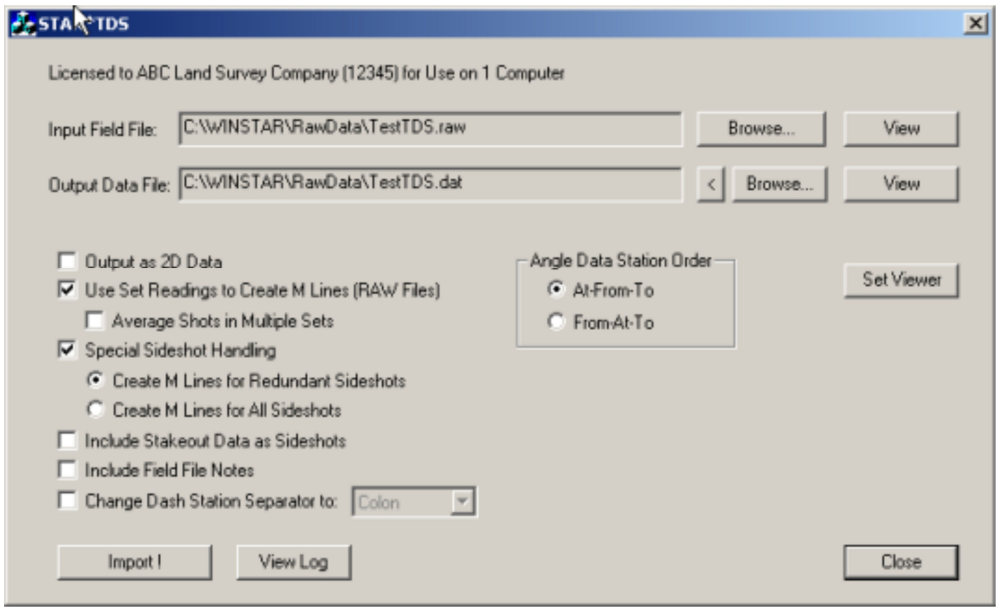
STAR*NET CONVERSION UTILTIES

STAR*TDS CONVERSION UTILITY

The STAR*TDS utility converts Tripod Data System data collector files to STAR*NET format.



Running the program is easy. First browse for the raw field file to convert, then browse for an output file (a new or existing file), set desired options and press the “Import” button. If errors or warnings are found, they are listed in a Log file - review by pressing “View Log” button. When errors are found, data will not be created in the output file. In this case, review the errors listed in the Log File, edit the raw field file to make necessary corrections and re-import.

When browsing for the output file, you can press one of two buttons. The standard “Browse” button opens the output file dialog in the same directory as the raw field file and offers the same file name as the raw field file, but with a “dat” extension. Of course you can modify the offered name to whatever you wish to use. The smaller “<” button opens the output file dialog in the same directory already shown in the field to the left – useful when you’ve stored output in a different directory during the previous run, and you want to output to that directory again.

A “View” button, next to each of the input and output file fields, brings up an editor. So besides viewing a file, you can also edit it. By default, the editor assigned is Windows “Notepad”, but just as in the STAR*NET program, you can set an editor of your choice by pressing the “Set Viewer” button and browsing for the editor program you prefer.

Selecting Processing Options

- Output as 2D Data – By default, STAR*NET data is created in a 3D output format. STAR*NET can handle 3D formatted data in both 2D and 3D adjustments. Since STAR*NET can internally reduce 3D data to 2D, creating data in 3D format should be considered preferable since all original data remains intact and STAR*NET handles reductions rigorously using curved earth geometry. However if you have local projects that are 2D and you prefer to have your data immediately converted to 2D format by applying a simple reduction of distance and zenith observations to horizontal distances, you can select this option.
- Use Set Readings to Create M Lines – This option adds features for converting RAW files collected by TDS software designed for the Ranger and Recon. When this option is selected, the program detects “sets” in the field file and outputs a backsight DV line (when backsight information is available) and a foresight M line for each set. Note that this option relies on the presence of RF (Repeat Foresight) lines in the RAW files to work. When this option is not selected (or when the field file is an older RW5 type), only single SS or M STAR*NET data lines are created from the single SS, TR or OB observation lines found in the field file.

