QEX 28

June 1984

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The ARRL Experimenters' Exchange

Packet Radio Gathers Forces

The bearded experimenters have emerged from their basements! This was the aura at the 1984 Dayton Hamvention as 300 plus crowded into the Packet Radio Forum. In previous gatherings, technical speakers shared the rewards, as well as failures, of their experiments, spoke of protocols, and how this technology might work one day. This time, however, people came to recount the group's accomplishments; to get things going at a faster pace. Packet radio communications is slowly, but successfully, evolving.

About 1700 terminal-node-controller (TNC) boards, (or software equivalents), have been sold. Thirteen hundred of them are considered operational being mostly owned by the Tucson Amateur Packet Radio (TAPR) Group. Other TNCs are available from VADCG, AEA, Ashby, and GLB Electronics. Richcraft Engineering sells packet software for the TRS-80® models I and III, as well.

A number of new networks have been sprouting locally since the ARRL Hq. packet repeater has been installed on 145.01 MHz. It recently had a call sign change to W1AW/R and has become more active with these new check-ins. We are in the process of locating a permanent site at a better location. Our goal is to get a solid path to the new packet machine installed atop Mt. Graylock in Massachusetts by the New England Packet Radio Association (NEPRA).

Not long ago, we reported OSCAR 10 teleport experiments by several stations. The same type of relaying is being done to connect HF packeteers to the Washington, DC VHF local net by WB4APR. Listen weekends in the upper 10 kHz region of the 30-meter band and you should hear some activity.

The bugs in the link-layer protocol seem to have been removed, and KA9Q appears to have solved the last problem -- how to use the poll/final bit. Unless someone screams, AX.25 level-2 author, WB4JFI, will make the changes in the specification. If all goes well, we will have a final spec and several implementations of mature software ready for ARRL Board approval in October.

The next standards hurdle is the network-layer protocol. Proposals will be discussed at the ARRL Digital Committee meeting in September at ARRL Hq. We're hoping for agreement at this meeting.

If you haven't read K1ZZ's editorial in June QST, take a look. It reflects growing acceptance of packet radio as a means of solving some ageless problems.

Second Spread-Spectrum STA

The FCC just granted a second special temporary authority (STA) for experimentation in spread spectrum to the Amateur Radio Research and Development Corp. (AMRAD). This STA covers VHF frequency hopping. Look for more details in QEX.

Are There Columnists Out There?

If you fancy yourself a potential QEX columnist, let us hear from you. Rather than restricting your thinking by our suggesting column subjects, we'd like to hear your proposal. -- W4RI

Correspondence

Log Program for the Apple IIe

I recently purchased an Apple IIe computer with two disk drives and an MX 80 Epson printer. I am a member of the International Ten Tec club and chase certificates. My problem? I've purchased two different programs on keeping logs and neither one is satisfactory for my needs. Is there anyone with knowledge of a program that incorporates up to 8 certificates with recall on each by either their call or 10-X number?

I have heard discussions on ten meters about computers performing services such as this. After conferring with these hams, I learned that they are using other computers and not an Apple. If anyone knows of where I could obtain a program like this, I would be happy to hear from them. -- Joseph Terest, Jr., KAØKCE, 6201 Chowen Ave. South, Edina, MN 55410.

More on the Osborne Computer and RTTY

This is in response to J. Don Corley's, WA5KTX, note in the April "Correspondence" column (QEX, no. 26), but may be of interest to other readers as well. Advent Products, 965 N. Main St., Orange, CA, 92667 manufactures a retro-fit switchable baud-rate device for the Osborne. Rates are 50 to 19,200, including 110. In addition to permitting amateur-baud rates, the device allows dumping into a spooler at a high rate, freeing the use of equipment for other tasks. The price is in the $70 range. Several amateurs in the Seattle area own this device and have them running with no problem. -- Dave Plant, NA7K, 10811 NE 143, Kirkland, WA 98034.

For Want of a Better Article

What a disappointment! I was reading an article on using my Timex computer for Amateur Radio purposes and all it told me was that it works.

How about some how-to data on interfacing with RTTY, AMTOR, CW, etc? It's out of my field, but of great interest to me. -- Dave Zinder, W7PMD, ARRL Technical Advisor, Southwestern Division, 4121 West Augusta, Phoenix, AZ 85021.

In This Issue

Part 2 of, "The GB3US Mk2: A Microprocessor Repeater Logic System," starts on page 5. The Radio Society of Great Britain kindly granted us permission to reprint this fine article in QEX. It originally appeared in the RSGB journal, RADio COMmunication, November 1983.

You can now join The Radio Society of Great Britain through ARRL Headquarters. Annual dues are $23 and you will receive their monthly membership journal, RADCOM. ARRL will also handle renewals.

We welcome correspondence from subscribers and/or readers who happen upon an issue of QEX in their ramblings through Amateur Radio related literature. Whether your comments are positive or negative, we are interested in your response. Only you can tell us what articles you would like to see or what we are doing wrong.

For those gifted in the art of writing, we would be happy to review articles for publication. If you have information you would like to share about Packet Radio, RTTY, or computer programs performing an important Amateur Radio function, send them in. - KA1DYZ.

Modifications for the Heathkit ET-3400A Microprocessor Trainer

By Donald G. Varner,* WB3CEH

How would you like to double the memory capacity of your Heathkit ET-3400A with no additional hardware? It can be done and this article deals with such a modification. If you have ever experimented with microprocessors in Amateur Radio, you know that they are becoming increasingly popular. Their tasks vary from controlling various functions within the radio to microprocessor-based repeater controllers.

