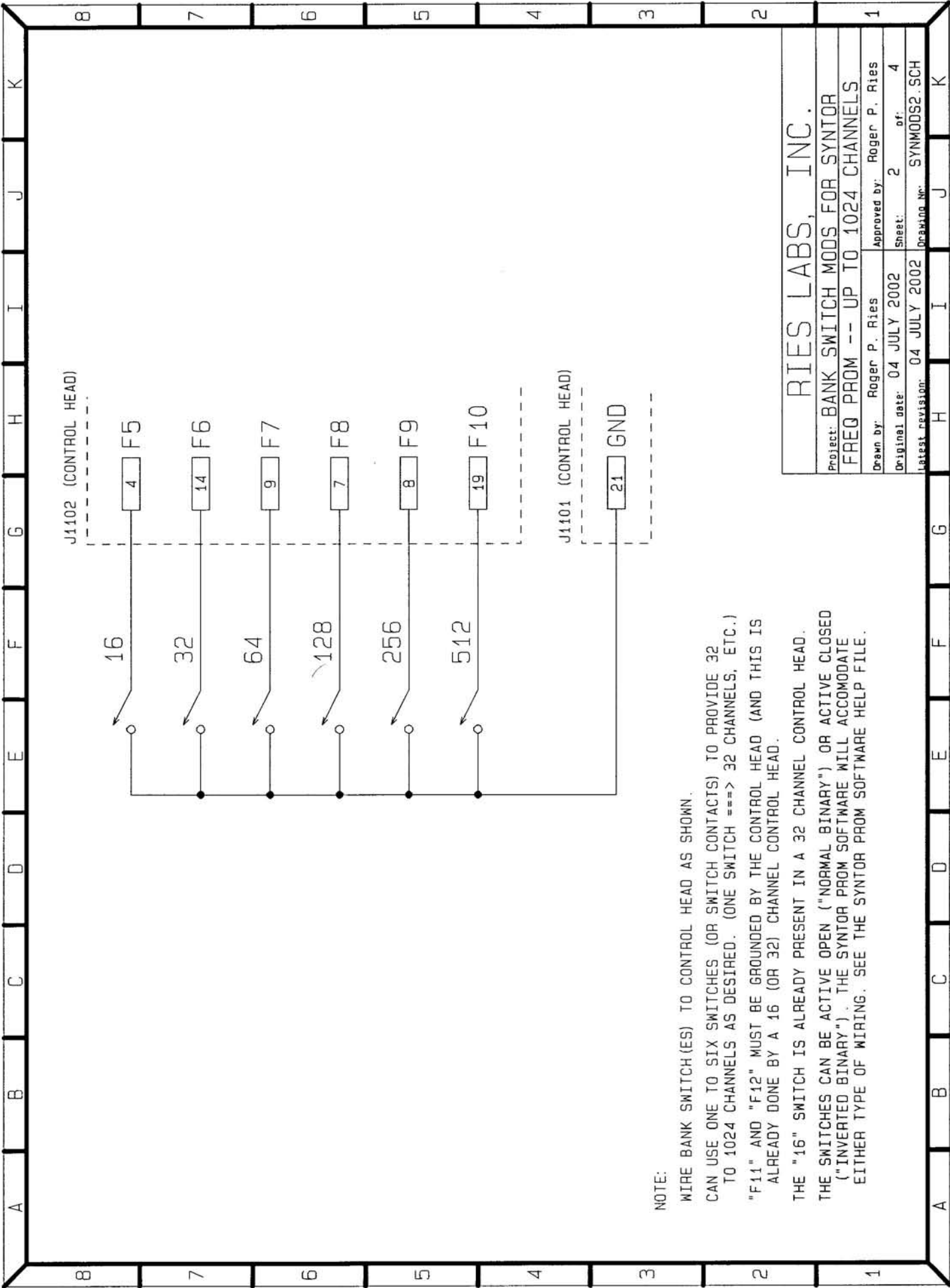
Drawn by: Roger P. Ries  
 Approved by: Roger P. Ries

