

## APPENDIX F

---

### CAiCE 2000

Included with this appendix are some guidelines that should be followed when preparing a CAiCE survey project to be submitted to the Michigan Department of Transportation:

#### F.1 File Naming Conventions:

- Project names will be the MDOT Job Number:

*e.g.:* 12345C

- The description field should contain the Route Number and Location as space allows:

*e.g.:* I-96: Wacousta Road to Lansing Road

- **DTM** surface will **always** be **EX**, for **EX**isting, (**not EXIST**). *If* multiple surface are present use **EX1**, **EX2**, etc. Note that for a MDOT project, multiple surfaces will rarely be used. Even if surfaces contained large gaps, such as multiple intersections along a route, they should still be included in one surface and the long triangles between them should be obscured.
- MicroStation files shall be the CAiCE project name plus a **PL** (**PL**animetric) suffix:

*e.g.:* 12345CPL.dgn

Specific files or reports called out in the scope may be contained in the submitted CAiCE archive file (12345C.zip or .arc depending on the version of CAiCE used). They should, however, be copied separately to the project diskette with descriptive names such as *benchlist.txt*, *control point witness.txt*, etc. The diskette should include a “readme” file which describes the files contained thereon. A hard copy of this file should be included in the appropriate section of the project portfolio.

#### F.2 Additional Tips

This information assumes that the user has a good working knowledge of CAiCE. (Don't be afraid to use HELP Button!)

## F.2.1 Creation of CAiCE Project

Common Problems Encountered:

- Wrong units are selected. (Metric or English)
- Wrong datum is selected. (Assumed, NAD83, NAVD88, etc.)
- Wrong Feature Table and Cell Library attached.
- Project not named according to above mentioned convention.

## F.2.2 Attaching CELL Library and Feature Table

It is important to attach the proper Feature Table and Cell Library PRIOR to processing data files for the following reasons:

### Feature Table

The feature table is what tells CAiCE how to interpret each Feature Code entered in the field. It defines the cell, line pattern, the color, style and weight to draw. More importantly, however, it defines the level to place it on in the final MicroStation file, and the default GROUND/FEATURE and zone attributes which determine whether or not the item will be included in the Terrain Model. If the feature table is not attached at the time of processing, CAiCE will have no way of knowing this attribute information.

### Cell Library

The Cell Library is not quite as critical. CAiCE references it to draw the appropriate cell or line pattern. If it is not correct, simply attaching the correct one and redisplaying the graphics will yield the desired results.

To attach either of these, click **TOOLS=>ATTACH** and choose the appropriate menu pick. Note that the menu shows which library is currently attached. Select **midot.ftb** for the MDOT Feature

Table. Be sure to select either **midot\_m.ccl** for Metric projects and **midot\_e.ccl** for English. The later versions of CAiCE also allow the attachment of the MicroStation Cell Library (\*.cel). This is *not* recommended as it drastically diminishes the performance of the graphics display.

### F.2.3 Survey Data Summary

Once the data has been imported into the CAiCE database, it is often helpful to click TOOLS=>SUMMARY=>SURVEY DATA. This will open a window that displays the summary of points and chains that are contained in the database. It is a good idea to check the total number of points in the file as well as the maximum and minimum X, Y & Z coordinate values to insure that they appear reasonable. Zeros or excessively large values are indications problems in the data set.

## F.3 Graphic Review

### F.3.1 The SELECT OBJECT BOX:

The select object box is used by many commands. It is a very powerful querying tool, but it does have a few drawbacks. The box works the same regardless of the command that calls it. Make sure that each field lists what you want to display otherwise you may have nothing displayed as there may be no data in the database that matches the query criteria. It is also prudent to take great care when performing global Global Edits/Changes, it is very easy to delete an entire segment or project if care is not taken. For the most part, it is a very useful device.

**OBJECTS:** Lets you select individual objects to view (e.g.: BC1 or CB235)

**FEATURE:** Lets you choose items by feature code (All BC chains or All CB's)

**ZONE:** Choose by Zone as defined by the feature table (e.g.: all utility items are in zone 3)

**SEGMENT:** Choose by Segment

When clicked, the Question Mark box to the right of each box will present you with a list of all available feature codes for the project. Holding the **CTRL** key you can click each item desired for selection. **PLEASE NOTE** that there is a 127 character limit in the list box. Therefore, if you select many items, some of them at the end of the list may not make into the box. This can be checked by repeating the display command, clicking in the list box and tapping the END key on the keyboard.

