

North American Response Centers

HP 3000 APPLICATION NOTE #18

THE CASE OF THE SUSPECT TRACK FOR 792X DISC DRIVES



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The Case of the SUSPECT TRACK for 792X Disc Drives

Did you ever have that sinking feeling when the message is displayed on the console that says SUSPECT TRACK ON LDEV X, DELETE, REASSIGN, RECOVER? Worse yet, after RECOVERing the sector the system doesn't seem to run quite right and you get the same message the next time you bring the system up!

This Application Note will explain what a **suspect track** is, how it became one, and, most importantly, what action to take when you encounter one. This discussion *only* applies to HP 7905, HP 7906, HP 7920, and HP 7925 disc drives (also known as the MAC disc family). Other drives, such as the HP 7933/35, use different mechanisms for dealing with defective tracks and so the information presented here does not apply.

As with other HP disc drives, the MAC family drives organize the data into sectors, tracks, and cylinders. A **sector** is the smallest addressable unit and consists of 128 16-bit words of usable data. Surrounding each sector are a 15-word preamble and a 7-word postamble. These areas are used by the disc controller to hold state and control information about the sector. For example, the preamble contains, among other things, the physical sector address (so the controller can check that it's really where it thinks it is) and the track status (SPARE, DEFECTIVE, PROTECTED). Tracks are simply concentric "rings" of sectors on a given surface; one track is the largest unit that the drive can transfer without either switching to a different surface or moving the head. The HP 7925 has 64 sectors per track; the other MAC-family drives have 48. A **cylinder** is the set of like-numbered tracks from all surfaces; think of it as a "stack" of tracks, one on top of the other. The drive can transfer an entire cylinder without moving the head mechanism.

What, then, is a suspect track? In its simplest form, it is a portion of the disc medium that the system "suspects" might be bad. MPE comes to this conclusion when it discovers that it cannot successfully read or write one or more sectors on the track after seven attempts. When this happens, the disc driver (HIOMDSC1) flags the track as suspect by making an entry for it in the **Defective Track Table (DTT)** in sector 1 of the disc in question. MPE records the error by logging it to the system log files, and then returns an I/O error to the process requesting the read or write.

Whenever the system is restarted, INITIAL (the program that brings up MPE) checks each system domain disc to see if there are any suspect tracks. (Private Volumes are processed by :VINIT, not INITIAL.) If so, you'll receive the SUSPECT TRACK message shown above. At this point, you have four options from which to choose; depending upon the option, the *entire track* and the files that reside on it may be lost. (If the track resides in free space, no files will be lost.) Let's have a look at the options available:

- 1) **DELETE**. This option will cause INITIAL to set the defective flag in the defective track table (DTT), and set the defective bit and cylinder address to %177777 in ALL the sector preambles on the track. The free space bit map is then updated with a RECOVER LOST DISC SPACE to reflect the loss of the track. If you decide to use this option during a restart other than a RELOAD, action is not always taken. (This will be discussed later.) Note that this *will* cause data loss if any permanent files reside on the bad track. You will need to RESTORE your lost data from tape.
- 2) **REASSIGN**. This option will cause INITIAL to write the address of an alternate track in the defective track's cylinder address and set the defective bit in the preamble. The disc then seeks to the alternate track and writes the address of the defective track in the preamble, and sets the spare bit. Data will be lost and the DTT will be updated.
- 3) **RECOVER**. Think of this option as IGNORE. This tells INITIAL to remove the entry from the DTT and *use the track anyway*. This is a temporary fix. The problem *will* come back if not handled

properly. Write down the address associated with the SUSPECT TRACK and call the Response Center to resolve this type of error.

- 4) **CARRIAGE RETURN**. This instructs INITIAL to keep the entry in the DTT and defer the decision of what to do with the suspect track until the next system restart. This option is useful if you do not know what to do with the track since it will keep the address in the DTT and the Response Center Engineers can then evaluate it later if necessary.

Considerations When Working With A Disc In The System Domain

Now that you know what options are available, let's take a look at special considerations for each, and how they affect your system operation.

If you develop a suspect track in the DIRECTORY of the system disc, your only option during a restart, with the exception of a RELOAD, is a RECOVER or CARRIAGE RETURN. Any other choice will result in data lost on that track and the possible need to RELOAD. During a RELOAD, you may DELETE or REASSIGN the track. The author recommends to DELETE the track. Performing a REASSIGN will cause the disc to perform multiple seeks to the newly reassigned area to read and write data. This may be a performance issue in certain instances. Now, since you have chosen the DELETE option, the directory will be moved to an error free contiguous area on the disc.