Average Shots in Multiple Sets – When this sub-option is selected, any multiple sets present will be averaged and only a single set is output as STAR*NET data.

- Special Sideshot Handling – By default, SS lines in the field file are converted to SS sideshot type lines in the STAR*NET data file. Remember that SS lines in STAR*NET are handled as non-redundant shots that are automatically calculated after an adjustment is performed. This allows the processing of thousands of topo sideshots without slowing down the adjustment. To have sideshots handled differently, select this option and a special handling method:

  Create M Lines for Redundant Sideshots – Causes a sideshot SS to be output as an M line if the target of the sideshot has the same name as any other foresight point, backsight point or occupied point in the file. This assures that the observation will be included as a redundant observation in the STAR*NET adjustment. This is recommended for most conversions.

  Create M Lines for All Sideshots – Causes all sideshot SS lines to be output as M lines. Good for small networks when you want all sideshots included in the actual network adjustment.

  Important Note! When backsight and foresight target names for a SS are the same, a DV line is always created whether "Special Sideshot Handling" is selected or not. The assumption is that you are taking a check shot observation to your backsight station.

- Include Stakeout Data – By default, TDS stakeout records present in field files are ignored. Selecting this option causes stakeout (SK) records in the raw file to be processed as sideshot records and included in the output data file.
- Include Field File Notes – Causes field file note lines to be included in the output data file.
- Change Dash Station Separator to – By default, the dash (e.g. 121-120-122) is used for station name separators. If some of your station names already contain dashes and you wish to keep them, this option allows you to change the separator to some other character.
- Angle Data Station Order – This is simply an output preference. Some surveyors prefer to see angular observations shown as At-From-To, others as From-At-To.

General Notes on Input and Output

- The program assumes field files have "RAW" or "RW5" extensions. If you have a file with a different extension, choose "All Files (*.*)" from the "File of type" field in the file selection dialog and then select the file you wish to convert from the complete list.
- In the field file, blank lines and lines beginning with the "#" character are ignored. You can edit the raw file and prefix any line with a "#" character rather that deleting the line.
- The Program supports ".DATA ON" and ".DATA OFF" inline options just like with most other STAR*NET conversion utilities. To cause selected parts of the raw field file to be ignored, insert a ".DATA OFF" line beginning at the place you want data to start being ignored and then a ".DATA ON" where you want data to be again converted.
- Stored Points found in the field file are copied into the data file as comments. To use one of these points as a control point in STAR*NET data, simply uncomment the data line and edit-in the appropriate fixity codes. Example: C 25 10000.000 10000.000 500.000 ! ! !
- Note that at the beginning of a STAR*NET data file created by this converter program, several inline option lines are included. For example:

```
.Units  FeetUS
.Units  DMS
.Order  AtFromTo
.Sep    -
.Delta  Off
```

```
.3D
```

Some of these inline options define information such as linear or angular units set in the field file header data or set by options in the converter dialog. These inline options precede data they define making it possible to combine data files having different characteristics in a single STAR*NET project.

- An entire data file created by this utility can be added to a STAR*NET project using the “Input Data Files” dialog (see the STAR*NET manual), or using a text editor you can copy and paste all or parts of the file contents into a data file that already exists as part of a STAR*NET project.
- The “Log File” is always created during a run. It lists any errors, warnings or notes produced during the run and references actual line numbers in the field file. This file has the same name as the input field file but with a “log” extension and is always created in the same directory as the input file. Review it by pressing the “View Log” button. When errors are reported, an output data file is not created and you should review the log file so you can correct errors and rerun. When only warnings are reported, an output data file is created, but it is still important to review any warning messages in the log file to determine the reason they were reported.
- A code “DP” (meaning “Delete Point”) may exist in TDS field files. No operations are currently performed by the converter for this code. If the surveyor feels that certain observations should be removed from the field file because of this “DP” code (for example observations that created the point, or observations that may occupy or backsight the point), the responsibility must remain with the surveyor to do so.