The origin of this modification begins with Bill Johnson, K3FOW. We were comparing our Heathkit 3400 series microprocessor trainers. Bill mentioned that he had increased the Random Access Memory (RAM) in his 3400 early-version trainer, using two 2114's NMOS (1024 x 4) static RAM chips. We noticed that my trainer, a later version -- the 3400A, uses these same two static RAMS already on board the trainer. These devices have a capacity of 1 k Ω, but the 3400A was only using 0.5 k Ω.

K3FOW's goal was to revise the schematic. My job was to review the X-ray drawing. With this information, it was determined that a minor modification could be employed to use the remaining 0.5 k Ω of RAM in the 3400A without adding any hardware.

The modification centers around 4 IC's: U14, no. 443-764, an MM2114; U15, no. 443-764, an MM2114; U20, no. 443-807, a 74LS42; and U5, no. 443-45, a 7408. (Reference the schematic for actual wiring changes.)

The first step is to get the A9 lines (pins 15) of U14 and U15 off ground and tied together. This is easily accomplished by removing the IC's and their sockets from the board. The tracks for pins 15 are on the top side of the board and under the sockets, making socket removal necessary.

U15 also has a track on the bottom side of the board. It is connected to the leg of C26 which is at ground potential. This track has to be cut from pin 15 to C26, and the point at C26 reconnected to a convenient ground point.

A continuity check is appropriate here to see if in fact the IC holes for pins 15 are off ground. If they are not, even though the tracks are cut, it is because a shield at ground potential is used in the middle of the board between the top and bottom track surfaces. It might be necessary to drill out these IC holes and insert a sleeve of Teflon tubing over the IC socket legs of pins 15 to ensure that they will not be grounded inadvertently. They can now be wired together, point-to-point, and reconnected to the proper point (see schematic).

The additional changes are straight forward. U5a, pins 2 and 3, tracks should be cut. The connections at these points should be removed and reconnected to the proper points on U20.

By taking your time and using the circuit board X-ray view, feed through holes can be located and used to make the wiring modification solder connections to the appropriate circuit points. The finished modification can be done with hook-up wire on the back side of the board, leaving the trainer's top board unblemished.

It is worth the effort to obtain additional 0.5 k Ω of RAM. This doubles the 3400A's board memory capacity at no extra cost. The memory obtained after modification is addressed from 0200 through 03FF. Good experimenting with the 6808 microprocessor!

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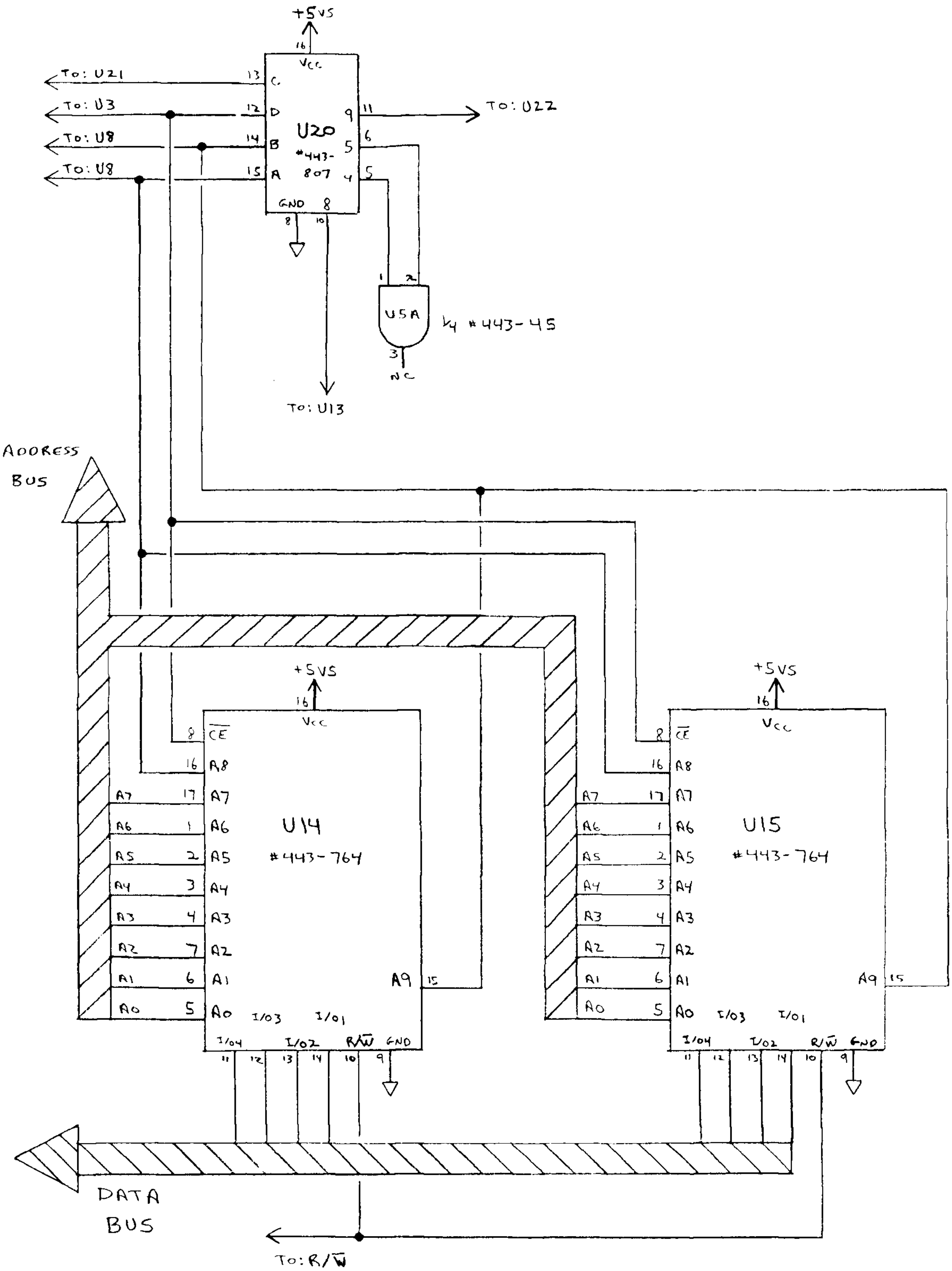