If you have not exceeded the 127 limit, the last thing that you selected will be at the end of the list. If that is not at the end, make note of what is (the last *full* Feature code) and then select all of the items that were lost in the truncation.

### **F.3.2 Chains**

Viewing the graphics is another way to check the integrity of the data. Viewing all survey chains will allow the user to see various problems with the data. The file should be scrutinized for any inappropriate line crossings, curves displayed as chords, non-concentric curves, inappropriate connectivity, invalid Feature Codes, etc. Lines that are assigned Feature Codes that do exist in the MDOT Feature table will be displayed in the default color. Also, Feature Codes listed in the Feature list of the Select Object Box that are invalid will have no description shown.

### **Points**

Points that will be displayed should be checked for proper feature code assignment, position, description. Points with invalid feature codes will usually display as the default symbol in the default color. Also, as with chains, Feature Codes listed in the Feature list of the Select Object Box that are invalid will have no description shown.

With both chains and points, only Feature Codes contained in the MDOT Feature Table are acceptable.

### **F.3.3 Editing Data**

Prior to making many edits, it is prudent to archive the project using the CAiCE project archive command. Be sure to select a sub-directory other than the project directory (which is default), otherwise, you will double the size of your archive with each successive archive thereby causing your project to increase in size geometrically. It may be helpful to create a separate “archive” or Backup directory for this purpose. Archiving the project on a regular basis, daily, twice daily, etc. will help minimize the amount of edits lost should anything happen to the project database such as corruption or accidental deletion.

There are many new tools available in CAiCE to assist in the editing of data to produce an acceptable final product. Chains can be separated, gapped, joined and manipulated in a number of ways. It is important to exercise due judgment when manipulating data to maintain its validity with respect to its relationship with actual field conditions.

Sometimes the curves look pretty bad, the software is limited to the laws of geometry, so it is very important to space the shots evenly along a curve. When possible, the people responsible for the collection of data should do some of the processing to become familiar with the effects of rod placement, curve coding and so on.

## **Global Edits**

### **GEOMETRY=>POINTS=>CHANGE ATTRIBUTES**

This handy command allows us to choose points using the **SELECT OBJECT** box. For instance, using this command we can select all points with the invalid feature code of LPOL for Light Pole and change them all to the correct code LP.

### **GEOMETRY=>POINTS=>DELETE**

This command works similarly to **edit...change** except it **DELETES**. For example, if we needed to blow out an entire segment, we could use this command and select all points and chains (a two step process) in a particular segment. Make sure you want to do what you are asking. **This could be dangerous!** You may wish to archive prior to committing to wholesale deletes.

**Once the Edits are complete, and you are satisfied with the planimetrics...Process the terrain next.**

## **F.3.4 Creating a DTM Surface**

Name: **EX**, Description is recommended.

**(DON'T FORGET TO CLICK THE CREATE BUTTON!)**

Prior to loading the DTM it is a good idea to have resolved the crossing of any chains that will be imported into the DTM surface to be used as breaklines.

### **LOAD DTM DATABASE:**

Be sure that only appropriate surface elevation data is included. Omit any data suspended above a natural surface such as data collected on the deck of a bridge, pier cap, etc.

## **COMPUTE and VIEW TRIANGLES**

Viewing the DTM surface will aid in determining the validity of the vertical data. It may be helpful to increase the value of the vertical exaggeration (view setting...modeling) to exaggerate any irregularities in the surface. Again, CAiCE offers many tools to assist in the inspection and correction of the terrain surface, such as shaded rendering of the surface, contours, free-hand cross-sections, 3d perspective views, drive through, etc. Once the surface is verified for correctness, all inappropriate or superfluous triangles should be obscured using the edit triangle feature code command.

**Compute Final Surface Contours** once the surface is correct. Be sure the contour interval is correct for the project.

### **F.3.5 Preparing Alignments:**

#### **Create alignments by:**

Entering PIs from record data by Coordinate Geometry

**GEOMETRY=>Point=>LOCATE** to enter bearing/distance info from ROW or old plans as appropriate (FE=ALI or CP )

Use best fit tangents to compute location of PIs

**GEOMETRY=>LINES=>BEST FIT**

Unique names and descriptions will help keep track of points during trial and error. Remember, using best fit line only stores the END POINTS of the line, not the line itself. These will be Points On Tangent. Analogous to our old “road splits”. Can be used to compute PI location using **GEOMETRY=>INTERSECTIONS=>PDB-PDB**

Delete points that are not acceptable to help avoid confusion.

