

HSTDual

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Chapter 1

HSTDual

1.1 Upgrading an HST only modem to Dual Standard

From: Tom Larson
To: All
Subj.: HST upgrade (pt1)
Area: Fido - USR HST Modem

Date: 10-06-92 01:18
Msg#: 10459 -> 11568

[*]HST Modem Upgrade - by Bill Yung
[W.YUNG1]

UPGRADING AN HST ONLY MODEM TO DUAL STANDARD

PLEASE REMEMBER!

You are responsible for any damage or liability when you make any modifications or upgrades to your equipment. Also keep in mind that opening your computer may void your guarantee. If you are unsure of your ability to take on a hardware project, find someone who isn't.

IFF ILLUSTRATIONS:

To help you with this upgrade, you can find a series of IFF illustrations by the author. You should refer to these diagrams on how to modify your modem. The illustration are:

HSTDual.iff1,
HSTDual.iff2,
HSTDual.iff3,
HSTDual.iff4.

[*][*][*]

A v32.bis SOLUTION!

Times change quickly in the world of high-tech electronics and the world of telecommunications is certainly no exception. It wasn't long ago v.32bis was conceived. Now, with the advent of modems supporting this type of modulation at very affordable prices, new high speed users are coming on-line faster than ever before. In the past, US Robotics dominated the high-speed market with their HST modulation. Gradually, the tide seems to be turning and HST users are finding themselves unable to connect at high speed with the increasingly popular v32.bis modems. If you've found yourself in this predicament, read on and you may find an inexpensive solution to your plight.

The Upgrade:

The upgrade about to be described is not possible with all HST only modems. The particular upgrade pertains only to the newer model Courier HST 14.4 modems. The newest 16.8k modems are quite different from the previous 14.4 models and I have not had the opportunity to investigate the possibility of performing a similar upgrade on those nor on any older models. Refer to the graphic illustrations: HSTDual.iff1, HSTDual.iff2, HSTDual.iff3, HSTDual.iff4 to determine if you own an HST model suitable for this upgrade. I have personally performed this upgrade and have verified it's reliability on my own Courier HST. The largest benefit of doing this upgrade is the substantial savings involved. The value of this upgrade is somewhere around \$300-\$400 (based on the cost of a new v.32bis unit); however, the cost of required materials is approximately \$60. If you are handy with a soldering iron, the entire process should take about 8 hours.

The most difficult part of the operation was finding parts sources. I was able to obtain everything required in about 1 week. I was informed the main DSP (Digital Signal Processor) chip could take up to 12 weeks to be delivered since it is a "highly allocated" part. This did not prove to be the case as it showed up a mere 5 days after I placed the order. Hopefully, everyone else will receive the same surprisingly fast delivery. I'll include the sources for all necessary components below for your convenience. Just to clarify USR's position on the matter of parts procurement: They will not assist you in any way. They do not sell parts. In fact, there is no upgrade kit available for the type of modem to which this procedure is applicable. USR will upgrade the unit for a fee of \$350 according to Mark Eric of HST. This was the only information he was willing to offer.

How Dey Do Dat?

The HST modulation is asymmetrical. Data travels at 14.4k bps in one direction while the back channel proceeds at 450 bps. In order to serve as a v.32bis modem, we must install the necessary components to provide for 14.4k bps operation in both directions. There are illustrations to accompany this text and they do aid in determining if you have an appropriate model and in finding the correct position to install the new chips. In the event you are unable to obtain the graphic portions of this article, I will attempt to give a complete and accurate enough description to facilitate the successful completion of the project without them.

The first step is to open the case by removing the rubber feet at the rear of the case and the two phillips screws beneath them. The case can now be opened. You are now looking at the guts of one the best modems in the world. What? You're not impressed? Try removing the metallic shield that isolates the digital from the analog. There, that's better. The area you've just revealed is the focal point of our work and is shown in detail in Figure 4. Immediately noticeable should be several spaces suitable for mounting the necessary circuitry. If there are no unused spaces, you don't have the proper model for upgrading. Welp, it was worth a shot, huh? Thank you for your patience in bearing with me this far. I bid you farewell. If you do notice the aforementioned spaces, you're about to become the proud owner of a USR Dual Standard modem. As you further inspect the unit, you will notice the pc board is well marked. There will be very little doubt concerning where the parts are to be mounted. If you notice empty spaces that do not correspond to the details I'm about to present, you probably have an older model. Drop me a line on GENie and maybe we can come up with

a solution.

