CHAPTER 9

UFOS FILE SPECIFICATION for CSM Host Port

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SECTION 1

INTRODUCTION

Tomake this UFOS File Specification manual a 84V machine with ROM1 = COMMON SM-E61 and ROM2 = Operating Software v3.77 has been used. This manual explains in detail all parameters that can be read in the Machine, feeder, board, M.I.S. Data and Vision files. On-line commands that can be send to the CSM are also discussed.

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Example 2:

&H.BADX=98.25 : BADX is the input BEAM SENSOR in the DATA-IN-SYSTEM-PARAMETERS-OFFSETS menu. The numeric value represents in this case the offset in the X direction (in mm) of the beam sensor relative to the teaching unit (e.g. camera).

2.3. Machine File: Parameters

This section describes in detail what each parameters means.

NOTE For UFOS versions lower than E64, &H.APG has a different meaning. For these software versions this value must be set to zero (0).

2.3.1. &H.APG

Description: Support of PCS (Production Control System) software connection with the CSM. THis option can be found in the DATA-IN - MACHINE - CONFIG menu.

Values: 0 = PCS is not used
1 = PCS is used

2.3.2. &H.BADX, &H.BADY

Description: This field specifies the offset of the beam sensor relative to the teaching unit (this value is used only if the field &H.BEMS is set to 1).

Values: -999.99 to 999.99 [mm]

2.3.3. &H.BEMS

Description: This field specifies the existence of the beam sensor device. The position of the beam sensor, relative to the teaching unit, is specified by the parameters BADX and BADY.

Values: 0 = No beam sensor exists
1 = Beam sensor exists

2.3.4. &H.BMRK

Description: Specifies if the Bad mark position data entry is relative to the PCB origin or relative to the Block Orgin. When set to 0, then only one bad mark data is given via the board file parameters &B.BMKX, &B.BMKY, &B.BSEN, &B.BMLG and &B.BFNO because in every block (circuit) on a PCB the offset from the block origin to the bad mark position in that block will be the same.
When set to 1, the bad mark position data entry is relative to

SECTION 2

THE MACHINE CONFIGURATION FILE

2.1. Machine File: Introduction

The machinefile determines how the system is configured and is an input to the <COMMON> program of the CSM. The settings of each parameter are found back in one of the following menues:-

MAIN MENU: DATA-IN- SYSTEM - MACHINE CONFIG.
- PARAMETERS - COORDINATES
- OFFSETS
- TIMERS
- COUNTERS

In these menus the system is described i.e. the heads that are used (e.g. Vision, Chuck, Dispenser etc.), the options that are used (e.g. ANE, Mechanical Alignment, Sub-stopper etc.). Detailed description of every option in the above mentioned menus can be found in Chapter 3 - Operation and Handling - of this manual.

2.2. Machine File: Parameter Format

The parameters in the machine file have the following format:-

&H.[xxxx]=[y]

where:	&H.	=	Fixed, this determines a machine file parameter input.
	xxxx	=	String of 3, 4 or 5 characters, describing the parameter input.
	y	=	Numeric Value. This value can represent a real physical X-, Y-, Z-Axis or Rotation value or it contains a value that represents a choice of options belonging to the parameter.

Example 1:

&H.BEMS=1 : BEMS is the input BEAM SENSOR in the DATA-IN-SYSTEM-MACHINE CONFIG menu. The numeric value represents the number of choices in this menu input (counting starts at 0);
0 = NO
1 = YES

In this case it means that the BEAM SENSOR is available in this system.

UFOS FILE DESCRIPTION

2.3.18. **&H.H1M1R, &H.H2M1R, &H.H3M1R, &H.H1P1R, &H.H2P1R, &H.H3P1R, &H.H1P2R, &H.H2P2R, &H.H3P2R, &H.H1P3R, &H.H2P3R, &H.H3P3R**

Description: These parameters are used for compensation of the R-axis linearity and are hidden from the user. In the future it will be possible to define these parameters by the utility program OFFSET.

HxM1R = offset angle of -90 degrees
HxP1R = offset angle of +90 degrees
HxP2R = offset angle of +180 degrees
HxP3R = offset angle of +270 degrees

Values: -9.99 to 9.99 [degree]

2.3.19. **&H.H1TM, &H.H2TM, &H.H3TM**

Description: Not used. This are the old 'after-pickup-timers'. They are no longer used and the area is reserved for use by Yamaha.

Values: 0.00

2.3.20. **&H.H1X, &H.H1Y, &H.H1R**
&H.H2X, &H.H2Y, &H.H2R
&H.H3X, &H.H3Y, &H.H3Z, &H.H3R

Description: Specifies the offsets of the mount heads (1-2-3) relative to the reference point of the teaching unit. The &H.H3Z parameter is introduced with the CSM84VZ and specifies the point where the underside of the nozzle just comes in contact with the surface of the PCB.

Values: X and Y: -999.99 to 999.99 [mm]
R: -999.99 to 999.99 [degree]
Z (CSM84VZ only): Usually in the range from -20.00 to -21.00 [mm]

2.3.21. **&H.H4X, &H.H4Y, &H.H4R**

Description: Specifies the position of the prep.head (4) relative to the teaching unit. These values are used only when the parameter &H.PREH is set to 1.

Values: X AND Y: -999.99 to 999.99 [mm]
R: -999.99 to 999.99 [degree]

2.3.13. &H.ECLP

Description: Specifies whether an edge clamp device is present or not. When present, the board file parameter &B.FIX will determine if edge clamping will be used or not. For the edge clamp position, refer to parameters EDGX and EDGY.

Values: 0 = Edge Clamp unit not present.
1 = Edge Clamp unit present

2.3.14. &H.EDGX, &H.EDGY

Description: Specifies the X and Y position of the edge clamp.

Values: -999.99 to 999.99 [mm]

Note: *This position is not used by <COMMON> but by the utility progams.*

2.3.15. &H.FDTM

Description: Specifies the position of a feeder on the front feeder bar that was teached to be used as a reference for automatically calculating the picking position of all other feeders on the front feeder bar. The X and Y positions of the component in the feeder on this position is specified in the fields &H.FLX and &H.FLY.

Values: 1 to 50

2.3.16. &H.FFMT

Description: This parameter specifies the floppy format type. This parameter is **not** used in the CSM machine.

Values: 0 = NEC
1 = IBM

2.3.17. &H.FLX, &H.FLY

Description: See &H.FDTM. Specifies the X and Y position of the component of the teached reference feeder on the front feeder bar.

Values: -999.99 to 999.99 [mm]

2.3.9. **&H.CONV**

Description: Specifies the way the transport conveyor move the boards in and out of the machine. When set to "Line", the boards enter the machine at the left side of the machine and leave at the right hand side. When set to "Return", the boards enter and leave the machine at the left hand side of the machine. When set to "Manual", the boards are placed in- and removed from the machine by an operator.

Values:
0 = Line
1 = Return
2 = Manual

2.3.10. **&H.CUT**

Description: a) The number of feed actions between cutting tapes. This value is not used within the CSM software.
b) In machines equipped with the component verification tool, this parameter represents the location of the test-jig on the feeder bar.

Values: a) 0 to 999
b) 1 to 42, 51 to 92 (the test-jig must always be situated where it can be reached by the heads supplying the component).

2.3.11. **&H.DISX, &H.DISY, &H.DISR**

Description: Specifies the offset of the line dispenser relative to the teaching unit. When the Component Verification Tool is used, &H.DISR defines the mode the CVT is working in.