Original date: 24 FEB 2002  
 Sheet: 1 of 4

Latest revision: 24 FEB 2002  
 Drawing No: SYNMODS1.SCH

**NOTES:**

FOR MORE THAN 16 CHANNELS REMOVE JU1101  
 FOR 32 CHANNELS NO ADDED WIRING IS NECESSARY  
 FOR 64 CHANNELS ADD ONE WIRE (BROWN) AND CONN  
 FOR 128 CHANNELS ADD TWO WIRES (BROWN, RED) AND CONN  
 FOR 256 CHANNELS ADD THREE WIRES (BRN, RED, ETC) & CONN  
 FOR 512 CHANNELS ADD FOUR WIRES (BRN, RED, ETC) & CONN  
 FOR 1024 CHANNELS ADD FIVE WIRES (BRN, RED, ETC) & CONN



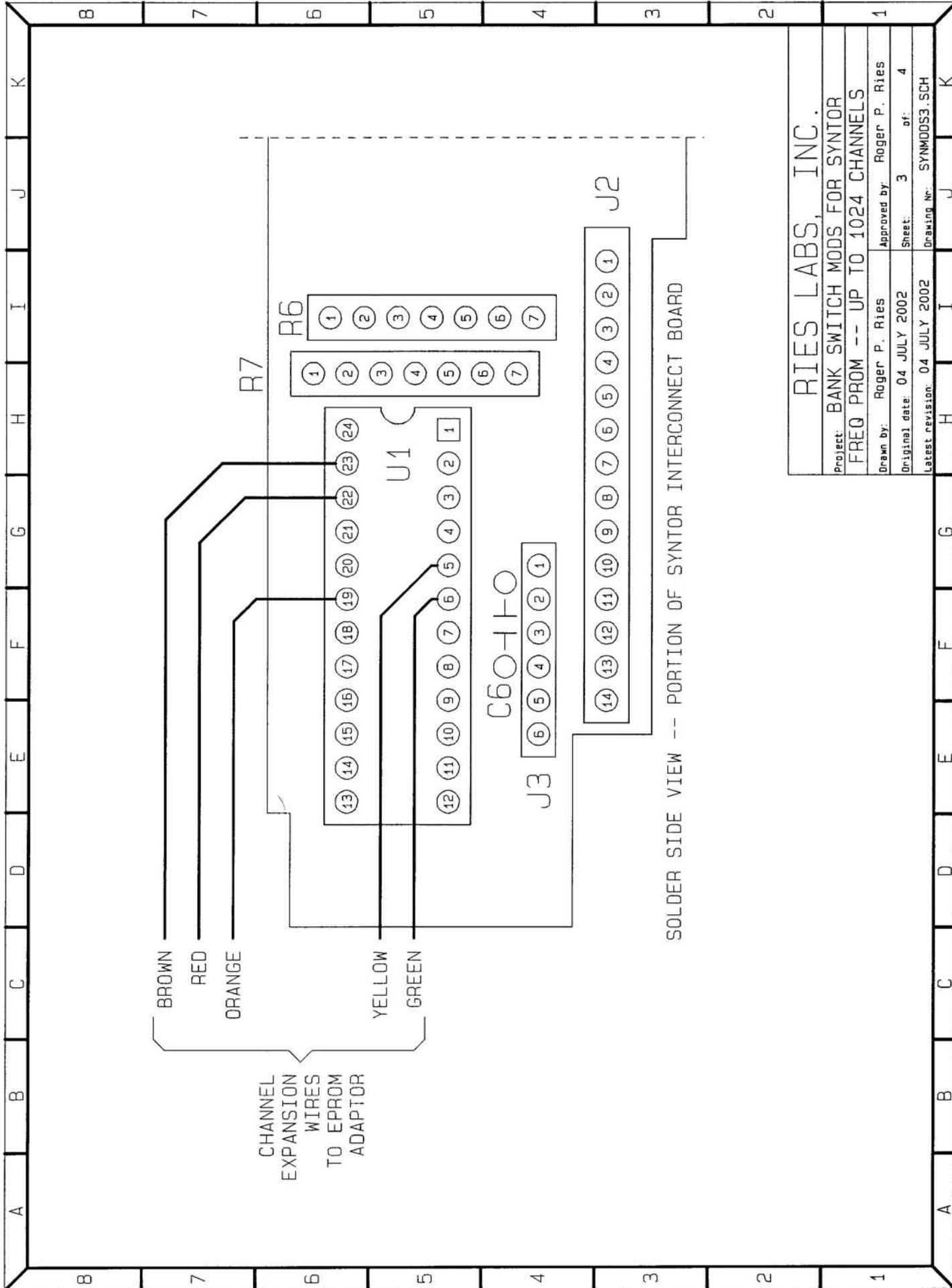
**NOTE:**

WIRE BANK SWITCH(ES) TO CONTROL HEAD AS SHOWN.  
 CAN USE ONE TO SIX SWITCHES (OR SWITCH CONTACTS) TO PROVIDE 32 TO 1024 CHANNELS AS DESIRED. (ONE SWITCH ==> 32 CHANNELS, ETC.)  
 "F11" AND "F12" MUST BE GROUNDED BY THE CONTROL HEAD (AND THIS IS ALREADY DONE BY A 16 (OR 32) CHANNEL CONTROL HEAD.  
 THE "16" SWITCH IS ALREADY PRESENT IN A 32 CHANNEL CONTROL HEAD.  
 THE SWITCHES CAN BE ACTIVE OPEN ("NORMAL BINARY") OR ACTIVE CLOSED ("INVERTED BINARY"). THE SYNTOR PROM SOFTWARE WILL ACCOMMODATE EITHER TYPE OF WIRING. SEE THE SYNTOR PROM SOFTWARE HELP FILE.

<b>RIES LABS, INC.</b>	
Project: BANK SWITCH MODS FOR SYNTOR	
FREQ PROM -- UP TO 1024 CHANNELS	
Drawn by: Roger P. Ries	Approved by: Roger P. Ries
Original date: 04 JULY 2002	Sheet: 2 of: 4
Latest revision: 04 JULY 2002	Drawing No: SYNMODS2.SCH