**GEOMETRY=>GEOMETRY CHAINS=>EDIT HORIZONTAL ALIGNMENTS**

PIs must be displayed on screen to allow snapping, including POB/POE.

Curve RADIUS or DEGREE of CURVE (English only) is entered in Curve Info.

Store final product, it will now be a geometry chain.

## **GEOMETRY=>GEOMETRY CHAINS=>BEST FIT=>ALIGNMENTS**

Similar to Best fit line...need two or more tangents joined by a curve.

Start with one tangent, continue with second tangent, do curve last.

Always select the points in same direction eg: start at the westerly/southerly most end of the westerly/southerly tangent, select the points of that tangent, then move to the next tangent and select in the same direction, Then repeat with the curve.

For multiple curves, save section and move ahead, this will load second tangent into first for use with next curve.

### **Prepare alignment reports**

#### **GEOMETRY=>GEOMETRY CHAINS=>DESCRIBE**

Gives the designers a complete description of the alignment.

(ALWAYS SUBMIT as part of the Alignment notes)

### **F.3.6 Prepare Misc reports**

#### **GEOMETRY=>MISCELLANEOUS REPORTS=>STA OFF REPORTS**

for various groups of points

Benchmarks (should be coded in the field BMCK), utils, etc.

#### **GEOMETRY=>POINTS=>DESCRIBE**

May be handy for various groups of points such as Underground/drainage structures, etc., Use your own judgment, the more info, properly presented, the better.

### **F.3.7 Creating MicroStation File**

**Consult with project manager, designer, scope, etc. for project requirements with respect to scale, contour interval, items to display, etc. prior to creating the final MicroStation file. NOTE: A macro has been developed to perform the creation of the Microstation file and is available throught the Lansing Survey Office (6-2000)**

(Set cell scale and text size prior to composing CDG

cell scale (affects the size of the cell drawn)

English: 1 for 1"=100', 0.4 for 1"=40' ,etc.

Metric: 1 for 1:1000, 0.5 for 1:500 , etc.

text size (ft:3...mm:1)

Clear Screen

Display chains as per scope

Display Points by group as per scope

Display contours (make sure Contour levels and colors are correct)

Display final alignment if desired or requested)

**(Create the CDG file...**It may be helpful to save the final display prior to creating the MicroStation file.)

**FILE=>EXPORT TRANSLATORS=>SCREEN GRAPHICS TO INTERGRAPH 2D DGN**  
(MicroStation 2D DGN FILE)

### **F.3.8 Selecting a Seed File:**

The SEED FILE contains the Working Units (for Scale) and Global Origin (defines the coordinate region). It is VERY IMPORTANT that the CORRECT seed file for a particular job is selected at this point. In the CAiCE directory is a list of SEED FILES, use the following as a guide to selecting the correct file for a project.

MiDOT2D.DGN Assumed coordinates; English

MiDOT2DM.DGN Assumed coordinates; Metric

SEEDMS.DGN MS indicates Metric, South Zone (State Plane Coordinates)

SEEDFS.DGN FS indicates Feet, South Zone (State Plane Coordinates.)

MC=Metric Central; MN=Metric North and so on.

### **F.3.9 Selecting a CELL Library**

The Cell Library that we attached at the start of the project is CAiCE's version of our MDOT MicroStation Cell Library. Now we are converting back to MicroStation. Selecting the correct Cell Library allows the program to place the correct MDOT MicroStation cells in the DGN file that we are creating



Enter:

**C:\CAiCE\CELL\MiDOT\_E.CEL for an English project**

**C:\CAiCE\CELL\MiDOT\_M.CEL for Metric.**

This will create a .DGN (MicroStation) file that can be loaded directly on the Designers WorkStation for viewing.

The CAiCE project file should be archived (zipped) using the CAiCE Project manager Archive command. This file should be included as part of the survey portfolio. In addition, any miscellaneous reports created within CAiCE, as well as any MicroStation files, should be included as part of the CAiCE archive. They should also, however, be copied to disk and submitted separate from the archive. This is so the receiving engineer, who may not be able to unarchive the CAiCE project file, will have access to these files.