Values: &HDISX, &H.DISY = -999.99 to 999.99 [mm]
&HDISR = -999.99 to 999.99 [degree]

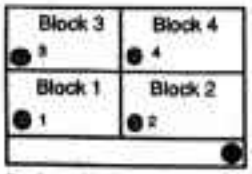
For CVT:
&H.DISR = 0 = Not used
1 = Feeder Empty
2 = First of Batch
3 = Continuous
4 = Select

2.3.12. **&H.DMPX, &H.DMPY**

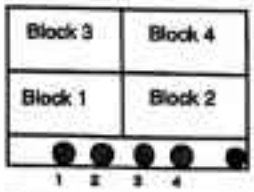
Description: Specifies the X and Y position at which components are dumped when they have to be discarded.

Values: -999.99 to 999.99 [mm]

UFOS FILE DESCRIPTION



Bad mark data relative to block origin.



Bad mark data relative to PCB origin.

x = Bad Mark for block x

the PCB origin. Bad marks can be put next to each other to enhance system performance. The parameters of the bad marks are then specified in the Nx parameter in the board file. This parameter is only used if the parameter &B.BMRK is set to 1. Refer to the drawing in the left border

Values: 0 = Bad Mark data is relative to PCB origin
1 = Bad Mark data is relative to Block origin

2.3.5. &H.CAMX, &H.CAMY

Description: Specifies the offset of the teaching camera relative to the teaching unit (generally if the teaching camera is present, then it is used as the teaching unit itself). When this camera is present, it is advised to use it as the teaching unit. In this case the coordinates should both be set to 0.00. This parameter is only used if the parameter MOVC is set to 1.

Values: -999.99 to 999.99 [mm].

2.3.6. &H.CHKT

Description: Specifies the time after which the pressure check is performed after picking or mounting a component when an AANC or Vision head is used. See also parameter MNTT.

Values: 0.00 to 999.99 [ms]

2.3.7. &H.CINW

Description: Specifies the initial conveyor width (track width). This parameter is only valid when the CSM is equipped with an automatic width conveyor system.

Values: The maximum conveyor width (z coordinate) - 0.5mm [mm]

2.3.8. &H.CMU

Description: Specifies whether the CMU (RS-232 port) is used in on-line or off-line mode. In on-line mode, you can give the robot controller commands through the CMU. The off-line mode can be used to send an receive data under program control, the on-line mode to remotely control the robot. For CSM purposes, the on-line mode is generally used.

Values: 0 = On-line
1 = Off-line

2.3.22. &H.HED1, &H.HED2, &H.HED3

Description: Specifies the type of head that is mounted on each of the head positions.

Values:
0 = No head available at the position
1 = Standard head
2 = IC head
3 = AANC head
4 = not used
5 = Vision head
6 = Dot dispenser
7 = Line dispenser
8 = Gripper

2.3.23. &H.LMMX, &H.LMMY, &H.LMMR, &H.LMMZ

Description: Specifies the minimum(-) soft-limit coordinates in millimeters (XYZ) or degrees (R).

Values:
X, Y and Z: -999.99 to 999.99 [mm]
Z (CSM 84VZ only) : -22.00 to -25.00 [mm]
R: -999.99 to 999.99 [degree]

Notes:

1. *Z soft-limits, except for the CSM84VZ, is used only when the machine is equipped with an automatic width conveyor system*
2. *On the CSM84VZ the Z softlimit is the limit of the Z-axis Servo of head 3.*

2.2.24. &H.LMPX, &H.LMPY, &H.LMPR, &H.LMPZ

Description: Specifies the maximum (+) soft-limit coordinates in millimeters (XYZ) or degrees (R).

&H.LMPx should be greater or equal to &H.LMMx (see 2.2.22).

Values:
X, Y and Z: -999.99 to 999.99 [mm]
Z (CSM 84VZ only): +1.00 to +3.00 [mm]

Notes:

1. *Z soft-limits, except for the CSM84VZ, is used only when the machine is equipped with an automatic width conveyor system*
2. *On the CSM84VZ the Z softlimit is the limit of the Z-axis Servo of head 3.*

2.2.25. &H.LPTM

Description: Locate pin timer value. It specifies the time that passes after the PCB is detected at the stopper and the moment that the locating pins are raised.

Values: 0.00 to 99.99 [s]

2.3.41. **&H.RATR**

Description: With this parameter the definition of the Rotation (R) in the mount attribute is selectable between RELATIVE or ABSOLUTE.

Values: 0 = RELative
1 = ABSolute

2.3.42. **&H.RTRY**

Description: This sets the number of retries carried out after erroneous picking or mounting in the mounting operation.

Values: 0 to 7

2.3.43. **&H.RDTM**

Description: Specifies the position of a feeder on the rear feeder bar that was teached to be used as a reference for automatically calculating the picking position of all other feeders on the rear feeder bar. The X and Y positions of the component in the feeder on this position are specified in the fields &H.RLX and &H.RLY.

Values: 51 to 100

2.3.44. **&H.RLX, &H.RLY**

Description: See &H.FDTM. Specifies the X and Y position of the component of the teached reference feeder on the rear feeder bar.

Values: -999.99 to 999.99 [mm]

2.3.45. **&H.SBST**

Description: Specifies whether the sub-stopper is present on the machine. When present, the parameter &B.SBST determines if the sub-stopper is used.

Values: 0 = No sub-stopper present
1 = Standard type
2 = W Sensor type
3 = Moving type (this type is attached on the HSD machine)

2.3.36. **&H.PINX, &H.PINY**

Description: Specifies the position of the locating pin closest to the main stopper.

Note: *This position is not relevant to <COMMON> but is used by the 'Utility' program.*

Values: -999.99 to 999.99 [mm]

2.3.37. **&H.PMAX**

Description: Specifies the number of boards that can be processed without stopping. Whenever this number of boards are processed, the CSM will stop and will wait for a N54 request from the following machine (usually an unloader).

Values: 0 = infinite amount
1 to 255 = Maximum number of boards that can be processed.

2.3.38. **&H.PREG**

Description: This parameter describes the point teach mode that must be used. In 1 point teach mode you teach the centre coordinate of each SMD. In 2 point mode you must teach 2 points of each SMD, the system then calculates the centre of these points (usefull to teach 2 leaded components by means of theirpads).

Values: 0 = 1 Point teach mode
1 = 2 Point teach mode

2.3.39. **&H.PREH**

Description: Specifies if a preperatory head is mounted. The position of the prep.head is specified in the parameters &H.H4X, &H.H4Y and &H.H4R.

Values: 0 = No preperatory head mounted
1 = Preperatory head mounted

2.3.40. **&H.PUTM**

Description: Specifies the time that passes between detecting a board at the stopper and activating the push-up plate.

Values: -999.99 to 999.99 [s]

2.2.31. **&H.MSG**

Description: Through the message parameter the language of the user interface can be selected.

Values: 0 = Japanese, not supported on current UFOS versions
1 = English

2.2.32. **&H.NSTA**

Description: Specifies whether the Automatic Nozzle Exchange unit is present or not. The positions of the nozzles in this unit are given by the parameters NZ1X, NZ1Y, NZ1R, NZ2X, NZ2Y, NZ2R, NZ3X, NZ3Y and NZ3R.

Values: 0 = No ANE unit exists
1 = AANC type
2 = Not used
3 = Vision head type

2.2.33. **&H.NZ1X, &H.NZ1Y, &H.NZ1R**
&H.NZ2X, &H.NZ2Y, &H.NZ2R
&H.NZ3X, &H.NZ3Y, &H.NZ3R

Description: These parameters gives the positions of the 3 nozzle exchange positions. When no nozzle exchange unit is present (&H.NSTA is set to 0), the value of these parameters are ignored.

Values: X and Y: -999.99 to 999.99 [mm]

2.3.34. **&H.PCNT**

Description: This gives the number of processed boards (related to parameter &H.PMAX). It is maintained by the system and is mainly meant for reading.