The Heathkit ET-3400A Microprocessor Trainer schematic. Modifications are shown.

THE GB3US Mk2

A microprocessor repeater logic system

PART 2

by A. J. T. Whitaker, G3RKL*

Construction

Fig 4 shows the pcb layout, and Fig 5 the corresponding component positions, the holes for which should be drilled 0·85mm diameter, except those for X1, Z1, RG1, C15 and all the preset resistors, which should be 1mm. The board has been designed so that there are no top soldered connections at any of the ic pins, so holders can be used throughout. If holders are used for ics 7, 11 and 14, RV8, RV9 and RV11 should be mounted on Veropins, otherwise they will not clear the holders without some "adjustment" with a file. Mounting the components is quite straightforward, the recommended order being through-pins (Veropins), diodes, resistors, presets, capacitors, ic holders and the remaining components. The crystal should be mounted on fibre washers, and the lugs on SK1 and SK2 (if used) removed to prevent fouling RV5, RV6 and the board mounting holes. When all the components have been inserted, a thorough check should be made to ensure that every connection, **top** and **bottom**, has been properly soldered, with no bridges; component polarity is correct where appropriate, and that no snagging or unwanted contact is made by the presets when turned through their full travel.

Setting up

The only test instruments required are a multimeter, dual-trace oscilloscope and audio oscillator.

1. If holders are used throughout, without any ics in place, apply +13·5V, check for shorts, and that the +5V and +10V lines are correct.
2. Set RV1, 2, 3, 7, 8 and 10 midway, and the rest of the presets fully counter-clockwise. Insert a 100Ω, 0·5W resistor between pins 21 and 12 in IC2's holder, and, omitting IC2 (the eprom), carefully insert all the other ics, taking due precautions with the cmos devices. Temporarily short SK1/5 (reset) to earth.
3. Apply +13·5V, check that the current is approximately 65mA and that the +5V and +10V lines are (still) correct.
4. Check that the crystal oscillator is working, and that a 1,750Hz square wave appears on IC10/2, 875Hz on IC10/5 and a short negative pulse of about 200μs on IC1/36 every 9·1ms.
5. Inject a 2V peak-to-peak sine wave into the receiver audio input (SK1/8) at 1,750Hz—the frequency can be checked against IC10/2—and set RV4 to give 1V pp at its wiper. As with the Mk1, this control is set in actual operation to give 1V p-p at this point for the maximum audio signal from the receiver (5kHz deviation for fm).
6. With the scope, testing at IC13/7 (notch filter output), carefully adjust RV1, which should give a small portion of travel over which the 1,750Hz signal is reduced. Set it in the centre of this portion and adjust RV2 and RV3 alternately to give minimum signal. Re-adjust these three presets to give the best null symmetrically about 1,750Hz. IC5/13, the logical audio input, should show a 1,750Hz square wave.
7. With the scope, testing at IC8/5 (pll vco), set RV6 to give a 1,750Hz waveform (again compare with IC10/2) changing R23 if necessary.
8. With the 1,750Hz still applied, advance RV5 to give about 400mV p-p at IC8/3. The 567 should lock, as indicated by IC5/15 going low.
9. Check all the other input lines at IC5 by putting the required logic value(s) on the appropriate input(s) at SK1 and SK2, including the frequency/battery indication.
10. Testing with the scope at the "hot" end of RV9, hold a 100nF capacitor across pins 4 and 5 of IC10, to leak a little 875Hz to the keying filter, and adjust RV8 for a maximum. Holding the 100nF capacitor across pins 2 and 3 of IC10, similarly tune the 1,750Hz filter with RV7.
11. Remove power, the 100Ω resistor in IC2's holder and the shunt across reset. Insert IC2, the eprom containing the station program and power up.
12. After about 5s, the unit will begin at its initialization point. If it does not, power down and up again (or just reset) until it does. Since it is now under software control, what happens will depend entirely on the program. The GB3US version sends a long bcs (beacon callsign) at this point. Testing with the scope at the transmitter audio output, by simulating the proper receiver audio and squelch inputs, the high level keyed tone amplitudes can be set and matched to the through-audio with RV9, low level with RV11, the Q output (software generated tone) with RV12, and the overall output level to the transmitter with RV10.
13. Finally, re-adjust with the station receiver and transmitter to give the required performance. A few minutes "tweaking" soon gives a feel for the adjustment procedure, which is actually quite straightforward. As with the Mk1, the outside connections may need to be made through a combination of ferrite beads, leadthrough and decoupling capacitors.

Software

A full description of the software is beyond the scope of this article, but a detailed listing, with some explanatory notes, of the original GB3US program is available by writing to the author. The basic subroutine blocks

An extract from the RSGB/Dept of Trade & Industry Specification for 145MHz/433MHz speech repeaters

Except where marked as a recommendation, the specification below is mandatory and forms part of the licence. Groups **must** equal or better the agreed specification.