## ANNEX A: APPENDIX F

---

### Guide for Placement of Elements in CDG file

#### Point to be Displayed by Cell Only.

# ANC	Cell	# CEM	Cell	# GYP	Cell
# GYW	Cell	# HYD	Cell	# LBASE	Cell
# LP	Cell	#MB	Cell	# MRSH	Cell
#NWLK	Cell	#PH	Cell	# PLP	Cell
# POLE	Cell	# POST	Cell	# PP	Cell
# PTWR	Cell	#RIP	Cell	# RRSB	Cell
# RRSW	Cell	# SGN	Cell	# SIG	Cell
# TPED	Cell				

#### Points by Cell and Description

# AZM	Cell, Desc	# BR	Cell, Desc	# BSH	Cell, Desc
# CP	Cell, Desc	# CTRS	Cell, Desc	#ETB	Cell, Desc
# FLAG	Cell, Desc	# GFP	Cell, Desc	# GLM	Cell, Desc
# GPMP	Cell, Desc	# GPS	Cell, Desc	# GTU	Cell, Desc
# MBOX	Cell, Desc	# MEAN	Cell, Desc	#MISC	Cell, Desc
# NGS	Cell, Desc	# PIN	Cell, Desc	# PINE	Cell, Desc
#PIPE	Cell, Desc	#PK	Cell, Desc	# PLAT	Cell, Desc
#PROP	Cell, Desc	#QCOR	Cell, Desc	# QQCOR	Cell, Desc
# RM	Cell, Desc	# ROC	Cell, Desc	# RW	Cell, Desc
# SCOR	Cell, Desc	#SD	Cell, Desc	#SPKHD	Cell, Desc
# STA	Cell, Desc	# STMP	Cell, Desc	# TP	Cell, Desc
# TR	Cell, Desc	# TRAV	Cell, Desc	# TREE	Cell, Desc
#TSTHL	Cell, Desc	# USGS	Cell, Desc	#WEIR	Cell, Desc
# WIT	Cell, Desc				

### Points by Cell and Elevation

# CB	Cell, elev	#ELHH	Cell, elev	#ELMH	Cell, elev
# GVLV	Cell, Elev	# GWEL	Cell, Elev	#HI	Cell, Elev
# MH	Cell, Elev	#TMH	Cell, Elev	# SMH	Cell, Elev
# STMH	Cell, Elev	# UMH	Cell, Elev	# WSO	Cell, Elev
# WV	Cell, Elev	# WWEL	Cell, Elev		

### Points by Description and Elevation

# C.V.	Desc, Elec.	# CMP	Desc, Elec.	# RCP	Desc, Elec.
--------	-------------	-------	-------------	-------	-------------

### Points by Cell, Description and Elevation.

# HVCP	Cell, Desc, Elec.	#LO	Cell, Desc, Elec.	# FL	Cell, Desc, Elec.
# RFPT	Cell, Desc, Elec.	# VCP	Cell, Desc, Elec.	# WELL	Cell, Desc, Elec.

### Survey Chains

All of the following chains should be displayed in the final Drawing File.

#ABUT	# BC	# BDR	# BEAM	# BIKE	# BLD
# BLOT	# BRL	# BRR	# CDR	# CL	# CLB
# CLOT	# CLV	# CMP	#CP	# CRK	#CTV
# DAM	# DCH	# DECK	#DIKE	# DLOT	# DRV
# EB	# EC	# EG	# ELO	# ELU	# EM
# EP	# EW	# EWL	# FNC	# FOP	#FTG
# GAS	# GDR	# GLOT	#GR	# GRG	# GUT
#H20	# HDG	# HSE	#HWAL	# LAKE	# MRSH
# NOIS	#OCHD	#OIL	# PATH	# PIER	#PLAT
#POND	# PROP	#PVT	# RCP	# REFL	# RIP
# RIV	# ROC	# RR	#RTWL	# SAN	# SCL
#SHBL	# SHLD	# SLAB	#SNLI	# SPL	# SS
#STM	# STR	# STRM	# SW	# TELO	# TELU
# TGRPH	# TREL	# TRL	# WEIR	# WWAL	