Values: 0..255

2.3.35. **&H.PFID**

Description: Specifies whether the point (local) fiducials positions (see section 4.3.2.) are related to the Mount origin or related to the Block origin.

Values: 0 = Related to Mount origin
1 = Related to Block origin

2.2.26. **&H.MA1X, &H.MA1Y, &H.MA1R**

Description: These parameters specify the position of the mechanical alignment unit 1. The value is ignored when the parameter &H.MAL1 is set to 0.

Values: X and Y: -999.99 to 999.99 [mm]
RL -999.99 to 999.99 [degree]

2.2.27. **&H.MAL1, &H.MAL2**

Description: Specifies whether the mechanical alignment units 1 and 2 are present on the machine or not. The position of the units are given in the parameters MA1X, MA1Y, MA1R and MA2X, MA2Y and MA2R.

Values: 0 = Unit does not exist
1 = Unit exists

2.2.28. **&H.MNTT**

Description: Specifies the after mount timer. A mounting check is carried out right after mounting is finished. The after mount timer specifies the time after which the vacuum is turned on after mounting. This is only used for AANC and Vision heads. See also parameter &H.CHKT.

Values: 0.00 to 999.99 [ms]

2.2.29. **&H.MOUT**

Description: Specifies if the output messages are send to the CMU or not.

Values: 0 = No
1 = Yes

2.2.30. **&H.MOVC**

Description: Specifies if a teaching camera is mounted. When mounted it is used as the teaching unit. The position of this camera is specified in the parameters &H.CAMX and &H.CAMY. When this camera is present, it is advised to set &H.CAMX and &H.CAMY to 0.00.

Values: 0 = No teaching camera mounted
1 = Teaching camera mounted

UFOS FILE DESCRIPTION

```
&H.RLX=    0.00     ; No auto set for feeders on rear feeder bar
&H.RLY=    0.00     ; No auto set for feeders on rear feeder bar
&H.NZ1X=  658.25    ; X position: (V)ANE nozzle 1
&H.NZ1Y=  482.91    ; Y position: (V)ANE nozzle 1
&H.NZ1R=    0.00    ; R rotation: (V)ANE nozzle 1
&H.NZ2X=  678.26    ; X position: (V)ANE nozzle 2
&H.NZ2Y=  482.89    ; Y position: (V)ANE nozzle 2
&H.NZ2R=    0.00    ; R rotation: (V)ANE nozzle 2
&H.NZ3X=  698.24    ; X position: (V)ANE nozzle 3
&H.NZ3Y=  482.90    ; Y position: (V)ANE nozzle 3
&H.NZ3R=    0.00    ; R rotation: (V)ANE nozzle 3
&H.MA1X=  464.79    ; X position: Mechanical Alignment unit 1
&H.MA1Y=  632.32    ; Y position: Mechanical Alignment unit 1
&H.MA1R=  -90.00    ; R rotation: Mechanical Alignment unit 1
&H.MA2X=   464.79   ; X position: Mechanical Alignment unit 2
&H.MA2Y=   632.17   ; Y position: Mechanical Alignment unit 2
&H.MA2R=  -90.00    ; R rotation: Mechanical Alignment unit 2
&H.VA2X=   210.45   ; X position: Fixed camera 2
&H.VA2Y=   592.24   ; Y position: Fixed camera 2
&H.VA3X=   0.00     ; Fixed Camera 3 not present
&H.VA3Y=   0.00     ; Fixed Camera 3 not present
&H.VA4X=   0.00     ; Fixed Camera 4 not present
&H.VA4Y=   0.00     ; Fixed Camera 4 not present
&H.ST1X=   122.04   ; X position: Temporary place position of prep. head
&H.ST1Y=   618.96   ; Y position: Temporary place position of prep. head
&H.ST2X=   0.00     ; Temporary place position 2 not used
&H.ST2Y=   0.00     ; Temporary place position 2 not used
&H.Z01=    0.00     ; Place position of Pallete 1 of LCS (not used)
&H.Z02=    0.00     ; Place position of Pallete 2 of LCS (not used)
&H.Z03=    0.00     ; Place position of Pallete 3 of LCS (not used)
&H.Z04=    0.00     ; Place position of Pallete 4 of LCS (not used)
&H.Z05=    0.00     ; Place position of Pallete 5 of LCS (not used)
&H.Z06=    0.00     ; Place position of Pallete 6 of LCS (not used)
&H.Z07=    0.00     ; Place position of Pallete 7 of LCS (not used)
&H.Z08=    0.00     ; Place position of Pallete 8 of LCS (not used)
&H.Z09=    0.00     ; Place position of Pallete 9 of LCS (not used)
&H.Z10=    0.00     ; Place position of Pallete 10 of LCS (not used)
&H.Z11=    0.00     ; Place position of Pallete 11 of LCS (not used)
&H.Z12=    0.00     ; Place position of Pallete 12 of LCS (not used)
&H.Z13=    0.00     ; Place position of Pallete 13 of LCS (not used)
&H.Z14=    0.00     ; Place position of Pallete 14 of LCS (not used)
&H.Z15=    0.00     ; Place position of Pallete 15 of LCS (not used)
&H.Z16=    0.00     ; Place position of Pallete 16 of LCS (not used)
&H.DISX=   0.00     ; X position: Line dispenser  (not used)
&H.DISY=   0.00     ; Y position: Line dispenser (not used)
&H.DISR=   0.00     ; R rotation: Line dispenser (not used)
&H.CAMX=   0.00     ; X offset: Camera relative to teaching unit
&H.CAMY=   0.00     ; Y offset: Camera relative to teaching unit
&H.BADX=   98.25    ; X offset: Beam pointer relative to teaching unit
&H.BADY=  -68.75    ; Y offset: Beam pointer relative to teaching unit
&H.H1X=   139.03    ; X offset: Head 1 relative to teaching unit
&H.H1Y=   -68.75    ; Y offset: Head 1 relative to teaching unit
&H.H1R=    0.00     ; R rotation offset: Head 1 relative to teaching unit
&H.H2X=   -64.96    ; X offset: Head 2 relative to teaching unit
&H..H2Y=   -68.52   ; Y offset: Head 2 relative to teaching unit
&H.H2R=    5.69     ; R rotation offset: Head 2 relative to teaching unit
&H.H3X=   1.09      ; X offset: Head 3 relative to teaching unit
&H.H3Y=   -68.69    ; Y offset: Head 3 relative to teaching unit
```