Control logic

Access: The repeater must not be carrier-accessed directly from "cold", and adequate immunity must be provided against access by speech. Access shall be by a tone of 1,750Hz ± 25Hz at half-system deviation. The acceptance time of the tone shall be between 200 and 400ms.

Re-access: Once the repeater transmitter is switched on, subsequent control of talkthrough must be by carrier unless tone re-access has been permitted in writing by the RSGB.

Timeout: Provision of a restriction on "over" length is optional. If provided, timing is at the discretion of the group. Typical times are 2min on 145MHz units and 5min on 433MHz units.

Close-down: When the repeater is no longer required (no signals on input) it should automatically close down within a recommended period of 5-15s. From this point, access must require a further toneburst. In exceptional cases, the repeater may remain carrier accessed for up to 30s after it has shut down.

Station identification: The callsign as stated on the repeater licence (or as notified to you by RSGB HQ) must be transmitted automatically at not greater than 15min intervals, preferably more frequently, in F3A. A tone frequency of 1,750Hz is recommended, at 500-1,500Hz peak deviation. RSGB recommends that 433MHz repeaters identify every time they are accessed, and at an interval of 5 to 15min, whether they are in use or not (ie "beacon" "callsign"). Procedure on 145MHz units is optional but must be within the guidelines laid down in this paragraph.

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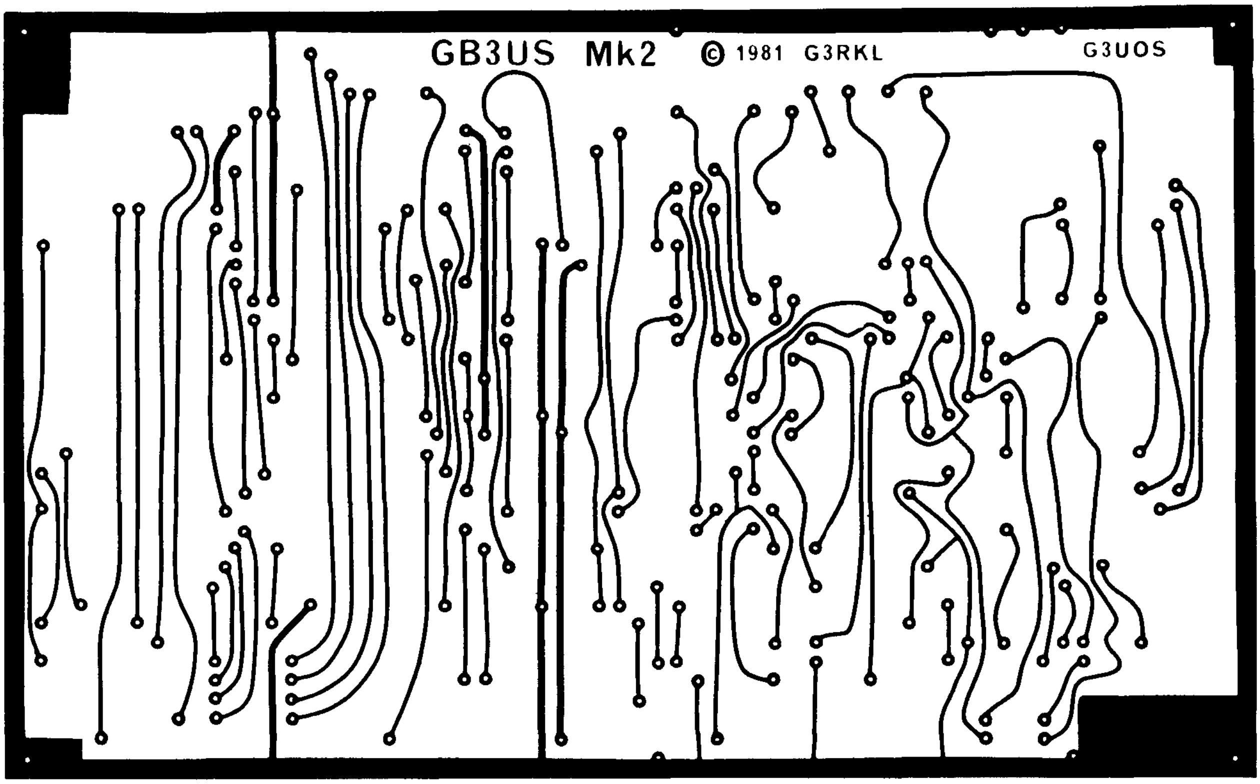