# FEATURE CODES

Feature (LINES)	Description	DTM (Y/N)
ABUT	BRIDGE ABUTMENT	Y
BB	BOTTOM OF BANK	Y
BC	BACK OF CURB	Y
BDR	BIT DRIVE	Y
BEAM	BEAM	N
BIKE	BIKEWAY/PATH	Y
BLD	BUILDING	Y
BLOT	BIT LOT	Y
BRL	BRUSH LINE	N
BRR	CONCRETE BARRIER	Y
CC	CURB CUT	Y
CDR	CONCRETE DRIVE	Y
CEM	CEMETERY	N
CLB	CENTER LINE (BRIDGE)	Y/N
CL	CENTER LINE (GENERIC)	Y
CLOT	CONCRETE LOT	Y
CLV	CULVERT (GENERIC)	N
CMP	CORR METAL PIPE	N
CP	TRAVERSE CTL LINE	N
CRK	CREEK CL	Y
CTV	CABLE TV (UG)	N
DAM	DAM	Y
DCH	DITCH CENTERLINE	Y
DECK	BRIDGE DECK	Y/N
DIKE	DIKE	Y
DLOT	DIRT LOT	Y
DRV	SURFACED DRIVE	Y
EB	EDGE OF BITUMINOUS	Y
EC	EDGE OF CONCRETE	Y
EG	EDGE OF GRAVEL	Y
ELO	ELEC LINE OVERHEAD	N
ELU	ELECTRIC LINE (UG)	N
EM	EDGE OF METAL	Y
EP	EDGE OF PAVEMENT	Y
EW	EDGE OF WATER	Y
EWL	EDGE WETLAND	Y
FNC	FENCE LINE	N
FOP	FIBER OPTIC CABLE	N
FTG	FOOTING	N
GAS	GAS LINE (NATURAL)	N
GDR	GRAVEL DRIVE	Y
GLOT	GRAVEL LOT	Y
GR	GUARDRAIL	N
GRG	GARAGE	Y
GUT	GUTTER FLOW LINE	Y
H20	(UG) WATERMAIN	N
HDG	HEDGE LINE	N
HSE	HOUSE	Y
HWAL	HEADWALL	Y
LAKE	LAKE	Y
LL	LANE LINE	Y

Feature (LINES)	Description	DTM (Y/N)
MISC	MISCELLANEOUS LINE	N
MRS	MARSH LINE	Y
NOIS	NOISE BARRIER WALL	Y
OCHD	ORCHARD	N
OIL	PIPE LINE (OIL)	N
PATH	PATH	Y
PIER	PIER	N
POND	POND	Y
PLAT	PLAT BOUNDARY	N
PROP	PROPERTY LINE	N
PVT	SURFACED ROADS	Y
RBOT	RIVER BOTTOM	Y
RCP	RNFC CONCRETE PIPE	N
RDG	RIDGE/BREAK LINE	Y
REFL	REFERENCE LINE	N
RIP	RIPRAP	Y
RIV	RIVER CENTERLINE	Y
ROC	ROCK OUTCROPPING	Y
RR	RAILROAD TRACKS	Y
RTWL	RETAINING WALL	Y
SAN	SAN SEWER LINE	N
SCL	SURVEY CENTER LINE	Y
SHBL	SHRUB LINE	N
SHLD	SHOULDER	Y
SLAB	CONCRETE SLAB	Y
SNLI	SIGN/BILLBOARD	N
SPL	SPILLWAY	Y
SS	STORM SEWER LINE	Y
STM	STEAMLINE (UG)	N
STRM	STREAM CENTERLINE	Y
STR	STRUCTURE	Y/N
SW	SIDEWALK	Y
TB	TOP OF BANK	Y
TELO	TELEPHONE (OVHD)	N
TELU	TELEPHONE (UG)	N
TGRPH	TELEGRAPH (UG)	N
TREL	TREE LINE	N
TRL	TRAIL	Y
WEIR	WEIR	Y
WWAL	WING WALL	Y

### Feature Description DTM (POINTS) (Y/N)

Feature (POINTS)	Description	DTM (Y/N)
ALI	ALIGNMENT PT	Y
ANC	DEADMAN	Y
AZM	AZIMUTH MARK	N
BFR	BIG ROCK	Y
BSH	BUSH	Y
CB	CATCH BASIN	Y
CEM	CEMETERY	Y
CP	TRAVERSE POINT	N
CTRS	CENTER SECTION	N