2.5. Example Machine File

Below, an example MCH file is shown for a CSM-84V machine. It can obtained by sending the on-line command "@READ MCH" through the serial line, or by using the CSM TOOLBOX:

```
$MCH$
&H.MSG=1          ; 1 = English
&H.CMU=0          ; 0 = CMU is on-line
&H.FFMT=0         ; 0 = Floppy is NEC format (not used)
&H.PREG=1         ; 1 = 2 Point Teach Mode
&H.RATR=0         ; 1 = Rotation is Absolute
&H.BMRK=0         ; 0 = Bad Marks are relative to the PCB origin
&H.HED1=6         ; 6 = Head 1 is Dot Dispenser
&H.HED2=1         ; 1 = Head 2 is Standard Head (Chuck)
&H.HED3=5         ; 5 = Head 3 is Vision Head
&H.BEMS=1         ; 1 = Beam Sensor Present
&H.MOVC= 0        ; 0 = No Teaching Camera mounted on the Beam
&H.PREH=1         ; 1 = Prep Head Used
&H.CONV=1         ; 1 = Conveyor set to 'return'
&H.ECLP= 0        ; 0 = Edge clamping not present
&H.SBST=1         ; 1 = Sub stopper present
&H.MAL1=1         ; 1 = Mechanical Alignment 1 unit present
&H.MAL2=1         ; 1 = Mechanical Alignment 2 unit prestent
&H.NSTA=3         ; 3 = ANE station present and is VANE type
&H.THND=2         ; 2 = Tray handling device present and  is TTF type
&H.VAL2=1         ; 1 = Fixed Camera 2 present
&H.VAL3=0         ; 0 = Fixed Camera 3 not present
&H.VAL4=0         ; 0 = Fixed Camera 3 not present
&H.TCUT=0         ; 0 = Tape Cutting device not present
&H.APG=0          ; not applicable since &H.MSG = 1
&H.TECK=0         ; 0 = No tray empty checking performed
&H.PFID=0         ; 0 = Local fiducials are relative to the PCB origin
&H.MOUT=0         ; 0 = Output messages not send to CMU
&H.LMPX= 595.00   ; Maximum (+) soft limit in X direction (mm)
&H.LMPY= 487.00   ; Maximum (+) soft limit in Y direction (mm)
&H.LMPZ= 0.00     ; Z-axis not used
&H.LMPR= 400.00   ; Maximum (+) soft limit of R rotation (degree)
&H.LMMX= -38.50   ; Minimum (-) soft limit in X direction (mm)
&H.LMMY= -38.48   ; Minimum (-) soft limit in Y direction (mm)
&H.LMMZ= 0.00     ; Z-axis not used
&H.LMMR= -400.00  ; Minimum (-) soft limit of R rotation (degree)
&H.PINX= 545.83   ; X position of the fixed locating pin (mm)
&H.PINY= 23.58    ; Y position of the fixed locating pin (mm)
&H.EDGX=556.23    ; Value ignored since &H.ECLP =0
&H.EDGY=18.58     ; Value ignored since &H.ECLP = 0
&H.WATX=256.55    ; X position of the waiting point of the teaching unit
&H.WATY=283.79    ; Y position of the waiting point of the teaching unit
&H.WATZ= 0.00     ; Z-axis not used
&H.DMPX=256.55    ; X position of the dumping point
&H.DMPY= 283.79   ; Y position of the dumping point
&H.FDTM= 33       ; Front feeder bar datum position number (for auto-set)
&H.FLX= 379.16    ; X position of front feeder datum
&H.FLY= 38.76     ; Y position of front feeder datum
&H.RDTM= 0        ; No auto set for feeders on rear feeder bar
```

2.3.50. &H.VA2X, &H.VA2Y, &H.VA3X, &H.VA3Y, &H.VA4X, &H.VA4Y

Description: When the parameters &H.VAL2, &H.VAL3 and &H.VAL4 specify that fixed camera 2 and/or 3 and/or 4 is present, these parameters specify the position of these camera's relative to the machine origin.

Values: -999.99 to 999.99 [mm]

2.3.51. &H.VAL2, &H.VAL3, &H.VAL4

Description: Specifies if the fixed camera's 2, 3 and 4 are present. The &H.VAL2 parameter represents the Visual Alignment camera. The &H.VAL3 and &H.VAL4 parameters are reserved for future extensions and should be set to not present. The positions of the camera's are specified by the &H.VA2X, &H.VA2Y, &H.VA3X, &h.VA3Y, &H.VA4X and &H.VA4Y parameters.

Values: 0 = Camera not present
1 = Camera present

2.3.52. &H.WATX, &H.WATY, &H.WATZ

Description: Specifies the waiting position (idle position) of the teaching unit when boards are moved in or out of the workarea of the machine.

Values: -999.99 to 999.99 [mm]

2.3.53. &H.Z01, &H.Z02, ..., &H.Z16

Description: These parameters specify the Z-coordinate at which the pallets of the external feeder (LCS) are placed. These parameters are used when parameter &H.THND specifies that an external feeder is present. They are used by the LCS.

Values: -999.99 to 999.99 [mm]
Z (CSM84VZ only) = Around the value of 0.00

2.4. Fixed parameters

The tape feeder offset for the various tape widths are hard coded into the software and cannot be changed by the user. For the CSM66,84,84V and 84VZ machines, the tape feeder offset is 0 (also for the stickfeeder).

The pitch between two holes on the feeder bars is 16mm and is a fixed value.

2.3.46. **&H.ST1X, &H.ST1Y, &HST2X, &H.ST2Y**

Description: These parameters specify the two 'temporary points' on the machine (ST1 and ST2).

A) When a prep.head is used (see parameter &H.PREH), ST1 is used a intermediate position for putting the component for takeover by the mount head.

B) When an external feeder (LCS; see parameter &H.THND) is used, ST1 is the position at which the mount head can pick the component, ST2 is the position at which it can place a component back if vision fails or rejects the component.

Values: -999.99 to 999.99 [mm]

2.3.47. **&H.TCUT**

Description: Specifies whether the tape cutting device is mounted or not. If it exists, the parameter CUT specifies the number of feed actions between cutting tapes. This is not supported by the CSM machine.

Values: 0 = Tape cutting device not present
1 = Tape cutting device present

2.3.48. **&H.TECK**

Description: After picking a component from the last row & column, this option determines if the head will pick the next component from the first row & column position (default) or if an 'tray is empty' message will be displayed on the screen. In the latter case the orange warning indication lamp will be switched on.

Values: 0 = Default (no check will be done)
1 = <COMMON> will display an 'tray is empty' message after access of the last row & colom on a tray.

2.3.49. **&H.THND**

Description: Specifies what type of tray handling device is connected to the machine. When value "External Feeder" or "External Feeder and Manual" is specified, the parameters Z01..Z16 specify the tray Z-position of each tray (Z01..Z16 are used by the LCS).

Values: 0 = No tray feed device
1 = Tray stacker
2 = Tripple tray feeder
3 = External Feeder (LCS)
4 = External Feeder (LCS) and manual feeder

3.3.5. &F().HIGHT

Description: This parameter defines the height of the vision head at the moment a component is mounted. It is used to carefully place components with sensitive leads.

Mounting Height = &F().HIGHT - &H.H3Z

Values:
- 0.00 = Default. The mounting coordinate will be taken from the &H.H3Z value.
- 6.00 max The maximum value is approximately 6.00 mm, but depends on the mechanical position of the Z down sensor.

3.3.6. &F().LCEN

Description: This parameter gives the end pallet of the component type in the tray stacker. Refer also to &F().LCST

Values: 0 to 255

3.3.7. &F().LCNO

Description: Defines the feeder plate hole number on which the feeder is mounted. It is only used when the TECH parameters is set to "Auto set". In that situation, the CSM calculates the pick-up position for the component, based on &F().LCNO and &F().TYPE in relation with the tape feeder offset table (see MCH) and the machine file paremeters &H.FFDT, &H.RFDT, &H.FLX, &H.FLY, &H.RLX and &H.RLY. The pitch (P) between the feeder holes is fixed to 16.0 mm. The formula used:

If LCNO <= 50 then

x = &H.FLX + (LCNO - &H.FFDT) * P - X_OFFSET[TYPE]
y = &H.FLY + Y_OFFSET[TYPE]

If 51 <= LCNO <= 100 then

x = &H.RLX + (LCNO - &H.RFDT) * P + X_OFFSET[TYPE]
y = &H.RLY - Y_OFFSET[TYPE]

If LCNO > 100 then the position is known by the LCS.

Note: *X_OFFSET and Y_OFFSET are the feeder offset tables.*

Values: 1 to 120

3.3.2. &F().DIMX, &F().DIMY

Description 1: When the component is stored in a tray (see parameter &F().TYPE), these parameters give the number of components in the tray matrix. DIMX gives the number of components in the X direction, DIMY in the Y direction (trays are assumed to be rectangular). See also parameters &F().PITX, &F().POSX and &F().PTRX.