Fig 4(a) Top view of the pcb

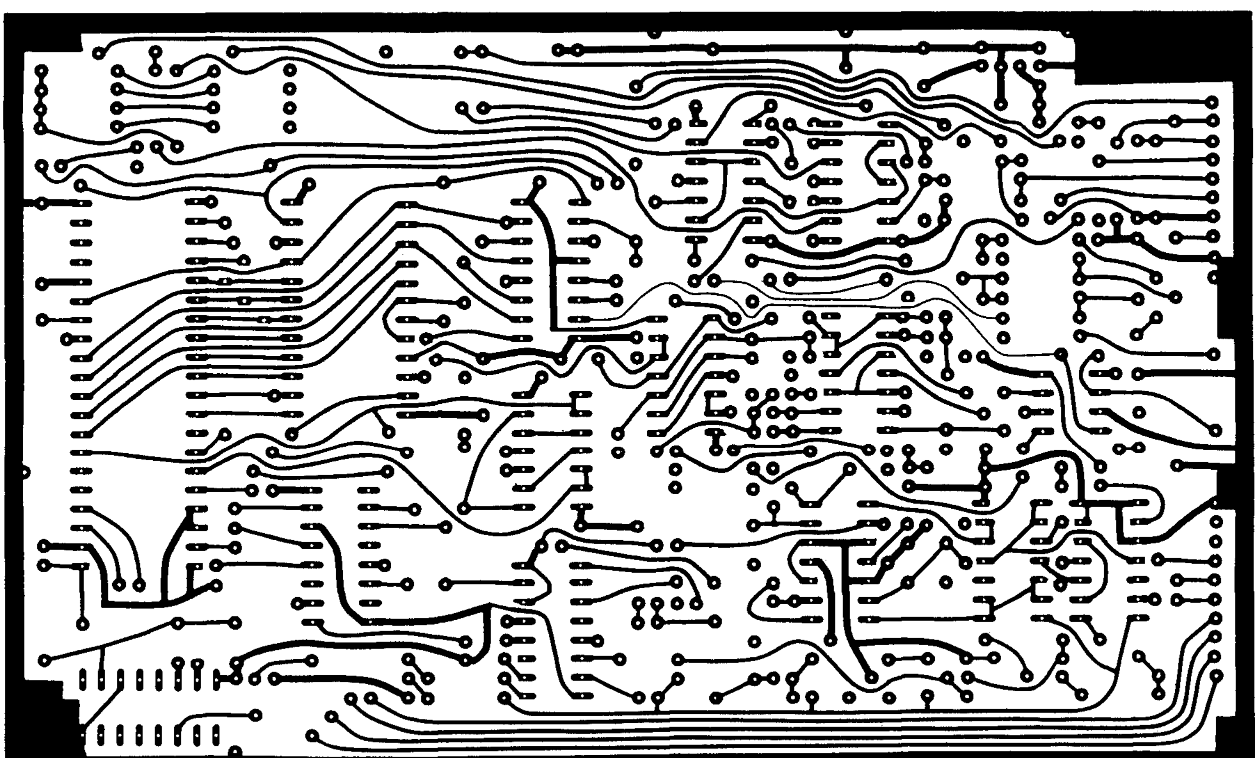


Fig 4(b) Underside view of the pcb

and their interconnection are shown in Fig 6, which give the following operating characteristics:

(a) Beacon callsign at 875Hz every 5min when not in use, sent as DE GB3US (short bcs), with every fourth one sent as DE GB3US SHEFFIELD (long bcs).

(b) Valid tone plus 5s of carrier for full initial access, success indicated by a low deviation callsign at 1,750Hz.

(c) 4min talkthrough time. (Present RWG recommended time is 5min for a 432MHz repeater.)

(d) 1s forbidden gap before reaccess, to allow other stations to break in.

(e) Carrier reaccess during a 10s reaccess period, indicated by two high-level 1,750Hz pips spaced 5s apart, the first replaceable by a status level H, L or B. Identification callsign sent when the timer is reset, if a period greater than 2min has elapsed since the last one.