Some desoldering is required to clear the holes for mounting our new parts. This can best be done with a desoldering iron. Radio Shack carries one for under \$10 that does a good job. I would also recommend the use of desoldering braid for the more stubborn spots. This too is available at any local electronics shop, Radio Shack included. The task of clearing the solder out of all the necessary holes is the most tedious portion of this upgrade as it involves clearing a couple hundred holes. As desoldering goes, it's a straightforward operation because there are very few paths on the bottom side of the pc board. In light of this fact, every effort should be made to clear the holes from the bottom so as to avoid damaging traces.

All of the desoldering having been completed and the pc board ready for the new parts, refer to the following parts list with associated pc board silkscreen labels. If you don't have the graphic portion of this article, refer to these pcb labels to determine the correct location for parts placement.

A Word Of Caution:

Before installing an IC pay special attention to it's orientation as marked on the pc board. Unlike many circuits which have all chips oriented in the same direction, this circuit follows no such convention. Pay particular attention to the new DSP which is rotated 90 degrees from the existing DSP.

PCB label	Description	Source	Part #	Price
	68 pin PLCC socket	Easy Tech	PLC68	2.29
U206	T/I 33MHZ DSP	Arrow	TMS320C25FNL33	25.00
L8	6.8 uH RF Choke	Easy Tech	CH68	1.29
U207-U208	8k 25ns Static ram	Easy Tech	6264BP25	8.25
U209-U210	Octal buss xcvr	Digi-Key	74HCT245	.77
U211-U212	Octal buffer/drvr	Digi-Key	74HCT541	.74
R201,2,4	10K resistors	Digi-Key	P10ke-nd	5.99
Cap Type 1	.01 uF SMD caps	Mouser	140-CC501B103K	.49
Cap Type 2	.1 uf SMD caps	Mouser	140-CC502B104K	.69
Cap Type 3	100pf SMD cap	Mouser	140-CC501N101J	.35

Capacitors:

Type 1 C201,203,211,213,215,217,223

Type 2 C204,212,214,216,218,221,222

Type 3 C224

Some Notes About Suppliers:

The most important chip is the DSP. It's by far the most expensive and the hardest to find. I found a local Texas Instruments dealer who would order them for me at ten dollars each but I would have to buy 20 of them. I also found them in stock at Hamilton Avnet but there is a \$100 minimum order. Arrow Electronics is a national distributor with a \$25 minimum and this turned out to be the best source for a single part. Even though they did not have the part in stock and warned of a long delay, the chip arrived within a week in a 3X1X1 box. No, not 3 inch by 1 inch by 1 inch. Three feet by 1 foot by 1 foot! These guys really know how to pack a chip. The

packaging included a large, military spec desiccant, a humidity indicator, static shielding barrier film (with label indicating relative humidity when opened), a three foot plastic chip carrier and lots of packing popcorn. Wow! Needless to say, when installed, the chip worked fine.

Supplier	Phone Numbers	Terms
Arrow Electronics	1-800-321-3837	\$25 minimum
Easy Tech	1-800-582-4044	no minimum
Digi-Key	1-800-344-4539	<\$25 = \$5 fee
Mouser	1-800-346-6873	<\$20 = \$5 fee

Substitutions:

The pc board is designed to accept surface mount resistors and capacitors. These are sometimes hard to obtain in small quantities. The \$5.99 price for the 10k resistors represents the price for 200 of them. Even so the plastic tube they came in is no bigger than my little finger. Although they're really tiny, I had little trouble handling them and mounting them with conventional equipment. It might not be a bad idea to substitute conventional resistors and capacitors of the appropriate values for the surface mount devices. Such substitutes can be found at any local electronics shop. There is no real space restriction to prevent you from using the more common (albeit much larger) parts. If by chance you have trouble finding the 6.8 uH rf choke, you may place a jumper from L7 to provide the necessary B+ to the IC's.

Finally, The Fun Part:

Reassemble the modem and type ATI7 from your favorite terminal program. The modem should respond with:

ATI7 Configuration Profile...

Product type	External
Options	HST,V32
Clock Freq	16.0Mhz
Eprom	64k
Ram	32k
Supervisor date	03/05/91
IOP date	10/11/90
DSP date	03/04/91
Supervisor rev	3.0
IOP rev	1.3
DSP rev	10

OK

Did it work? Are you leaping with glee? Do I detect a tear of joy in your eye? I thought so. Congratulations. You've done a fine job. You may now be able to sell your modem for almost what you paid for it. Isn't that an enchanting thought? Thanks for coming along for the ride and have fun with your new dual standard.