How the Program Processes the Field File

The conversion utility reads the complete field file into memory, verifying the syntax of all data codes and values, and organizing all data in sequence by type. If errors are found in syntax or numerical data fields, data conversion is not performed and errors are written to the log file.

When the converter parses raw data lines, it checks to assure the code beginning each data line (eg. JB, SP, BK, LS, OC, SS, TR, RB, RF, etc.) is one of the codes in the TDS code set documented at the time this converter version was released. If not, the data line is ignored.

If the data from the field file appears OK, the output is created based on the processing options you selected. Since all data from a field file is organized in memory, checking requirements for processing certain options are very efficient. For example, checking a sideshot to see if the target is redundant is determined by checking all other targets, backsights and points occupied.

When using field data collected by newer generation Ranger and Recon hardware and software that creates files with RAW extensions, STAR*TDS can parse the individual sets. If the option is selected that all “sets” at an instrument occupation point are to be averaged, the converter reviews all the sets having the same backsight and foresight points to assure that these sets all have the same characteristics, i.e. same HI/HT values and same observation types. (Observation types would differ if one set had slope distances/zenith angles but the other set had horizontal distances/elevation differences.) For example, if the converter found five sets with the same backsight/foresight points, but two sets had different HT values than the other three, the converter would output the average of the two sets and the average of the three sets separately. See more information regarding processing of “sets” on the next page.

When the user chooses to have field data converted into 2D format, some of the processing is simplified. For example, in the case of the five sets that have inconsistent HI/HT values mentioned in the last paragraph for a 3D conversion, all HI/HT values will be ignored in a 2D conversion, therefore you would simply get an average of all five sets output.

TDS data resections are handled by creating “direction sets” in the output data. One direction set line is output for every RS line found in a resection sequence. A resection sequence is a series of two or more RS records terminated by a single SP (Store Point) record that defines the point being occupied. Both Face-1 and Face-2 observations are handled in a resection sequence.

For example, if the following resection sequence appears in a TDS field file:

```
RS,PN10,CR285.0259,ZE91.5139,SD50.674
RS,PN9,CR63.5849,ZE91.3137,SD51.758
RS,PN8,CR100.2225,ZE91.5721,SD52.774
SP,PN200,N 1394095.56789,E 2207255.22183,EL657.00
```

The following STAR*NET direction set will be created as data:

```
DB 200
DM 10                285-02-59.00     50.6740  91-51-39.00
DM 9                  63-58-49.00     51.7580  91-31-37.00
DM 8                 100-22-25.00     52.7740  91-57-21.00
DE
```

How Sets in “RAW” Field Files Are Converted

Sets in “RAW” field files collected with the Recon and Ranger are supported. Some additional explanation however may help you understand how conversion of these sets takes place.

Sets usually include RB and RF lines (mnemonics for Repeat Backsight and Repeat Foresight). When both RB and RF lines are present, StarTDS outputs DV and M lines. The DV line is the average of the Face-1 and Face-2 backsight information, and the M line is the average of the Face-1 and Face-2 foresight information. RB lines in the RAW file, however, may or may not be present depending on whether backsight distances are being observed. When RB lines are not present in collected data for a set, the converter does not output a DV line.

A set (or group of sets) in the RAW file is always terminated by a TR or SS line that contains the “average” of the set or sets. This “ending” TR or SS line may appear directly after the set data, or it may appear later, after one or more regular sideshots to other targets.

During conversion to STAR*NET data, the Height of Reflector for the backsight is read from the RB line (when it is present). The HR for the foresight, however, is read from the LS (Line of Sight) line found most prior to the “ending” TR or SS line, not from the RF line. (Why is this? Because after observations for a set are complete, the surveyor is prompted for an HR in case he wants to enter a corrected value. If he does enter a new value, that revised HR value is not displayed on the RF line! TDS plans to fix this problem in their RAW files in some future version.) Note that that the foresight descriptor is also taken from the “ending” TR or SS line.

