

LOW COST ENTRY INTO PACKET RADIO USING DIGICOM
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The purpose of this paper is to provide information on setting up a low cost packet radio system via the **Digicom** modem and software. It assumes the reader is minimally computer literate and has a basic knowledge and understanding of packet radio basics.

Florian Radlherr (**DL8MBT**) can be called the father of DIGICOM, although **DL2MDL** and **DL3RDB** must be credited as well. Digicom is a software-based packet radio system for either the C64 or the C128 developed in the mid 1980's. The **Digicom** system comprises of 1) modem 2) software 3) computer and 4) radio.

The modem utilizes the AM7910 chip which allows both VHF and HF operation. Some of the older modems use the TCM-3105 chip. The modem is available from various distributors and clubs (See Appendix A) assembled or in kit form at reasonable prices. I have supplied schematics (See Appendix B) for those wishing to build their own modem. The majority of the parts are available from local electronic stores while the chips can be mail ordered from larger distributors. Check your yellow pages.

In a recent phone call to Commodore Business Machines, they indicated that approximately 10 million C64's and another 7 million C128's have been manufactured and sold. These units are not only affordable compared to the IBM's and clones, but are a common hamfest item at bargain prices. The C64 is recommended for its inexpensiveness, however, its 40 column screen is a primary drawback. The user may not be aware of his 40 column handicap in a realtime packet QSO. However, once a BBS is accessed or file transfers are engaged where columns and listings are specifically aligned, the user may have visual difficulty equating 1 line of 80 columns with 2 lines of 40. Some Digicom software versions incorporate a hi-res option that will allow the user to switch from 40 column to 80 column mode. Although the intentions of this feature are good, it is impractical. One would need a magnifying glass to actually comprehend anything. To make the text easier to read, the user can obtain a green or amber screen Composite Monitor in the 12" range.

An important note regarding the new "flatbed style" C64C computers have a ceramic capacitor soldered across the cassette motor line. The motor line is used for TX in both Digicom and Digiprom versions. The capacitor is marked on the C64C as C84 and must be clipped out. Removal of this capacitor will not affect the normal usage of the computer.

A 1541 disk drive is used to load the floppy. Users

have daisy chained these drives to increase capacity while others have successfully hooked up Commodore hard drives. Those unable to acquire or afford a disk drive can purchase the software in cartridge form, **Although** not available for all programs, the cartridge versions are identical to the disk versions.

The C128 is the alternate option to the C64. The primary disadvantage is price. With a TV set as a monitor, the computer will display 40 columns in C128 or C64 mode. The back of the computer will allow an additional RGB monitor by way of a 9 pin cable. This will enable the user 80 columns in C128 mode, and thus, run C128 Digicom software without the inconvenience of overlapped lines as discussed above.

Computer die-hards with Commodore +4's and SX-64's will be pleased to find out there still is use for their equipment as well.. The Commodore +4 requires a memory add-on to operate the software written for it. The SX-64 has no cassette port, so the modem must be installed inside the computer. (See Appendix A for modification source)

The software is the workhorse for the system. It is the result of **hard** work on the part of the Digicom team in Germany and the Digiprom team in the United Kingdom. All software is public domain (shareware) and may be copied and distributed as long as all files are kept **entact** and no fees are charged. Unscrupulous entrepreneurs who have attempted to monopolize on these copyrighted versions have realized their folly after being taken to court! Over **the** years many versions of **sof** tware have been circulated, some being US modifications. (See Appendix C) Operation of the latest version will **ensure** the user of a bug free version and latest features. It is recommended that if the user wishes to run a NODE, use Digicom V3.60 or Digiprom V1.00, to run a PBBS (mailbox) use Digiprom V4.07A (UK version has no third **party** mail), to run a PBBS (mailbox) with auto-forwarding/reverse forwarding use Digiprom MB-XA. As of this paper, **the** latest Digicom Version 5.0 has been released from Germany.