Values: 0 to 255

Description 2: When using the **Component Verification Tool**, &F().DIMX gives the component definition. &F().DIMY defines the power of 10 value of the component (see also &F().PITX).

Values:

&F().DIMX: 100 = Not used
101 = Resistor
102 = Capacitor
103 = Inductor

&F().DIMY: 100 =< &F(xxx).DIMY =<112
100 equals 10!**00**
1**12** equals 10!**12**

3.3.3. &F().DMP

Description: Defines the action to be taken when vision fails on a component. It can be set to DUMP, in which case the component is dropped at the dump position (see MCH parameter &F().DMPX). It can also be set to TRAY BACK. In this case the component is placed back at the position it was picked from.

Values:
0 = Standard (Dump)
1 = Tray Back

3.3.4. &F().DSPF

Description: The 'display flag'. This field should never be written to. It is filled in by the system whenever any of the parameters is written to. It is used by the CSM to indicate that the entry in the feeder file for this part number contains data.

Values:
0 = No data in this entry
1 = Data in this entry

THE FEEDER DEFINITION FILE

3.1. Feeder File: Introduction

The feeder definition file (FDR) describes all the information required to handle components to <COMMON>. It contains a number of entries, each describing one 'component type'. In the description of a component type the type of feeder is defined, on what position on the feeder bar this feeder can be found, the vacuum sense level of the component, if the feeder position is auto set or must be teached and many more information.

Only one feeder file exists in the CSM. All board files refer to this file (through the component type).

3.2. Feeder File: Parameter Format

The parameters in the feeder file have the following format:

&F(xxx).[YYYY]=[Z]

where:

&F	=	Fixed, this determines a feeder file parameter input
xxx	=	Component number (up to three digits)
YYYY	=	Character string describing the parameter input
Z	=	Numeric value or string. This value can represent a real physical X-, Y- Z-Axis or Rotation value, a choice of options belonging to the parameter or a comment string which can be used to describe a component.

3.3. Feeder File: Parameters

This section describes in detail what each parameters means.

3.3.1. &F().COMMENT

Description: Contains a comment field. The value may contain any character EXCEPT the "/" character. The characters are delimited by /'s. The comment may be up to 8 characters long. The comment value appears in the MIS data.

Values: /ABCDEFGH/, where ABCDEFGH can be any string with a maximum of 8 characters.

UFOS FILE DESCRIPTION

```
&H.H3R=   -40.00    ; R rotation offset: Head 3 relative to teaching unit
&H.H3Z =   0.00     ; Z offset: Head 3 relative to teaching unit (CSM84VZ)
&H.H4X=   40.04     ; X offset: Prep head relative to teaching unit
&H.H4Y=   -326.46   ; Y offset: Prep head relative to teaching unit
&H.H4R=   0.00      ; R rotation offset: Prep head relative to teaching unit
&H.CINW=   0.00     ; Automatic Conveyor track width (not used)
&H.LPTM=   1.00     ; Locate pin up delay is 1 second (after detection)
&H.PUTM=   1.00     ; Push up plate delay is 1 second (after detection)
&H.H1TM=   0.00     ; After pick-up timer 1 (not used)
&H.H2TM=   0.00     ; After pick-up timer 2 (not used)
&H.H3TM=   0.00     ; After pick-up timer 3 (not used)
&H.CHKT=   0.10     ; After pick-up vacuum check timer
&H.MNTT=   0.10     ; After mount vacuum switch on timer
&H.RTRY=   3        ; 3 = Maximum retry counter
&H.PMAX=   0        ; 0 = production indefinite
&H.CUT=    0        ; No tape cutter and/or component verification used
&H.PCNT=   0        ; Amount of PCB's processed so far (cumulative)
&H.H1M1R=  0.00     ; Head 1: R-axis linearity compensation (not used)
&H.H1P1R=  0.00     ; Head 1: R-axis linearity compensation (not used)
&H.H1P2R=  0.00     ; Head 1: R-axis linearity compensation (not used)
&H.H1P3R=  0.00     ; Head 1: R-axis linearity compensation (not used)
&H.H2M1R=  0.00     ; Head 2: R-axis linearity compensation (not used)
&H.H2P1R=  0.00     ; Head 2: R-axis linearity compensation (not used)
&H.H2P2R=  0.00     ; Head 2: R-axis linearity compensation (not used)
&H.H2P3R=  0.00     ; Head 2: R-axis linearity compensation (not used)
&H.H3M1R=  0.00     ; Head 3: R-axis linearity compensation (not used)
&H.H3P1R=  0.00     ; Head 3: R-axis linearity compensation (not used)
&H.H3P2R=  0.00     ; Head 3: R-axis linearity compensation (not used)
&H.H3P3R=  0.00     ; Head 3: R-axis linearity compensation (not used)
```

UFOS FILE DESCRIPTION

3.3.21. **&F().SLY**

Description: Defines the vacuum level check to ensure that a component is picked up correctly

Values:
0 = No vacuum check
1 = Low level
2 = Medium level
3 = High level

3.3.21. **&F().TECH**

Description: When this parameter is set to 'Auto-set', the pick-up position of the component is calculated by the system (see &F().LCNO). When it is set to 'Teach', the position is taken from &F().POSX and &F().POSY parameters.

&F().POSR is always used.

Values:
0 = Auto-set
1 = Teach

3.3.23. **&F().THND**

Description: Specifies the position of the tray handling. It can be on the machine or on an external tray handler.

Values:
0 = on CSM
1 = external tray handler (LCS)

3.3.24. **&F().TUNT**

Description: Teaching unit. The value of this field is only relevant while teaching the coordinates of the pick-up position. It is not used during the normal mounting process.

Values:
0 = Teaching unit is Beam Sensor
1 = Teaching unit is Head 1
2 = Teaching unit is Head 2
3 = Teaching unit is Head 3
4 = Teaching unit is Prep.head
5 = Teaching unit is Camera

3.3.17. &F().POSZ

Description: This specifies the component picking coordinates. This coordinate value is the position at which the underside of the nozzle comes in contact with the surface of the component in the feeder or tray.

Picking Height = &H.H3Z when &F().POZ= 0.00
Picking Height = &F().POZ when &F().POZ ≠ 0.00

Values: 0.00 = Default.
Maximum and Minimum values are dependant on the +Z and -Z softlimit coordinates (see &H.LMPZ and &H.LMMZ)

3.3.18. &F().PTRX, &F().PTRY, &F().PTRZ

Description: Specifies the position within a tray where the next component should be picked. This parameter should normally not be written to by the user, since the system then looses track of where it should continue within the tray.

Values: 0 to 255

3.3.19. &F().PUSE

Description: This parameter is introduced in the CSM84VZ. When picking a component from a tray handling device, this parameter determines if the push rod is used. Not using the push rod saves cycle time.

Values: 0 = Do not use push rod
1 = Use push rod

3.3.20. &F().RTRY

Description: This parameter determines if the machine retry counter should be used in case of a pick error or that the machine should go into an error if the first pick fails. This might be necessary for certain special feeder types

Values: 0 = YES, use normal retry counter
1 = NO, no retries for this component.

Note: *This option is only available in firmware version 066 and higher*

3.3.13. &F().PCNT

Description: Specifies the number of push index counts. The pusher first transports the tape by pushing the number of times specified in this parameter before picking the component. It should be set to 0 when using trays.