So at the end of a set (or group of sets) sequence, the converter searches forward through the raw data looking for the “ending” TR or SS line. (It will have the same occupy and foresight point names as used in the set.) Once this ending TR or SS line is found, the set data lines in STAR*NET format are then written to the output file.

The example below illustrates a typical set in a RAW field file. It shows the RB and RF lines, and later the “ending” TR line for the set defining foresight point 101. In this example, the surveyor observed a set targeting foresight point 101, did a “Traverse Later”, observed some sideshots and then finally did a “Traverse Now” to point 101.

```
OC,OP100,N 461076.88161,E 843516.024317,EL680.7215,--
LS,HI5.25,HR5.0
BK,OP100,BP99,BS301.5919,BC0.0000
RD,BD 1:0.0000
RB,OP100,BP99,AR0.0000,ZE92.5434,SD193.208,HR5.1,--PIN
RD,FD 1:188.5953
RD,ZD 1:88.5058
MD,SD 1:297.624
RF,OP100,FP101,AR188.5953,ZE88.5058,SD297.624,HR5.0,--
```

```
RD,FV 1:8.5948
RD,ZV 1:271.0846
MD,SD 1:297.614
RF,OP100,FP101,AR8.5948,ZE271.0846,SD297.614,HR5.0,--
RD,BV 1:179.5958
RB,OP100,BP99,AR179.5958,ZE267.0505,SD193.207,HR5.1,--PIN
--Traverse later to point: 101
LS,HI5.25,HR5.55
SS,OP100,FP551,AR282.3617,ZE90.2648,SD43.946,--
SS,OP100,FP552,AR344.0926,ZE93.1310,SD101.288,--
LS,HI5.25,HR5.0
TR,OP100,FP101,AR188.5952,ZE88.5106,SD297.619,--OA    <--- Ending TR Line for the Set
OC,OP101,N460881.719276,E 843740.642119,EL686.926039,--
```

Sometimes the “ending” TR or SS line cannot be found! The most common reason for this is that when a set of observations is completed, the surveyor does a “Traverse Later” and then takes some sideshots. Then after the sideshots, the surveyor neglects to “Traverse Now” to his traverse point. This can cause the ending TR or SS line in the raw file to be lost. Or if power is turned off on the collector at the wrong time, this may also cause an ending TR or SS line to be lost.

When STAR*TDS processes a “set” of observations but cannot find the “ending” TR or SS line, the conversion stops and an error is posted in the log file. If the “set” data shown on the previous page were missing the ending TR line, the error message would look similar to this:

```
ERROR [Lines: 166-178] Reading set but missing ending TR or SS line.
Occupy: 100; Foresight Point: 101.
```

This error must be fixed before the conversion can be completed! You can edit a TR or SS line into your RAW data, but an easier way is to edit in an “Inline Option” that has been included in the TDS converter utility especially for this purpose. The inline option has this format:

```
.ENDSET  OccupyName  ForesightName  'Descriptor
```

This inline option must be used only when the “ending” TR or SS line has been lost. Edit this option into the RAW file directly after the “set” data but before any other observation data. Make sure to locate this inline so that the correct Height of Reflector value will be applied.