The user's first task is to identify the version being used, load up *your favorite word processor and print out the documents. Those anxious to get started immediately, may begin the version simply by typing **LOAD"*",8,1**. I have found that several versions, after being loaded, will **not** execute when typing **RUN** at the ready prompt. Since the software is written in machine language, **typing** the command **SYS30720** after the ready prompt will start the program. The time should be entered initially, then the user's callsign with the command **MYCALL <callsign>**. All commands are preceded by a colon (:). **Lines** without a colon indicate converse mode and will be transmitted upon a carriage

return, Selection between 300 baud HF and 1200 baud VHF operation is done through a switch on the modem, not the software. **Any** user **attempting** to receive packet signals at HBAUD 1200 setting should experiment with values between 1135 and 1175. Also, make sure audio output on the modem is high enough by listening to yourself **on** a comparable receiver if connects are not being made.

There are two amazing basic features to the software that have always intrigued me. First, programs of the same format can be transferred between two computers without loading any special **programs** or transfer protocols. Second, the software allows **remote** control operation with varying degree of security levels. This is a feature that enables other users to do-something as simply as changing the hosts screen color, to more complex activities such as writing data files or programs to disk. With a hardware add-on, relays can be remotely turned on and off by packet. In addition to these basic features, some specialized versions include personal connect messages, mailbox options, autoforward and autoreverse (done with permission from your local packet BBS SYSOP), Local Area Network configuration (excellent to use when set-up between multiple users - it also allows for by-pass of major nodes eleviating congestion), and many more.

Finally, most radios are easily wired to the modem with little or no modification. Appendix D contains the wiring diagrams for the most popular **HT's** and mobiles.

Feel free to write to any of the amateurs in the source list for help. But please read the manuals first. Digicom is an excellent low cost system that will give you hours of enjoyment!

APPENDIX A

Drude, Ted **KA9ELV**. "**My SX-64 Runs Digicom**". 73 Amateur Radio, October 1989.
JSM Group, "**Digiprom V4 Series Instructions**". Peterborough, England.
Kutner, Barry N., **M.D. W2UP**. "**Digicom>64 - A Software-based Packet Radio System for the Commodore 64**". 73 Amateur Radio, August 1988.

ACKNOWLEDGEMENTS

Schematics courtesy of A&A Engineering, Anaheim, CA.
Thanks to Bill **G6WWW** of the non-profit Digiprom team who supplied which much need **information**,

SOFTWARE SOURCES

John **Bearsby**. PO Box 500, GPO Mirrabooka 6061. west Australia.
Don Henry, 21 **Hillview** Drive. Aldavilla 2440, NSW. Australia.
Archie Janks. PO Box 37126. Birnam Park, J/Burg 2015, South Africa,
Con **Kapoutsis**. 78 South Worpel Way. Mortlake, London **SW14 8NG**. Great Britain,
Peter Mallett. 22 Meehan Street. **Blenheim** 7301. South Island, New Zealand.
Micheal Mullikin, 5626 Viking Drive, Jackson, MI 49201.
Chris Rendenna, **KB2BBW** 709 Ten Eyck Avenue, Floor 2, Lyndhurst, NJ 07071.
Rick **Silverio**, c/o C.A.R.S., PO Box 653, **Meadville**, PA 16335.
Jack Thomas. 1705 East 28th Street 17. Ashtabula, OH 44004.
Lars Thunberg. Box 109. S-640 31 Melloesa. Sweden.