A suspect track in VIRTUAL MEMORY can not be DELETED or REASSIGNED except during a RELOAD. This results in virtual memory being moved to a error free contiguous disc space. Be aware that some versions of MPE report VIRTUAL MEMORY as being part of the FREE SPACE BIT MAP. This type of error can be handled by the Response Center; give us a call.

A suspect track in the system RESERVED AREA of a system disc can only be RECOVERED or CARRIAGE RETURNED during a start. Reserved area is a disc label, the defective tracks table itself, or INITIAL's area for boot. In any case, this is not good. A CARRIAGE RETURN is recommended in this case so that the Response Center Engineer will know which track is suspect.

You do not get the option to DELETE or REASSIGN a track in the system area on a COOLSTART since the system area consists of files and programs that are necessary for the system to keep running. If you could, you would be destroying system code or data.

Considerations When Working With Private Volumes and Serial Discs

Private volumes are handled differently from than system domain discs. Tracks that become SUSPECT on Private Volumes (PV's) should be REASSIGNED. The FORMAT command in VINIT correctly spares defective tracks; however, there is a problem. A SUSPECT TRACK on a PV is processed using the DTRACK command within VINIT. If the system is running MPE version E/F.00.00 (V/P) and the track is DELETED using the DTRACK command, the track REMAINS IN FREESPACE. This is a problem that is currently being addressed. The spare track table gets increased by one and you have a DELETED track in FREESPACE! If you perform a PDTRACK in VINIT the DTT shows the track as REASSIGNED to CYL= 0 HD= -1. The only way to fix this type of problem is to rebuild the entire disc pack or ignore the error. This can cause a problem because if the track is actually bad and DISC CACHING is enabled for the PV, a system failure 650/651 may result. The above problem should be fixed in MPE Version E.01.00 (V/R).

For a volume used as a SERIAL disc, you must use the SERIAL command in VINIT. This changes the disc label to indicate that the volume is a serial disc. Tracks flagged a SUSPECT on these discs should be REASSIGNED.

Preparing For The Case Of The Suspect Track

Now, what can you do to speed the process up? Before shutting the system down, run VINIT and perform a PDTRACK on all 792X disc drives. Any tracks flagged as SUSPECT, in this VINIT listing, will have to be dealt with on the next system start. Now run the program BADSECTR found in the TELESUP account (Note that this is an unsupported utility.) Following the instructions, input the LDEV number, cylinder, head (using the information from VINIT) and sector address. Start at sector 0 continuing for 48 sectors for a 7920 and 64 sectors for a 7925. BADSECTR will then tell you what area is in use for these addresses, whether it is a file(s), virtual memory, directory etc. Armed with this information you will now know what to expect when the system is started. To further your investigation, try to STORE the affected file(s) to tape or FCOPY the file(s) to another group. If this fails, then you will know the data that resides on that track will be lost. You should have backups on tape available.

There are other methods of minimizing data lost (MDL). Since 792X disc drives flag ALL sectors as being defective, it could be not all sectors are bad. It is possible that more than one file will reside in a given track. Therefore, why should all files, on the track, be purged if only one sector is defective? They don't have to. By analyzing your system log files, the Response Center can find the exact sector in the track that has the error on it. Running BADSECTR again and specifying this one sector, you will know the exact file that has the problem. The Response Center has methods for handling the case when only one sector on the track is bad.

Let's review ways of handling SUSPECT TRACKS. On a restart perform a CARRIAGE RETURN to keep the address in the DTT if you do not know how to handle the track in question. This will be of great help to the Response Center or your Account CE in their investigation of the problem. If the track proves to be a true media defect, DELETE the track. If the track was flagged as SUSPECT due to a hardware problem within the disc, the entry can be removed from the DTT with the help of the Response Center or Account CE.

Do not use DTRACK in VINIT to process suspect tracks on PV's if you are on MPE V/P or below since this will reassign the track incorrectly.

Well, that should do it. The clues are all uncovered and we have all the facts to handle our next SUSPECT TRACK. If you have any questions please don't hesitate to call the Response Center. We will be glad to answer your questions.