The set below is identical to the set shown on the previous page except that (a) when the surveyor was prompted for a new HR after the set was observed, he entered a new 6.77 value, and (b) the ending TR line was lost because of a “Traverse Later” problem discussed earlier. In this example, you will see the LS line with the new target height appearing directly after the set. So in this case, entering an “.ENDSET” inline right after the new LS line and before any other observation data will fix the “missing TR line” problem and also assure the correct HR will be assigned.

```
OC,OP100,N 461076.88161,E 843516.024317,EL680.7215,--
LS,HI5.25,HR5.0
BK,OP100,BP99,BS301.5919,BC0.0000
RD,BD 1:0.0000
RB,OP100,BP99,AR0.0000,ZE92.5434,SD193.208,HR5.1,--PIN
RD,FD 1:188.5953
RD,ZD 1:88.5058
MD,SD 1:297.624
```

```
RF,OP100,FP101,AR188.5953,ZE88.5058,SD297.624,HR5.0,--
RD,FV 1:8.5948
RD,ZV 1:271.0846
MD,SD 1:297.614
RF,OP100,FP101,AR8.5948,ZE271.0846,SD297.614,HR5.0,--
RD,BV 1:179.5958
RB,OP100,BP99,AR179.5958,ZE267.0505,SD193.207,HR5.1,--PIN
LS,HI5.25,HR6.77          <--- The revised HR for the foresight shows up here.
.ENDSET 100 101 'OAK      <--- Adding this inline acts as the missing TR or SS line!
--Traverse later to point: 101
LS,HI5.25,HR5.55
SS,OP100,FP551,AR282.3617,ZE90.2648,SD43.946,--
SS,OP100,FP552,AR344.0926,ZE93.1310,SD101.288,--
OC,OP101,N460881.719276,E 843740.642119,EL686.926039,--
```

Using a Slash "/" Code in the Descriptor to Automatically Rename a Point

When reobserving a point in the field, some users often enter a fake name such as "9999" so they can compare the resulting coordinates in the instrument to the currently stored coordinates by inversing the two points, or perhaps some other method. But of course, the real point name must always be used in STAR*NET observation data. To cause the real name to be automatically output during conversion, enter a slash "/" as the first character of the descriptor and follow it directly by the actual point name you want to appear in the STAR*NET data. You can optionally follow that point name by a space and add a descriptor.

Example raw data line with point name 9999 and the "/" command to change it to 4567:

```
SS,OP210,FP9999,AR317.0432,ZE98.2710,SD59.58288,--/4567 CURB EDGE
```

Resulting data file in STAR*NET format with 4567 used as the target name:

```
SS 210-209-4567  317-04-32.00  59.5829  98-27-10.00  5.390/7.000 'CURB EDGE
```

Note that the change to the specified target name it is a simple and immediate substitution as the raw data is being read by the converter. This renaming feature can be used with any observation type including "Sets" of observations.

Important Information about Linear Units with Old RW5 Field Files

Old TDS collector software used with HP-48 collectors gives you a choice of recording data in Feet or Meters. If you choose Feet, data collected is recorded as International Feet - not US Feet. Most users we have talked with do not know this!

So then if you run STAR*NET in US Feet using this file, all linear data including the coordinates will be converted from International Feet to US Feet during the adjustment. You probably don't want these coordinates to change! To easily handle this, put a ".UNITS FEETUS" inline option before any fixed coordinates (so they remain to be handled as US Feet), and then a ".UNITS FEETINT" inline before the observation data (so observations are still handled as collected).