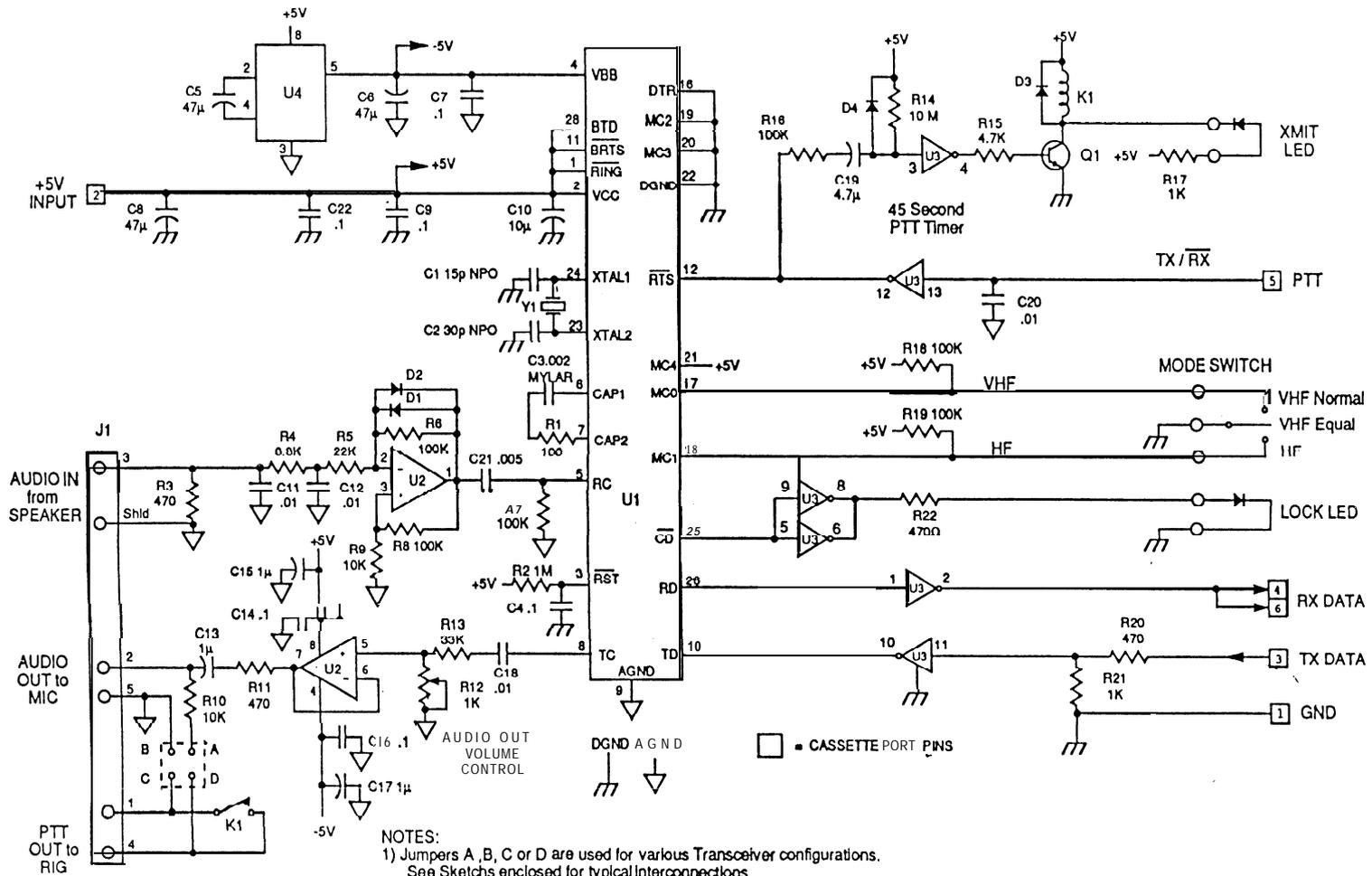
HARDWARE

A&A Engineering,, 2521 West **LaPalma**, Unit K, Anaheim, CA 92801. (714) 952-2114
Crawford Amateur Radio Society, PO Box 653, Meadville, PA 16335.
EasyTech, 2917 **Bayview** Drive, Fremont, CA 94538, (800) 582-4044. (One source for TCM-3105 chips.)
Ramsey Electronics, Inc., 793 Canning Parkway, Victor, NY 14564. (716) 924-4560.

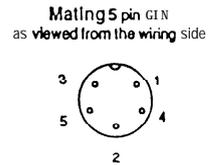
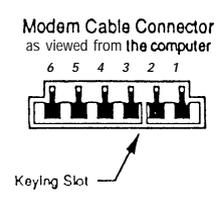
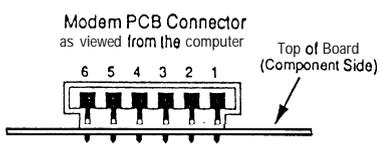
USE2 SUPPORT

The **DIGICOM EXCHANGE**, Chris Rendenna, Editor. 709 Ten Eyck Avenue, Floor 2, Lyndhurst, NJ 07071 (201) 939-6986.