The GB3US control program

```
000   7100 F800 B1F8 08A1 F89A BCBD 2D9D 3A0C
010   B5BE A2A8 ACAD AEAF F801 BFF8 4082 E2C4
020   9FFA EFBF FEFE F1FA 2032 389E FA0C 3238
030   FB0C 3238 9EFB 0C38 9E52 92F9 4082 F800
040   B1F8 48A1 E070 0000 02FB 01AE FA20 3254
050   9FF9 088F 9D3A 5F8D 3A5F 9FF9 208F 382D
060   8EFA 0132 6B92 F938 B230 7892 FA38 3278
070   92FF 08B2 8EF9 01AE 8EFA 0232 8392 F907
080   B230 9092 FA07 32A6 92FF 0182 8EF9 02AE
090   82FA 803A 9E22 82FB 163A E4F8 DAA2 82FA
0A0   7F32 E422 30E4 82FA 8032 D182 FA7F 32D1
0B0   88FA 803A B8F8 87A8 288E FA01 32CE 88FA
0C0   7F32 CA8E FA02 32E4 30CE 9FF9 108F F800
0D0   A8F8 00A2 9FFA 18FB 183A E49E FA01 C201
0E0   86C0 0509 F800 B3F8 EBA3 D39F FA07 B18F
0F0   FA80 A1D1
100   9FFA 1032 11F8 02B7 F823 A78F F980 AF30
110   809F FA20 3247 9EFA 3032 239E FF10 BEF8
120   1F30 299E F930 BEF8 42BB F806 B9F8 66A9
130   9EF9 81BE F880 BDF8 2CAD F880 B8AA 9FF9
140   40FA 5FBF C006 809F FA80 3262 8EFA 013A
150   62F8 08BB F806 B9F8 64A9 9EF9 41BE F870
160   303C 9FFA 403A 6B9E FA30 BE8F FAFE AFC0
170   0680
180   973A B787 3AB7 F833 B7F8 45A7 F880 BDF8
190   2CAD 9FFA 403A A4F8 0689 F866 A9F8 1FBB
1A0   F870 B8AA 9FF9 43FA 5BBF 9EFA 3FF9 43BE
1B0   8FFA 7FAF C003 E08E FA01 328F A530 E185
1C0   FA80 3AC7 F887 A525 85FA 7F3A EE9F FA40
1D0   3AD7 9EFA F030 DA9E FAFD BE8F FA7F AF30
1E0   E99E F903 BE27 C006 809F FA7F BF38 27C0
1F0   0680
300   9FFA 403A 989C 3A10 8C3A 109F F908 BF38
310   2C96 FB02 3A1B 86FB 2332 4796 FF60 3A24
320   8FFA FEAF 963A 4E86 3A4E 9FFA D8F9 86BF
330   8FFA 7FF9 00AF F880 BDF8 2CAD F80C B7F8
340   D1A7 9EFA FD30 9B9F F980 BFF8 1FA9 269F
350   FA20 CA04 3697 3A5B 87CE C427 8EFA 013A
360   6CF8 6EAB 9FFA F8F9 04BF 3093 86FA 7F3A
370   938E FA18 A395 F6F6 F6F6 3387 F633 8283
380   3092 83F9 0230 92F6 338F 83F9 0130 9283
390   F903 B59F FA80 3A9F 9EF9 03BE C006 809F
3A0   FAEF 8FF8 03B0 F8AA A0D0 E0F8 00B1 F848
3B0   A170 0029 89FA 10CE 7A00 893A C0F8 1FA9
3C0   78F8 5AA3 2383 3AC4 39C0 7A30 C19F FA40
3D0   3AD6 9EFA 33BE 9FFA 78F9 038F 8FFA 7FAF
3E0   F866 B6F8 8AA6 3000
400   2BBB 3A1C 9FFA 78F9 05BF 8FFA 7FF9 00AF
410   F804 B6F8 50A6 F890 A5C0 0680 8EFA 0132
420   2D9F FAF8 F903 BF8F FA7F F900 AF9F FA80
430   CA03 9FC0 0680 F833 B7F8 45A7 F880 BDF8
440   2CAD F806 B9F8 66A9 F81F BBF8 70B8 AA9F
450   F940 FADF BF9E FA3F F941 BEC0 0680
500   8EFA 0132 1A25 853A 1397 3A0D 87CA 03CD
510   C001 869E F903 BEC0 0680 2696 FB04 3A49
520   86FB 4E3A 4995 FA03 FC60 A9F8 06B9 F804
530   BBF8 60B8 AA9F F940 BF9E FA3F F941 BEF8
540   9ABC F800 ACB5 C006 8096 FB02 3A53 86FB
550   2832 2896 3A96 863A 968F FA01 3269 9FFA
560   F1BF 8FFA 7EAF C004 369F FAF7 BF8F F981
570   3065
580   9FFA 10CA 0186 9FFA 403A 179F FAF9 BF8F
590   FA7F AFC0 0167 F890 A59E FAFD 3016
600   8EFA 013A 0885 3211 2530 2797 3A23 873A
610   239F FA40 3A43 9FFA F8F9 05BF 8FF9 80AF
620   C004 3627 F86E A59F FA40 3A43 9FF9 40BF
630   F806 B9F8 49A9 F80C BBF8 20B8 AA9E FA3D
640   F941 8EF8 00B5 C006 80AA AA55
660   808A AAEA 5EE5 7A27 E3A8 A8CA CA92 A2A8
670   8AE2 B8A2 2E8E 95
680   9FFA 403A 8CF8 0080 F820 A000 9B32 E2B8
690   3295 2B30 8598 F6F6 F6F6 AB8A FA0F C649
6A0   BA8A FA03 3AC2 9AFE BA3B DF9E FE3B B7FE
6B0   3BBC 9EF9 0D30 BF9E F905 30BF 9EF9 09BE
6C0   300F FB01 3A01 9AFE BA33 DF8A F903 AAF8
6D0   02FB 023A DF9B FF01 BB9E FAF3 BE30 DF1A
6E0   3085 9FFA BFBF 9EFA 3FBE 3085
```

(f) Pulsed pre-timeout warning tone, under the through-audio, during the last 5s of relay.
(g) Non-reaccessible timeout indicated by a trimfone type tone (the famous 'HH "strangled parrot"), with 30s maximum default time.
(h) Tone reaccessible, high-level callsign (1,750Hz) at the end of timeout or first end-of-reaccess.
(i) Initial access conditions during second end-of-reaccess callsign, if less than 15s of relay have elapsed inbetween.
(j) Automatic Mode 2 during a "jammed" input, indicated by a reversal of the usual keyed tone frequencies. This allows the timer to be reset at any time by a valid tone. Automatic return to Mode 1 when the input clears.
(k) Software determination of a valid tone virtually eliminates false triggering on speech. Nominal acceptance duration is 200ms minimum to 1,000ms maximum, followed by 500ms of carrier.
(l) Letter "C" sent (1,750Hz) to indicate that the input has cleared after timeout and the transmitter has closed down.

The program is written in 1802 machine code, as shown in the listing. By copying this **exactly**, with the appropriate changes to the message store and length parameters, an eprom can be "blown" for a unit to work to the above specifications. The bcs message is stored (start address = 666) as a series of two-bit characters, 00 = interletter gap, 01 = interword gap, 10 = a dot, and 11 = a dash, the dot and dash characters automatically containing the one dot space. Thus the sequence "DE" will be coded as: interword gap, dash, dot, dot, interletter gap, dot, ... which equals 01, 11, 10, 10, 00, 10, ... which in hex is 7A,2-. The message length parameters, as a (two-bit) character count are located as follows: short bcs (and all other callsigns) at 120, 19E and 449 (= 1F for the 'US program), and long bcs at 128 (= 42 for 'US). The talkthrough timer is set at: high byte 3E1, low byte 3E4 as the number of 9·14285ms interrupts required, eg 4min = 26,250 = 668A. Location 04A should be 01 for a logical squelch (1 for carrier), and 00 for a relay squelch (0 for carrier). To help groups get started, on receipt of a 2516 the author is willing to program it as above, with the requested bcs message.