Example Input Field File

The following is the beginning of a sample field file named TestTDS.raw supplied with the program. You can use this file to make a test run with the STAR*TDS converter utility.

```
JB,NMi20k0407,DT04-07-2004,TM09:49:11
MO,AD0,UN2,SF0.999886,EC0,EO0.0,AU0
OC,OP545,N 1366305.932,E 2134663.1935,EL1069.6036,--1/2" RBS(T)
BK,OP545,BP544,BS70.2757,BC0.0000
--HR at Backsight: 4.98
LS,HI5.59,HR5.46
RD,BD 1:359.5959
--BS zenith: 89.5845, slope dist: 227.189539
RB,OP545,BP544,AR359.5959,ZE89.5845,SD227.189539,HR4.98,--1/2" RBS(T)
RD,FD 1:180.2907
RD,ZD 1:90.0022
MD,SD 1:208.882391
RF,OP545,FP547,AR180.2907,ZE90.0022,SD208.882391,HR5.46,--1/2"rbs
RD,FV 1:0.2857
RD,ZV 1:269.5941
MD,SD 1:208.885475
RF,OP545,FP547,AR0.2857,ZE269.5941,SD208.885475,HR5.46,--1/2"rbs
RD,BV 1:179.5949
--BS zenith: 270.0117, slope dist: 227.186029
RB,OP545,BP544,AR179.5949,ZE270.0117,SD227.186029,HR4.98,--1/2" RBS(T)
--Horizontal Angle Error: 0.0000
--Zenith Angle Error: 0.0002
--Slope Distance Error: 0.003084
--Horizontal Angle Error compares to the average: 0.0000
--Zenith Angle Error compares to the average: 0.0000
--Slope Distance Error compares to the average: -0.001435
RD,BD 2:359.5958
--BS zenith: 89.5845, slope dist: 227.196298
RB,OP545,BP544,AR359.5958,ZE89.5845,SD227.196298,HR4.98,--1/2" RBS(T)
RD,FD 2:180.2905
RD,ZD 2:90.0022
MD,SD 2:208.888132
RF,OP545,FP547,AR180.2905,ZE90.0022,SD208.888132,HR5.46,--1/2"rbs
RD,FV 2:0.2857
RD,ZV 2:269.5940
MD,SD 2:208.885475
RF,OP545,FP547,AR0.2857,ZE269.5940,SD208.885475,HR5.46,--1/2"rbs
RD,BV 2:179.5948
--BS zenith: 270.0117, slope dist: 227.191048
RB,OP545,BP544,AR179.5948,ZE270.0117,SD227.191048,HR4.98,--1/2" RBS(T)
--Horizontal Angle Error: 0.0002
--Zenith Angle Error: 0.0002
--Slope Distance Error: 0.002657
--Horizontal Angle Error compares to the average: 0.0000
--Zenith Angle Error compares to the average: 0.0000
--Slope Distance Error compares to the average: 0.001435
SS,OP545,FP547,AR180.2908,ZE90.0021,SD208.885368,--1/2"rbs
OC,OP546,N 1366288.7056,E 2134613.8267,EL1069.7197,--1/2" RBS(T)
LS,HI5.14,HR5.31
BK,OP546,BP545,BS70.4549,BC0.0000
--HR at Backsight: 5.21
--BS check 546 - 545:ZE90.0302,SD52.290775,HD err= -0.001237, VD err= 0.000021
--BS Circle check : angular err= 0.0001
RD,BD 1:0.0001
--BS zenith: 90.0302, slope dist: 52.289167
RB,OP546,BP545,AR0.0001,ZE90.0302,SD52.289167,HR5.21,--1/2" RBS(T)
RD,FD 1:87.0623
RD,ZD 1:109.3111
MD,SD 1:122.852576
RF,OP546,FP58036,AR87.0623,ZE109.3111,SD122.852576,HR5.31,--1/2"rbs

etc...
```