Values: 0, 1, 2, 3, 4

Note: *On the UFOS screen the values are 1, 2, 3, 4, 5*

3.3.14. &F().PITX, &F().PITY

Description 1: When the component is located in a tray (see &F().TYPE), these parameters specify the parts pitch between two adjacent components in the tray in both X- or Y-directions. See also paremeter &F().DIMX, &F().POSX and &F().PTRX.

Values: -999.99 to 999.99 [mm]

Description 2: When the component is used together with the Component Verification Tool, the parameter &F().PITX specifies the value of the component and &F().PITY specifies the tolerance of the component. The power of 10 value is specified in the parameter &F().DIMY.

Values:
&F().PITX = 0.00 to 999.99
&F().PITY = 0.00 to 100.00

3.3.15. &F().POSX, &F().POSY

Description 1: Defines the position at which the component is picked when &F().TYPE is not 'Tray'. When parameter &F().TECH is set to 'Auto- set', this position is ignored and the value is calculated as described under the parameter &F().LCNO.

Description 2: Defines the position of the first component in a tray when &F().TYPE is 'Tray'.

Values: -999.99 to 999.99

3.3.16. &F().POSR

Description: Defines the rotation at which the components are picked.

Values: -999.99 to 999.99 [degree]

3.3.8. **&F().LCNT**

Description: Specifies the head down time during pick and mount. After the head is lowered, it remains in the lowered position for this amount of time before it is raised again. During this time vacuum is established or released.

Values: 0 to 5 (Units of 50 ms).

3.3.9. **&F().LCST**

Description: This parameter gives the start pallet of the component type in the tray stacker. Refer also to parameter LCEN

Values: 0 to 255

3.3.10. **&F().NO4**

Description: This parameter determines if the prep. head should be used to pick this component. If so, the component is picked with the prep. head, placed at a temporary station (Machine parameter &H.ST1X and &H.ST1Y) and taken over by the head that must mount the component.

Values: 0 = Prep. head not used to pick component
1 = Prep. head used to pick component

3.3.11. **&F().MALI**

Description: Defines the mechanical alignment unit to be used for aligning the component. When set to 0, no mechanical alignment will take place. This parameter is also used when parameter &F().VFNO and &F().MATP are not zero.

Values: 0 = None
1 = Use Mechanical Alignment unit 1
2 = Use Mechanical Alignment unit 2

3.3.12. **&F().MATP**

Description: Specifies the use of the mechanical alignment units in relation to the use of vision. When set to ALWAYS, the component will always be mechanical aligned before it is presented to the vision system. When it is set to AT RETRY, the component is first presented to the vision system, if the vision measurement fails, it is aligned with the alignment unit specified in &F().MALI and then presented to the vision system again.

Values: 0 = Not Use
1 = At Retry
2 = Always

THE BOARD FILE

4.1. Board File: Introduction

Board files exist for each type of PCB that has to be processed by the machine. It specifies a number of processing parameters for the board and the positions for mounting components, placing glue dots, etc.

A board file consists of 2 groups of data:

- Running conditions
- Point data

A board file is related to one type of PCB. The name of this PCB type must be specified on the first line of the board file.

The board file has the following format:

```
PCBNAME=[name]
running conditions
point data
```

where:

a) name = Character string up to 8 characters maximum. Only letters and digits are allowed providing that the first character is always a letter. Non-capitalized letters will be shown in reversed video on the screen.

b) running conditions = Refer to section 4.2.

c) point data = Refer to section 4.4.

4.2. Board File: Running Conditions Parameter Format

The running conditions specify the way in which a board should be handled, eg. the fixing method, bad mark sensing etc. These parameters are specified in a block of lines, each containing one parameter. The parameters in the board file have the following format:

```
&B.[xxxx]=[yyy]
```

where:
- &B = Fixed, this determines a board file parameter input
- xxxx = String of 3 to 7 characters describing the parameter input
- yyy = numeric value or character string (with a maximum of

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3.4. Example Feeder File

An example FDR file is shown (in this case for component type 2, which is a 0402) for a CSM84V machine. It is obtained by sending the on-line command "@READ FDR" through the serial line, or using the CSM TOOLBOX:

```
$FDR$
&F(2).TYPE=0                ; 0 = Feeder type is 8mm tape
&F(2).THND=0                ; 0 = Item is found in CSM machine
&F(2).LCNO=10               ; 0 = Feeder position is 10 (front bar)
&F(2).TECH=0                ; 0 = Auto-set
&F(2).COMMENT=/0402   /     ; '0402' is shown in comment field
&F(2).TUNT=5                ; 5 = Teach unit is the camera
&F(2).POSX= 11.71           ; X position of pick up point
&F(2).POSY= 38.85           ; Y position of pick up point
&F(2).POSZ= 0.00            ; Nozzle just touches PCB
&F(2).POSR= 0.00            ; Pick up angle
&F(2).PCNT=0                ; No extra indexes before picking
&F(2).HIGHT= 0.00           ; Component height (not used)
&F(2).SLV=2                 ; Vacuum level check is medium
&F(2).LCNT=0                ; Head down time during pick and mount
&F(2).MALI=0                ; 0 = No mechanical Alignment used
&F(2).VFNO=0                ; 0 = No vision file used
&F(2).MATP=0                ; 0 = Vision + alignment not used
&F(2).RTRY=0                ; 0 = Standard machine retry counter used
&F(2).PUSE=0                ; Not used, not a tray component and 84VZ
&F(2).DIMX=1                ; Tray dimension in X direction
&F(2).DIMY=1                ; Tray dimension in Y direction
&F(2).PITX= 0.00            ; Pitch between components in tray (X)
&F(2).PITY= 0.00            ; Pitch between components in tray (Y)
&F(2).UPDP=0                ; Update pointer is not updated
&F(2).PTRX=0                ; Prime access point in tray in X direction
&F(2).PTRY=0                ; Prime access point in tray in Y direction
&F(2).LCST=0                ; Starting stacker number
&F(2).LCEN=0                ; Ending stacker number
&F(2).PTRZ=0                ; Prime Stacker number which will be used
&F(2).DMP=0                 ; 0 = Dump is standard
&F(2).NO4=0                 ; 0 = Prep. Head is not used for this component
&F(2).DSPF=1                ; 1 = CSM indicates valid data entry
```

3.3.25. &F().TYPE

Description: Specifies the type of feeder the component type is held in. See also &F().LCNO. When the Component Verification Tool is used, the value must be 0 to 5

Values:
0 = 8mm tape
1 = 12mm tape
2 = 16mm tape
4 = 24mm tape
5 = 32mm tape
6 = 32mm embossed tape
7 = 44mm embossed tape
14 = stick feeder
15 = tray feeder

3.3.26. &F().UPDP

Description: Specifies whether or not the LCS pick up access point and tray access Nr. will reset their value at data transmission to the LCS.

Values:
0 = Not update
1 = Update

3.3.27. &F().VFNO

Description: The vision file to be used to measure and align the component.

Values:
0 = Do not align with vision
1 = Vision file 0
.
.
30 = Vision file 29

4.2.1.11. **&B.FIX**

Description: Specifies the way in which the PCB is fixed during mounting.

Values:
0 = Pin
1 = Edge
2 = Pin and Push up

4.2.1.12. **&B.LDEX**

Description: A flag to indicate that line dispensing jobs must be executed.

Values:
0 = Skip line dispense
1 = Execute line dispense

4.2.1.13. **&B.MBMX, &B.MBMY**

Description: Specifies the master bad mark position in coordinates relative to the PCB origin.

Values: -999.99 to 999.99 [mm]

4.2.1.14. **&B.MTEX**

Description: A flag that indicates that mount jobs must be executed.