Program development

All the software for this unit has been developed using the RCA COSMAC evaluation kit (CDP18S020), by electrically substituting the kit's micro and ram for the unit's micro and eprom. This enabled the program to be edited in situ with the kit's monitor, but it is unlikely that many people would be able to use this very effective method. However, it might be possible to interface the unit to any of the popular home computers to give the same result, but probably the easiest way to develop a program is to actually blow an eprom and try it, since most home computers have eprom blowing capabilities. With the low cost of 2516s and of the unit itself, it is quite practical for a group to build at least two units, using the spare(s) for standby and program development.

Conclusion

The GB3US Mk2 logic unit is a completely self-contained board suitable for the control of any single channel phone repeater. It is small, easy to build, cheap, economical on power and very flexible in its method of operation. It is particularly suitable for groups running more than one repeater, as it offers the capability of hardware standardization between stations, but individual mode of operation determined solely by one replaceable eprom chip.

The actual program can be made as simple or as complicated as desired, giving the group complete control over the behaviour of their repeater(s), and it can be changed at any time to incorporate additional facilities or Department of Trade & Industry/Repeater Working Group requirements

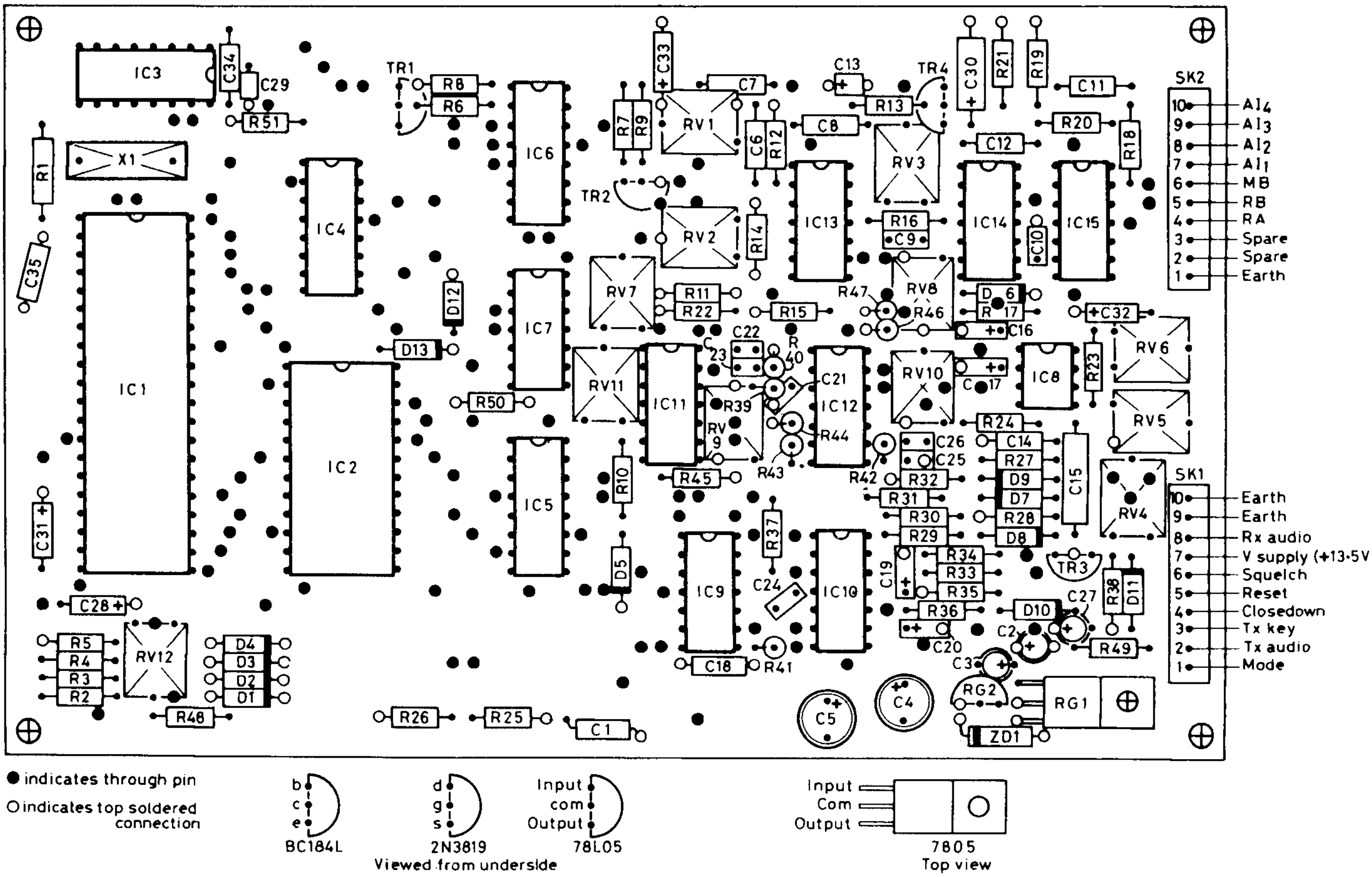


Fig 5. PCB component layout

as necessary. Program development should be possible on any of the popular home computers, providing they have a 2516 eprom programming board. For the many groups already using GB3US Mk1 logics, the Mk2 is a direct physical and electrical replacement, which will enable them to upgrade their control system to any desired level with a minimum of effort. Two units have been running on GB3US and GB3HH for over a year, and have given very satisfactory and reliable service.