This monthly newsletter was started on a voluntary basis over three years ago.. Send SASE for latest issue.



NOTES:
 1) Jumpers A, B, C or D are used for various Transceiver configurations. See Sketches enclosed for typical interconnections
 3) Audio out to RIG is 25 mV if R12 is set to center. Range is 0 to 50 mV.



APPENDIX B

A & A Engineering		2521 W. La Palma, Unit K Anahelm, CA. 92801 USA	
SCALE n/a		DRN BY STAS A	
DATE 13 MAR 88		REV 13 JAN 92	
DIGICOM >64 MODEM			
SCHEMATIC		DRAWING NUMBER	REV
		492-154	C

APPENDIX C
USERS SOFTWARE GUIDE

The following is an updated list originally published in THE DIGICOM EXCHANGE Vol. 2 No. 2 Feb. 1991. This revised list contains information obtained from Mike (KF6PU), Con (G6URT), Bill (G6WWW), Gorch (DF3MH) and Juan (LU3AGC).

DC>64 V1.42 - Utilizes User port. Least powerful of all versions. Has no multiconnect or binary xfer. Prototype.

DC>64 V1.50 - This is the original version written by DL8MBT in 1985 and was donated to the amateur world FREE.

DC>64 V1.51 - No multiconnect or binary xfer. Has gateway capability if two C-64s and two modems are used. (Not an official release)

DC>64 V1.52 - Same as V1.51 but with callsign W2UP in header. Hbaud corrections must be made with each of these versions as 50 hz clock is used. HB 1200 (1156) and HB 300 (289). (Not an official release.)

DC>64 V2.00 and DC>128 V2.00 - These are the last official versions from BAPR. Multiconnect, binary xfer, remote security levels, chat and node (true store and forward virtual circuit networking) are available.

DC>64 V2.03 - Same as V2.00 with Special character set, Status line. SABM retry bug is fixed and Dwait can be set to zero. Has Password security system and callsign and morning or evening annunciators can be stored in ctext with Ctrl-A and Ctrl-B.

DC>64 V2.10 - same as V2.00 but include improved printer and PERM routines.

DC>64 V2.1B - First of the PBBS versions of Digicom. Superseded by V3.00

DC>64 V2.11 - Great Britain revamp of V 2.00.

DC>64 V2.22 - Same as V2.10 with reverse print status line. "Port" replaces "DC-" on status line. "STBY" replaces "QRV". SABM retry bug is fixed. Dwait can be set to zero. Drives 8 and 9 can be accessed either locally or by remote. HDLC routines improved.

DC>64 V3.00 - Kantronics style PBBS functions. Mail can be read by msg. number. Messages are displayed in RLI/MBL-style format. This version dedicates Port 4 exclusively to Digicom node functions. K # and KM not supported. sysop can not selectively delete mail. PBBS-TIDY utility provides rather crude file maintenance capability.

This is a revamp of 2.11 by a Belgian amateur.

DC>64 V3.10 - Combines a debugged V3.00 with modified V4.0 PBBS TIDY. SABM retry bug is fixed. Dwait can be set to zero when desirable. V3.10 maintains prompt structure of V3.00 which is superior to V4.00.

DC>64 v3.11 - Same as V3.00 but upgraded by the JSM Group to include CW identification to comply with British regulations.

DC>64 V4.00 - Similiar to V3.00 . Double slashbars are no longer required for remote commands. Has Hi-Res loader with sound. Pbbs and Node command prompts are combined. V4.0 PBBS TIDY is much improved over earlier version. Selective file deletion is possible as is renumbering of messages. This is the first Digiprom written by Pete (G7AMW). This was a test program that was never intended to be released.

DP>64 V4.01 - Same as V4.00 with bugs removed by author Pete (G7AMW). Rewritten by Pete (G7AMW) to remove bugs and avoid illegal profits that were being made on V4.00 by unscrupulous people. Copyright notice and name change to Digiprom made. Available on cartridge and disk.

DC>64 V3.50 - Released in November of 1989(?). Many new functions added. Autorouting, expanded Editor functions, more node connect ports, quit text, and other functions.