Example Output File

This is the resulting TestTDS.dat file in STAR*NET format converted using the processing options shown on the first page. You can experiment using different options.

```
# STAR*TDS Version 7.2.2
# Copyright 2012 MicroSurvey Software Inc.

# Input Field File : C:\RawData\TestTDS.raw
# Date Processed   : 02-22-2006 10:29:56

.Units  FeetUS
.Units  DMS
.Order  AtFromTo
.Sep    -
.Delta  Off
.3D

# Job  : i20k0407
# Date : 04-07-2004
# Time : 09:49:11

DV 545-544                          227.1878  89-58-44.00   5.590/4.980
M  545-544-547       180-29-08.00   208.8839  90-00-20.50   5.590/5.460 '1/2"rbs
DV 545-544                          227.1937  89-58-44.00   5.590/4.980
M  545-544-547       180-29-08.00   208.8868  90-00-21.00   5.590/5.460 '1/2"rbs
DV 546-545                           52.2901  90-03-01.00   5.140/5.210
M  546-545-58036      87-06-23.00   122.8504 109-31-09.50   5.140/5.310 'rwm
DV 547-545                          208.8788  90-10-10.00   5.720/5.210
M  547-545-58037     113-55-17.50    93.7528 104-48-23.50   5.720/0.300 'rwm
DV 547-545                          208.8813  90-10-13.00   5.720/5.210
M  547-545-58038     220-25-49.50   114.1214  91-16-39.50   5.720/5.050 '(pbsj 866)
DV 547-545                          208.8795  90-10-13.50   5.720/5.210
M  547-545-58038     220-25-49.50   114.1177  91-16-41.00   5.720/5.050 '(pbsj 866)
SS 58038-547-58039     0-00-00.00   114.1098  88-59-02.00   5.320/5.470 'bscc-58039
SS 58038-547-58040   111-04-49.00   148.8297  89-08-05.00   5.320/6.200 'bl*ts325
SS 58038-547-58041   107-37-52.00   154.1997  90-14-49.00   5.320/6.200 'bl*bs325
SS 58038-547-58042   106-10-34.00   157.6797  90-06-01.00   5.320/6.200 'bl*bs326
SS 58038-547-58043   123-15-49.00   226.6195  89-33-11.00   5.320/6.200 'ts325
SS 58038-547-58044   120-32-26.00   230.2595  90-17-07.00   5.320/6.200 'bs325
SS 58038-547-58045   119-38-44.00   231.5895  90-14-41.00   5.320/6.200 'bs326
SS 58038-547-58046   128-22-14.00   299.9494  89-44-17.00   5.320/6.200 'ts325
SS 58038-547-58047   126-20-00.00   303.3594  90-14-33.00   5.320/6.200 'bs325
SS 58038-547-58048   125-29-25.00   305.3094  90-11-07.00   5.320/6.200 'bs326
SS 58038-547-58049   131-37-53.00   373.9593  89-49-22.00   5.320/6.200 'ts325
SS 58038-547-58050   129-50-20.00   378.1192  90-16-38.00   5.320/6.200 'bs325
SS 58038-547-58051   128-35-17.00   380.1492  90-08-03.00   5.320/6.200 'bs326
SS 58038-547-58052   133-45-32.00   441.1591  89-53-26.00   5.320/6.200 'ts325
SS 58038-547-58053   131-47-47.00   448.5791  90-22-25.00   5.320/6.200 'bs325
SS 58038-547-58054   131-31-58.00   449.5191  90-21-28.00   5.320/6.200 'bs326
SS 58038-547-58055    88-01-36.00   124.7498  89-01-54.00   5.320/6.200 'bl*ts326
SS 58038-547-58056    90-14-30.00   115.0898  90-40-51.00   5.320/6.200 'gs
SS 58038-547-58057    92-45-37.00   216.1196  85-43-35.00  5.320/10.800 'bl*flfw325
SS 58038-547-58058    94-49-18.00   211.7896  86-15-20.00   5.320/6.200 'gs
SS 58038-547-58059   103-07-26.00   174.4597  86-28-11.00   5.320/6.200 'ts326
SS 58038-547-58060   114-36-18.00   241.5795  85-59-19.00   5.320/6.200 'ts326
SS 58038-547-58061   109-11-07.00   254.6395  85-43-15.00   5.320/6.200 'gs
SS 58038-547-58062   104-00-42.00   273.0595  85-51-47.00   5.320/6.200 'flfw325
SS 58038-547-58063   359-59-55.00   114.0998  88-58-56.00   5.320/5.470 'bscc-58038
DV 58038-547                        114.1076  88-59-34.50   5.320/5.450
M  58038-547-58064   143-15-33.00   414.8432  90-12-23.50   5.320/5.560 '(pbsj 867)
DV 58038-547                        114.1348  88-59-34.50   5.320/5.450
M  58038-547-58064   143-15-41.00   414.8461  90-12-25.00   5.320/5.560 '(pbsj 867)
SS 866-867-58065     359-59-58.00   414.8392  89-52-09.00   5.840/5.040 'bscc-866
SS 866-867-58066       1-27-56.00   288.0894  90-16-04.00  5.840/10.830 'ie 18"rcp/di
SS 866-867-58067       0-31-19.00   292.0094  89-43-58.00   5.840/6.200 'pd
SS 866-867-58068     145-52-14.00   123.5098  89-12-13.00   5.840/6.200 'ts325
SS 866-867-58069     140-54-31.00   132.4397  90-32-30.00   5.840/6.200 'bs325
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etc...
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