References

[1] "A basic repeater logic system (the GB3US Mk1)" A. J. T. Whitaker, G3RKL. *Rad Com* Vol 56, No 1, January 1980, pp34–40.
[2] "Some additions to the GB3US basic repeater logic" A. J. T. Whitaker, G3RKL. *Rad Com* Vol 58, No 1, January 1982, pp30–31.
[3] *The CDP 1802CD Microprocessor Data Sheet—File Number 1023.* RCA Solid State Division, Somerville, NJ, 08876.

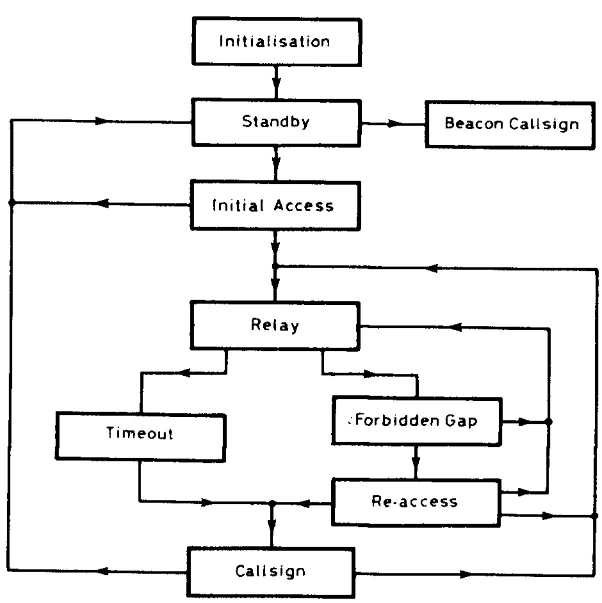


Fig 6. Software block diagram

The Motorola MC3361P

A new addition to the Motorola low power, narrow band FM-IF product line is the MC3361P. It is designed for use in FM dual conversion communications equipment, and is similar in design and application to the MC3357P. It contains an oscillator/mixer, limiting IF, quadrature detector, active filter, and mute function. The difference is that the MC3361P will work at supply voltages as low as 2.0-V dc, with the MC3357P operating only to 4.0-V dc. This is important in portable applications such as the cordless telephone handset, where it permits a battery complement reduction of two cells.

The MC3361P will operate without compromise on two carbon zinc AA (penlight) cells at near end-of-life condition. Also, it has a typical current drain of 4.2 mA. This is low with respect to the capabilities of this type of circuit, so battery life is long.

The performance of this circuit has not been compromised. Typical (-3 dB) limiting sensitivity is 2.0 uV rms, and recovered audio output voltage (at Vin = 5 mV rms) is 150 mV rms typical. The 100 and up price is $1.61 and its availability from stock is 6 weeks from the factory or through authorized Motorola distributors.

The Linker 100

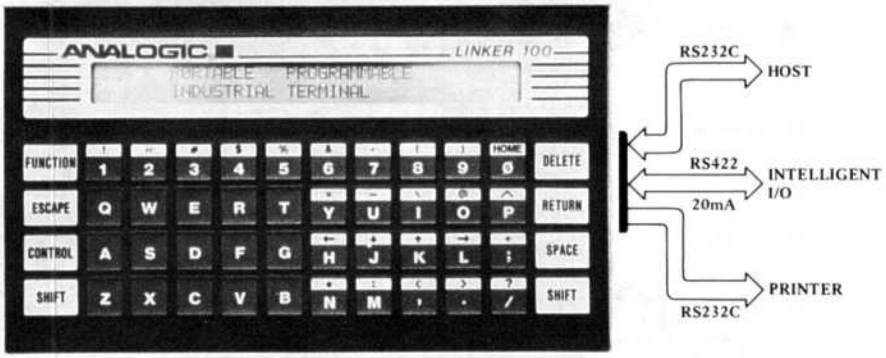
The Analogic Corporation of Danvers, Massachusetts, engages in the design and manufacture of high precision measurement, signal translation, and data manipulation equipment. The major business areas of the Company comprise four groups: Advanced Technology, Industrial Technology, Medical Technology, and Test and Measurements. These groups are involved in the disciplines of data conversion and array processing, industrial controls and calibration instruments, patient monitoring and diagnostic imaging, and automated testing.

The Industrial Technology Group is responsible for the Linker /TM/ 100, a newly-introduced industrial terminal/controller. Recently, networking capability was added to it so communications could be possible with a remote host computer or single intelligent peripherals from a central location via an RS422 or optional 20 mA compatible link, in addition to RS232C. The Linker 100 is user-programmable for performing PID, ramp/soak, cascade, ratio, or custom algorithms. Combining the features of compactness with intelligence, it is also ideal for field service/testing applications.

The Linker 100 is now supplied with a user-memory socket for expansion of the battery-protected RAM by 2k or 8k, or to add an additional 4, 8, 16, or 32k of UVPROM. A 2-line LCD display permits up to 40 ASCII characters per line.

The Linker 100 contains a central on-board computer (a Z8 processor with compact BASIC) that communicates with two internal intelligent peripherals (display and keyboard) and the equipment under control. Independent processors enhance programming flexibility and optimize computing speed. The Z8 is supported by external battery-protected 1.2k of user CMOS RAM and by an 8k utility PROM.

The Linker 100 is available from the Analogic Corporation at a price of $400 in quantities of 100 units or $595 for single orders. The 20-mA current loop is $50 with delivery approximately 6 weeks.



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2) document advanced technical work in the Amateur Radio field, and

3) support efforts to advance the state of the Amateur Radio art.

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