DC>64 v3.51 - Supposedly there is a bug in V3.50 that is fixed in V3.51. Bugs in IPOLL. With some distributed copies, however, the program will lock-up when the user attempts to send a message while in MSYS BBS'. (See Vol 3 No. 2 Feb 92 and Vol. 3 No. 4 Apr 92 DIGICOM EXCHANGE) It is suspected that V3.51A is a USA custom version, however, as DIGICOM users pass along copies, the "A" has been left off or added randomly. This makes identification very difficult

DC>64 V3.51A - This was a modified version to V.3.51 (which in turn was a modification to v.3.50!). There were a couple of glitches, but the modifier or the origin of this is unknown. What has happened the years is that the is "A" is sometimes dropped or added when hams make disk copies for others, The end result is that you can't be sure which of the two you are actually getting.

DC>64 V3.60 - Official DL8MBT program. Excellent features enable configuration as 1) one operating port and PBBS (Personal Bulletin Board Service ie: mailbox) or 2) four operating ports, thus utilizing the full features.

DC>64 V3.61 - Same as V3.60 but for the c16.

DP>64 V4.05D - A mailbox program similar to V3.00, but now KM is supported. Other features include Jheard, Net-Rom node

simulation, different port connect messages, and page tone. Four extensive manuals extremely similar to V4.00. Could be a terminal program. Some copies need to be loaded with DP, then SYS30720 to run. Update to DP V4.01.

DP>64 V4.06A - This modified version from GIOEEC attempted to clear up bugs that 4.05D had. However, this version still had bugs.

DP>64 V4.07 - Four ports supported with autoforwarding from your local BBS to the mailbox. However, bug in autoforward.

DP>64 V4.07A - Major overhaul to this version in which memory locations had to be moved. Autoforwarding bug fixed, Two versions written: one for UK without 3rd party mail capability, and one non-UK version that does support 3rd party capability.

DC>64 V5.0 - Latest from the German Digicom Group. Features

include: Simultaneously use of two Channels and higher Baud Rates up to 9600 Bd (Even 19200 Baud are possible, but only good for a C128 as the C64 has a too slow Screen output) with an SCC-Cardridge plugged into the expansion-slot of the C64 or C128. Crossband operation with e.g. different Speeds is possible, C64 now manages 20 Ports (4 Screens and 16 Nodeports), C128 manages 40 Ports (4 Screens and 36 Nodeports). Path up to theoretic 37 Calls lenght possible. Node transparent what means lenght and PID of Frames are repeated in original form. Node answers with a little Prompt and handles now the "Recon-nected to..." feature used by other Nodes, Path-finder now only recognizes the three messages "connected", "busy" and "fail", whereby messages like "link setup* 0." no longer disturb the link setup procedure, Use of the Fast Serial with an 1581 Floppy Disk Drive with the C64 possible by fixing two wires. This is recommended when using higher baudrates and file-in/out. People running a too long TXDEL can become masked. out b-y a new command (MXFLAGS). Many, many mare features.-