Feature (POINTS)	Description	DTM (Y/N)
CORNER (PLS)		
ELHH	ELEC HANDHOLE	Y
ELMH	ELEC MANHOLE	Y
ETB	ELEC TRANS BOX	N
FCOR	FENCE CORNER	Y
FL	FLOW LINE	Y
FLAG	FLAG POLE	Y
GFP	GAS FILLER PIPE	N
GLM	GASLINE MARKER	Y
GPMP	GAS PUMPS	N
GPS	GPS MONUMENT	N
GVLV	GAS VALVE	Y
GTU	GAS TANK (UNDGND)	Y
GWEL	GAS WELL	Y
GYP	GUY POLE	Y
GYW	GUY (DEADMAN)	Y
HI	HIGH POINTS	Y
HVCP	PHOTO TARGET	N
HYD	FIRE HYDRANT	N
LBASE	LIGHT BASE	N
LBOT	LAKE BOTTOM (PNT)	Y
LO	LOW POINTS	Y
LP	LIGHT POLE	Y
MB	MAILBOX	Y
MBOX	MONUMENT BOX	Y
MEAN	MEANDER COR (PLS)	N
MISC	MISC POINT	N
MH	MANHOLE	Y
NGS	NGS MONUMENT	N
NWLK	WALK-NOWALK	
SIGN		N
OWEL	OIL WELL	Y
PK	PK NAIL	Y
PH	TELEPHONE OR CALLBOX	Y
PIN	IRON PIN	N
PINE	CONIFER TREE	Y
PIPE	IRON PIPE	N
PLAT	PLAT CORNER	N
PLP	POWER LIGHT POLE	Y
POLE	UTILITY POLE (GENERIC)	Y
POST	POST (GENERIC)	Y
PP	POWER POLE	Y
PROP	PROPERTY CORNER	N
PTWR	POWER TOWER	Y
QCOR	QUARTER SECTION CORNER (PLS)	N
RRSW	RR SWITCH BOX	Y
RW	ROW MARKER	Y
SMH	SANITARY MH	Y
SCOR	SECTION CORNER (PLS)	N
SD	SATTELITE DISH	N
SGN	SIGN POST	Y
SIG	TRAFFIC SIGNAL	Y
SPKHD	SPRINKLER HEAD	Y
STA	SURVEY STATION	N
STMH	STORM MH	Y
STMP	STUMP	Y
TMH	TELEPHONE MH	Y
TP	TELEPHONE POLE	Y
TPED	TELEPHONE PED	Y
TR	TRAVERSE/TP POINT	N
TREE	DECIDUOUS TREE	Y
TSTHL	TEST HOLE	Y
UMH	UTIL MH (GENERIC)	Y
USGS	USGS MON	N
VCP	VERT TARGET	N
WELL	WELL (GENERIC)	Y
WIT	WITNESS SEC CORNER (PLS)	N
WSO	WATER SHUT-OFF	Y
WV	WATER VALVE IN MANHOLE	Y
WWEL	WATER WELL	Y
XYZ	RANDOM SHOT (SPOT ELEV)	Y

Note:  
The following codes have been removed and are no longer used:

LINE CODES:	DTM
BS	BOTTOM OF SLOPE
EBIT	EDGE OF BIT
ED	EDGE(GENERIC)
GPS	TRAVERSE LINE
RCL	ROAD CL
TOE	TOE OF SLOPE
TRAV	TRAVERSE LINE
TS	TOP OF SLOPE
POINTS:	
CNIF	CONIFEROUS TREE
SBSE	SIGN BASE
SPEL	SPOT ELEV

NEW CODES HAVE BEEN ADDED AND ARE UNDERLINED IN THE ABOVE LIST.

SUGGESTIONS FOR ADDITIONAL CODES SHOULD BE SENT TO ORIAN DOLLMAN-JERSEY IN THE

Feature (POINTS)	Description	DTM (Y/N)
<u>QQCOR</u>	<u>SIXTEENTH CORNER (PLS)</u>	N
RBOT	RIVER BOTTOM (PT)	Y
RFPT	REFERENCE PT	Y
RM	REFERENCE MARK	N
RRSG	RR SIGNAL	Y