A B C D E F G H I J K

8 7 6 5 4 3 2 1



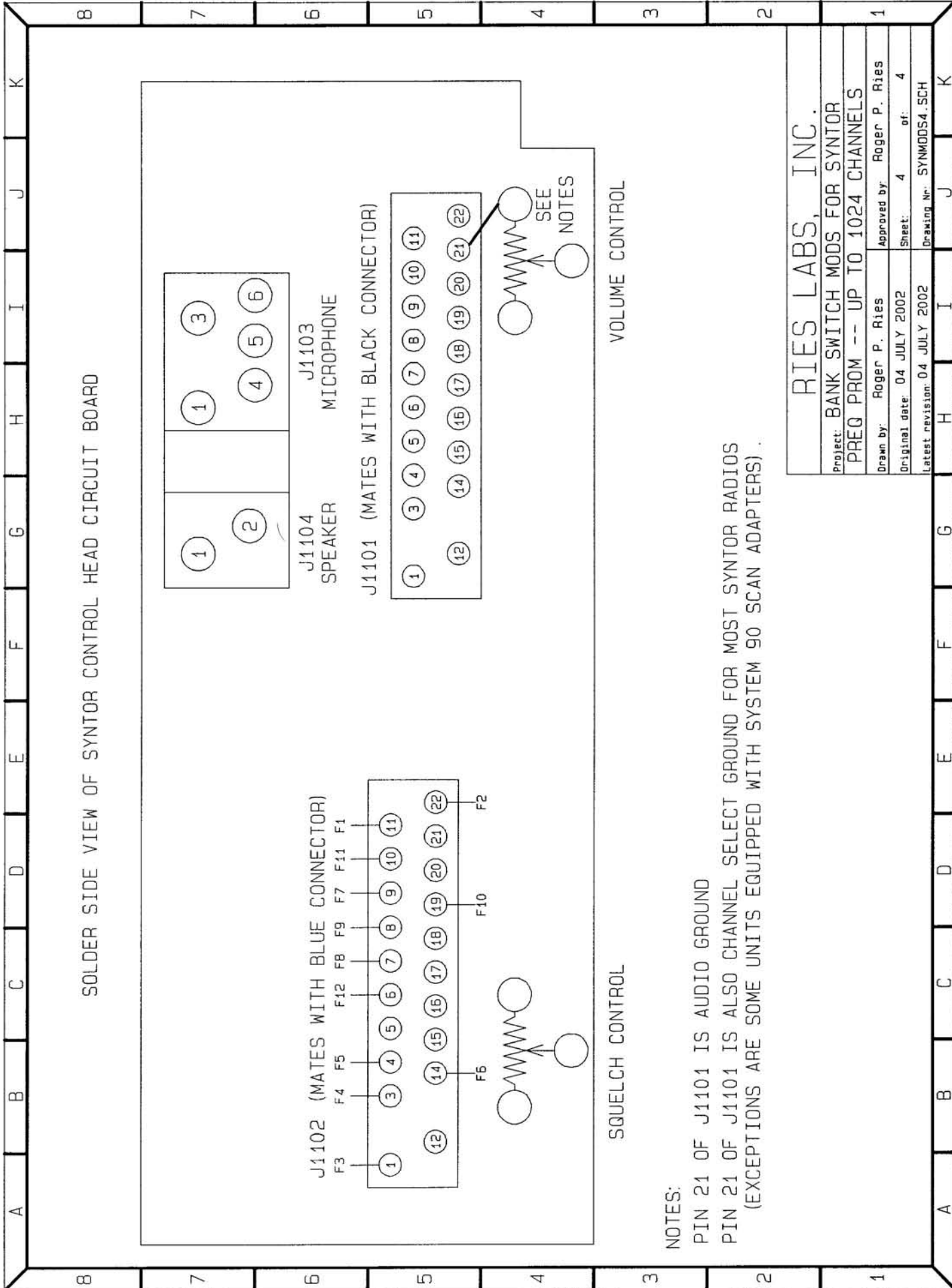
RIES LABS, INC.

Project: BANK SWITCH MODS FOR SYNTOR  
 FREQ PROM -- UP TO 1024 CHANNELS

Drawn by: Roger P. Ries Approved by: Roger P. Ries  
 Original date: 04 JULY 2002 Sheet: 3 of: 4

Latest revision: 04 JULY 2002 Drawing No: SYNMODS3.SCH

A	B	C	D	E	F	G	H	I	J	K
8	7	6	5	4	3	2	1			



SOLDER SIDE VIEW OF SYNTOR CONTROL HEAD CIRCUIT BOARD

NOTES:

PIN 21 OF J1101 IS AUDIO GROUND

PIN 21 OF J1101 IS ALSO CHANNEL SELECT GROUND FOR MOST SYNTOR RADIOS  
(EXCEPTIONS ARE SOME UNITS EQUIPPED WITH SYSTEM 90 SCAN ADAPTERS) .

RIES LABS, INC.

Project: BANK SWITCH MODS FOR SYNTOR  
PREG PROM -- UP TO 1024 CHANNELS

Drawn by: Roger P. Ries Approved by: Roger P. Ries  
Original date: 04 JULY 2002 Sheet: 4 of: 4  
Latest revision: 04 JULY 2002 Drawing Nr: SYNMODS4.SCH