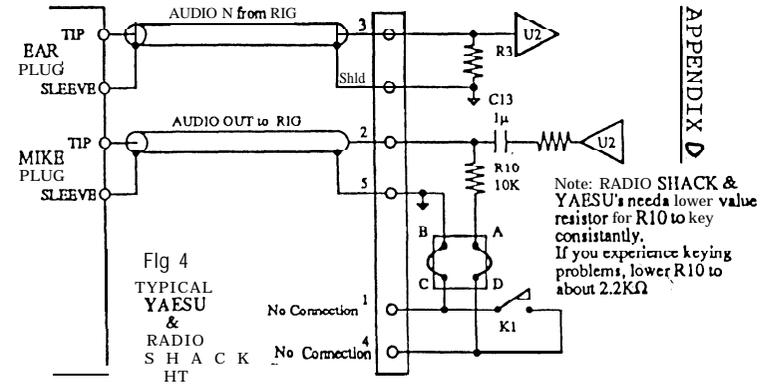
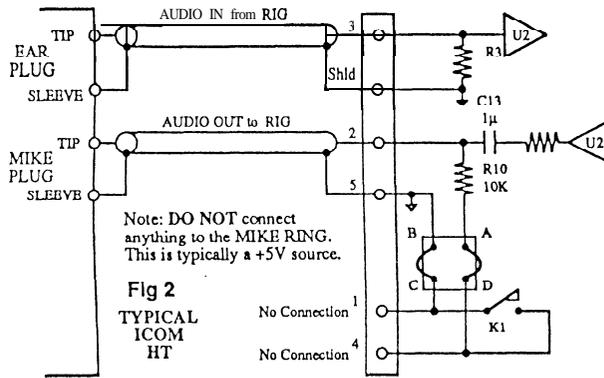
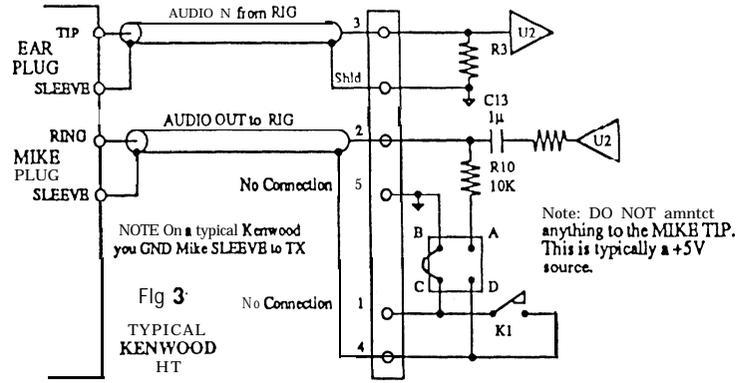
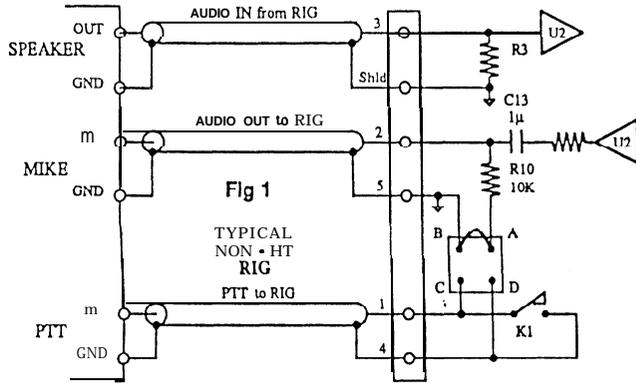
DP>64 MB-XA - Mailbox program (PBBS) with autoforwarding. Word processor included. Written for use with 801, 802, 803 and 1101 Commodore printers although some non-C64 printers will, work. Meant to compliment V4.07A, 80 column mode only!

DP>128 MB-XA - Self copying (self-extracting) program written exclusively for the C1.28 with three independent routines that check the system. Same program as above but for C128.

DP>64 MB-XB - Currently under development and testing.

DP> NODE V1.00 - Meant to be used in conjunction with JSM Gateway and DP V4.07A, but can stand alone too. Coomands include Bye, Connect, Info, JHeard, Mail, Nodes, Users.

TYPICAL MODEM INTERCONNECTIONS



APPENDIX D

Notes:

- 1) Figure 1 shows a typical, Non - Handi -Talky interconnection. Three separate shielded cables are recommended. If your rig does not supply three separate grounds, you may combine the shields at the rig. Miniature microphone cable (lapel mike cable) is recommended.
- 2) Figures 2, 3 and 4 show interconnections for typical HT's. Most Handi-Talkies don't have a separate PTT line. They are put into the transmit mode by applying a DC load from the MIKE HOT to GROUND, then super-imposing (AC coupling) the audio onto this same line. R10 applies the DC load and C13 does the AC coupling. These HT interconnection diagrams were submitted to us by various manufacturer's, these interconnections do work and are in wide use. (SOME KENWOOD'S ARE DIFFERENT)
- 3) NOT ALL of a certain manufacturer's rigs are the same.
YOUR RIG MAY BE DIFFERENT. CHECK YOUR OPERATORS MANUAL IF YOU HAVE PROBLEMS.