Testing:

There's only one command set option needed to enable the v.32bis

handshaking. It's ATB0. Change this parameter and write it to NVRAM. From now on, your modem will attempt to negotiate a v.32bis connection with any modem it dials. If you call another dual standard, you will connect as a v.32bis, NOT HST. Therefore, you may want to change back to ATB1 when dialing duals. When dialing HST only modems, an HST connection will be made after a brief attempt at v32.bis. If you have trouble making a v32.bis connection, try dialing the GENie 9600 line in your area. I've experienced no trouble connecting with GENie at high speed.

WHAT? It Doesn't Work?:

Here's some things to try if you didn't achieve immediate success:

If the modem is completely dead:

Check the fuse. If it's blown, there's a reason why it blew. Don't just replace it and try it again. Try and find the cause of the trouble by looking for:

- 1) Shorts across leads of any capacitor.
- 2) IC's which may have been installed with incorrect orientation.
- 3) Globbs of solder left from desoldering which may be shorting.
- 4) A broken trace in a part of the modem you shouldn't be touching in the first place. Remember, we're adding a new circuit, not tampering with the old ones.

If the modem lights up and echoes back characters but doesn't show HST,V32 in the second line of the ATI7 response:

- 1) Type ATI2 from your terminal program. This checks the ram. you now have two banks of ram and should subsequently receive two OK's as a response. Like this:

ATI2

OK

OK

If you receive the correct response, the trouble is not in your ram. If you do not receive two OK's, make sure you have 35ns or faster static rams.

- 2) Did you remember to install L8? If you don't have a 6.8uh rf choke, did you install the jumper properly? The jumper should extend from the lead of L7 that is farthest from the edge of the modem to the through hole for L8 that is likewise, farthest from the edge.
 - 3) Did you install the DSP correctly in it's socket? Remember, it does not face the same way as the existing DSP.
 - 4) Did you make a parts substitution other than using conventional instead of SMD resistors and capacitors? For example:
Did you use 74LS541's instead of 74HCT541's?
 - 5) Nearly all connections are made on the top side of the pcb. check the legs of the chips on the top side to verify the establishment of a good solder joint.
 - 6) Also check for the items mentioned above in the "Completely Dead" section.
-

Hopefully, any problems will be resolved using these methods. If not, have yourself a good long cry because you trashed a \$600 modem and your wife will never let you buy another in a million years. She may even confiscate your tools to prevent you from destroying anything else around the house. (And we couldn't blame her one bit) Go ahead, get it out of your system. It's not good to keep that kind of emotional loss all bottled up. Okay, alright, enough of that. Get a grip on yourself. Take a couple deep breaths. Chant your mantra. Relax.....

Just kidding. In reality, if you've exhausted every other option, leave me e-mail on GENie and I'll try to bail you out but I can't be responsible for your actions or the quality of your work. Take your time when you do this upgrade. It's not a race. There is no prize for the who completes it the fastest. If you absolutely can't live without a modem for even one day (like me), do the desoldering one night and the soldering the next. It took me about 6-8 hours to do this, most of which was spent desoldering.

Performance:

I'm a relative novice to v.32bis so I'm not sure how the modem should perform but I have noticed some shortcomings in the v.32bis type modulation. First of all, there is one bbs with which I have trouble making a connection. The problem is intermittent. Usually when I DO have the trouble the modem will hang up while negotiating error correction. As soon as the ARQ light comes on, I get a NO CARRIER. This doesn't happen all the time and only with that one bbs. (The Woodworks. Thanks, Tim) Secondly, the modem realizes cps rates around 1300 even though the result string indicates I'm connected at 14400/V32. With HST modulation, 1650 cps is typical. Even so, 1300cps is noticeably faster than 280cps. (To say the least!) Other than that, I'm just ecstatic over the whole episode.

Acknowledgements:

I didn't figure this out without help from others. Those who contributed know who they are and I wish to thank them sincerely. Thanks to Atari for making a computer for those of us without patience, money or a doctorate. To those who offered nothing but disinformation and discouragement, I still think you make the best modem in the world. With that said, I have no further axe to grind and nothing nice to say either, leaving me with no alternative but to terminate our little chat....

-Bill Yung

I haven't tried this (my HST is too old, I believe this will work only for square LED models). It came from the GENIELAMP online magazine and should be fairly credible. I wouldn't suggest trying this unless you know what you are doing however.

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