Values:
0 = Skip mount lines
1 = Execute mount lines

4.2.1.15. **&B.OPMD**

Description: Running mode 2. This parameter can be set to 'Normal', 'Check' or 'Pass'.

a) When set to normal, the boards are processed normally, mounting/dispensing is performed.
b) When set to Check, the board is also processed as usual, only no checks on mounting or picking is performed. This allows you to run the machine in 'demo' mode. In this mode, the MIS data is not updated.
c) When set to Pass, all boards that enter the CSM leave it without being processed. This is only possible when parameter &B.ASFG is set to 0 (AUTO).

Values:
0 = Normal
1 = Check
2 = Pass

4.2.1.7. **&B.COMMENT**

Description: This can be used to add a comment to the board file. The comment string is delimited by "/". The string may be up to 8 characters in length.

Example: &B.COMMENT=/comment/

Values: Maximum of 8 characters. The character '/' may not be used unless it is a delimiter character.

4.2.1.8. **&B.CONV**

Description: Defines the conveyor timer. This is the time that the exit sensor of the conveyor is inactive before the conveyor stops. This is used for odd shaped boards, that de-activate the exit sensor for a short time (e.g. due to a hole) before it is actually completely moved out of the machine.

Values: 0 to 4 (Units of 0.5 seconds)

4.2.1.9. **&B.DDEX**

Description: A flag to indicate that dot dispensing jobs must be executed.

Values: 0 = Skip dot dispense
1 = Execute dot dispense

4.2.1.10. **&B.FID1**

Description: Specifies the way in which Origin fiducial corrections on the board are used. It can be set to "Not Use", in which case no fiducial measurement and correction will take place. It can be set to "PCB" in which case two fiducials are measured and all place actions are correct according to these measurements. It can be set to "Block" in which case two fiducials are measured just before each block is processed. The measurements are only used to correct the specific block. The positions of the fiducials are specified in the point data part of the board file.

Values: 0 = Not use
1 = PCB
2 = Block

4.2.1.3. &B.BMKX, &B.BMKY

Description: Bad mark position. The bad mark position is given in block coordinates. The value is used only when the parameter &H.BMRK is set to 0.

Values: -999.99 to 999.99 [mm]

4.2.1.4. &B.BMLG

Description: Specifies the condition of the bad mark. When set to ON, the bad mark is reflective, when set to OFF, the bad mark is non-reflective. This value can only be used when the bad mark positions are relative to the Block origin (&H.BMRK must be set to 0)

Values:
0 = ON
1 = OFF

4.2.1.5. &B.BMRK

Description: Defines if Bad mark check is used. It can be set to NOT USE, USE or MASTER MARK.

a) When set to 'NOT USE', no bad mark sensing is performed.
b) When set to 'USE', each block is scanned for a bad mark (refer to &H.BMRK if the bad marks are related to the Block - or to the PCB origin).
c) When set to 'MASTER MARK', the system first scans for a marker at the master mark position (see &B.MBMX, &B.MBMY). When such a mark is found, the block bad marks are scanned. When the master mark is not found, the block marks are not scanned and the system assumes that all blocks are good. The master mark is used as a signal to indicate that at least one block has a bad mark. By using this mechanism you can save cycle time.

Values:
0 = Not use
1 = Use
2 = Master mark

4.2.1.6. &B.BSEN

Description: Defines the equipment that is used for bad mark sensing (this parameter is ignored if &B.BMRK is set to 'not use').

Values:
0 = Beam sensor
1 = Camera

8 characters)

Not all possible parameters need to be given a value. If a parameter is not specified, the value of it will default to 0 (zero).

The &B parameters are read when you start (switch) the board file.

4.2.1. Board File: Parameters

This section describes in detail each parameter.

4.2.1.1. &B.ASFG

Description: Specifies running mode 1. It can be set to the values AUTO, STEP, UTILITY JOB or JOB CONDITION.

a) When set to AUTO, the CSM processes the board without operator assistence (except for error conditions).

b) When set to STEP, the CSM will execute a part of the process cycle and then stops, when the operator presses the run key, the next part of the cycle will be executed after which it stops again, etc.

c) When set to JOB CONDITION, a menu of condition settings will be shown to the operator. In this menu you can select:

1. DATA CHECK SEND (skip or exec.) this means that a data check is carried out or not.
2. DISPENSE CONTROL. You can only select this when DS (dispense) software is used in the machine.

d) When set to UTILITY JOB, a menu of utility programs will be shown to the operator (eg. WARMUP) when this board file is started. All other parameters are irrelevant in this situation.

Values:
0 = AUTO
1 = STEP
2 = JOB CONDITION
3 = UTILITY JOB

4.2.1.2. &B.BFNO

Description: Specifies the vision file to be used for scanning the bad marks when the camera is used (see parameters &B.BMRK and &B.BSEN).

Values: 0 to 29

The pre-dispense-line has the following format:

J[number] = [x-position] [y-position] [z-disp]

where:			
	J	=	Fixed, indicates a pre-dispense line
	number	=	Sequence number of the pre-dispense line (0..)
	x-position	=	x-position of the pre-dispense point
	y-position	=	y-position of the pre-dispense point, the x and y positions are given in block coordinates of block with line number 1 (see Origin-lines).
	z-disp	=	String of 8 digits. Leading zeroes are not shown. This string has the following format:

ABCDEFGH

A =	Vision file; 0 = not used, 1 = used
BCD =	The glue time in [ms]
EF =	Rotation of glue head; 00 = 0 degree, 01 = 90 degrees
G =	The head number that will perform the dispense job.
H =	Skip-parameter; 0 = execute the line, 1 = skip the line

Pre-dispense lines are executed only when the skip parameter in z-disp specifies that the line must be executed and the running parameter &B.PDEX indicates that the pre-dispense job must be done.

4.3.4. The Dot-dispense lines

The dispense lines specify a number of points where dispense dots will be placed. The dot-dispense line has the following format:

D[number] = [x-position] [y-position] [z-disp]

where:			
	D	=	Fixed, indicates a dot-dispense line
	number	=	Sequence number of the dispense line (0..)
	x-position	=	x position of the dispense point
	y-position	=	y position of the dispense point, the x and y positions are given in block coordinates.
	z-disp	=	String of 7 digits. Leading zeroes are not shown. This string has the following format:

ABCDEFG

ABC =	The glue time in [ms]
DE =	Rotation of glue head; 00 = 0 degree, 01 = 90 degree
F =	The head number that will perform the dispense job.
G =	Skip-parameter; 0 = execute the line, 1 = skip the line

Dispense lines are executed only when the skip parameter in z-disp specifies that the line must be executed and the running parameter &B.DDEX indicates that the dispense jobs must be done.

mark-dia	=	mark diameter in [mm]
srch-area	=	search area height and width in [mm]
x-off	=	x offset where to start scanning (relative to the fudicial position).
y-off	=	y offset where to start scanning (relative to the fiducial position).
z-fid	=	A string of 5 digits. Leading zeros are not shown. The string has the following format:

ABCDE

AB = vision file number, only if the reading equipment is the camera; range 00 to29
C = reading equipment; 0 = beam sensor, 1 = camera
D = Scan type; 0 = XY, 1 = XYX
E = Mark logic; 0 = on (reflective), 1 = off (non-reflective)

Note: *The parameter &B.FID1 determines if line I0 contains data for processing PCB or Block fiducials.*
The parameter &H.PFID determines if the coordinates in lines I1 to I15 are relative to the PCB origin or Block origin.

Examples:

I0 = 100.00 100.00 200.00 200.00	;	PCB fudicials are on X1=100.00, Y1=100.00, X2=200.00, Y2=200.00
i0 = 1.00 2.00 0.00 0.00 29100	;	Mark diameter is 1mm, the search area is 2mm, no offset in where to start scanning. 29100: Vision file 29, camera is reading equipment, scan type XY is used and mark logic is reflective.

The Scan type defines the algorithm used when a beam sensor is used. The movements of the beam are:

XY : First find X-centre, at X-centre find the Y-centre so, first move in X-direction, then in Y-direction.
XYX: First find X-centre, at X-centre find Y-centre, then at Y- centre determine the X-centre again.

4.3.3. The Pre-dispense lines

The pre-dispense lines specify a number of points where the pre-dispense dots will be placed.

4.3.1. The Origin lines

The origin lines specify the position of the PCB origin and the BLOCK origins. The coordinates in these lines are given in machine coordinates in units of [mm] or [degree]. The origin line has the following format:

O[number] = [x-position] [y-position] [rotation] [block-skip]

where:	O	=	Fixed, indicates an origin line
	number	=	Integral number. Number 0 is used to indicate the PCB origin, other numbers to specify block origin points.
	x-position	=	x-position of the block or PCB origin [mm]
	y-position	=	y-position of the block or PCB origin [mm]
	rotation	=	rotation in degrees
	block-skip	=	Indicates if a block must be processed or not. This parameter has no meaning for O0. Value 0 means: process the block Value 1 means: do not process the block

Examples:

O0 = 300.0 0.0 0.0 0 ;	PCB origin on X=300.00, Y=0.0, Rotation = 0.0 and process the block.
O1 = 100.34 20.5 180.0 1 ;	Block 1 origin is on X=100.34, Y= 20.5, rotation is 180 degrees, but do not process the block.

4.3.2. The Fiducial lines

The fiducial lines specify the positions of PCB, Block and Point fiducials. The fiducial lines have the following format:-

I[number] = [x1-position] [y1-position] [x2-position] [y2-position]

i[number] = [mark-dia] [srch-area] [x-off] [y-off] [z-fid]

where:	I	=	Fixed, first fudicial line
	i	=	Fixed, second fudicial line
	number	=	This is the reference number of the fiducial line Number 0 is used to specify the PCB or Block fiducial (depends on parameter &B.FID1). Non-zero number specify point (local) fiducial lines. Range: 0..15
	x1-position	=	x-position of the first fudicial
	y1-position	=	y-position of the first fudicial
	x2-position	=	x-position of the second fudicial
	y2-position	=	y-position of the second fudicial

(parameters continue on next page)

2.2.1.16. **&B.PCBW**

Description: Specifies the measured PCB width. This parameter will only be active when the CSM has an automatic width conveyor system.

Values: -999.99 to 999.99 [mm]

2.2.1.17. **&B.PDEX**

Description: A flag that indicates that pre-dispense jobs must be executed.

Values: 0 = Skip pre-dispense lines
1 = Execute pre-dispense lines

2.2.1.18. **&B.SBST**

Description: This parameter specifies if the substopper must be used or not.

Values: 0 = Do not use sub-stopper
1 = Use sub-stopper

4.3. Point Data

The point-data group contains positions that tell the system where to execute certain actions. It contains Origin positions, Fiducial positions, Pre-dispense positions, Dot-dispense positions, Line-dispense positions, Line-dispense sub-line, Mount positions and Bad Mark positions.

```
point-data ::=                    parameter ::=
    { origin-line |                       {     O
      fiducial-line |                           I and i
      pre-dispense-line |                       J
      dot-dispense-line |                       D
      line-dispense-line |                      L
      line-dispense sub-line |                  C
      mount-line |                              M
      bad mark-line                             N
    }                                     }
```

The sequence in which the lines appear in the file is irrelevant. The system will always execute the lines in the following order:

1 - pre-dispense lines
2 - dot-dispense lines
3 - line-dispense lines
4 - line-dispense sub lines
5 - mount lines

The origin and fiducial lines give reference data for the other lines.

SECTION 5

THE MIS DATA FILES

5.1. MIS Data Files: Introduction

The CSM collects figures about the production process. It measures the time it is powered on, the time it is actually processing, the number of boards processed, pick and place error and cycle counts. This data can be inspected from on the video monitor or read through on-line commands.

5.2. Structure of the MIS data

The data that is collected consists of a number of items:

- time data
- cumulative PCB area consisting of a data area for each PCB-type
- trip data

5.2.1. The time data

The time data consists of:

1. Cumulative time:
   - 1a) The total time during which the machine was powered-on since the last time the memory was initialized
   - 1b) The total time the machine has been running since the last time the memory was initialized
   - 1c) The ration between 1a and 1b.
2. Single time:
   - 2a) The total time the machine has been powered on since that last time that power was applied to the machine.
   - 2b) The total time the machine has been running since the last time that power was applied to the machine.
   - 2c) The ration between 2a and 2b.

Layout:

PRD

/OPR/
xxxxxH xxM xxS yyyyyH yyM yyS

/RUN/
xxxxxH xxM xxS yyyyyH yyM yyS

/RAT/
xxx.xx% yyy.yy%

4 = head 1, head 2, head 3
5 = head 1, head 3, head 2
6 = head 2, head 1, head 3
7 = head 2, head 3, head 1
8 = head 3, head 1, head 2
9 = head 3, head 2, head 1

C = Head number; 1 to 3
D = Nozzle number; 1 to 3; ignored when the head is not an ANE head (see machine configuration parameter &H.HEDx.
E = Skip parameter; 0 = execute the line, 1 = skip the line.
FGH= Part number; value 1..120; this is a index into the feeder file. The system determines through this number which feeder definition must be used for picking. Refer to the feeder file description for more information.

Mount lines are only executed when their skip parameter (see z-mount) is set to 'execute' and the running condition parameter &B.MTEX is set to 'execute'.

Common collects a set of successive mount lines until it detects that the head number of the next mount line is lower then the head number in the current mount line. The set of mount lines that are collected this way is called a cluster. First <COMMON> picks the components in the cluster in the sequence in which the mount lines appear in the cluster. Then <COMMON> starts the mount parts of the mount lines in the cluster. The sequence in which the mount parts are executed depend on the optimize parameter of the first mount line in the cluster.

4.3.8. The Bad Mark Lines

The bad mark lines define the positions of the block bad marks. These lines can only be found if the parameter &H.BMRK in the machine file is set to 1. When set to 0 the position of the bad mark is found in the parameters &B.BMKX, &B.BMKY, &B.BSEN, &B.BMLG and &B.BFNO. The bad mark line has the following format:

N[number] = [x-position] [y-position] [z-disp]

where:
N = Fixed, this indicates a bad mark line
number = Sequence number of the bad mark line
Line 0 is to define the Master Bad Mark, all other lines are to define the block bad marks
x-position = x position of the bad mark
y-position = y position of the bad mark
z-disp = String of 4 digits. Leading zeroes are not shown. This string has the following format:

ABCD

A = Bad mark sensing equipment; 1 = Vision, 0 = Beam.
B = Bad mark logic; 0 = bad mark is reflective, 1 = bad mark is non-reflective.
CD = Vision file number; 0 to 29

ABCDE

ABC = Dispense time [ms]
DE = Velocity; this is used for changing the thickness of the line. Normally it is set to 0.

1 9
FINE HEAVY

z-disp = String of 8 digits. Leading zeroes are not shown. This string has the following format:

FGHIJKLM

FG = Start % of the line (only active when job set = DISP)
HI = End % of the line (only active when job set = DISP)
JK = Rotation angle 00 = 0 degree, 01 = 90 degrees
LM = Job set: 0 = MOVE
1 = DISP
2 = CLEANING

Line Dispense SUB lines are executed only when the skip parameter in the Line dispense z-disp specifies that the line must be executed and the running parameter &B.LDEX indicates that the line dispense jobs must be done.

4.3.7. The Mount lines

The mount lines specify where and what components must be placed on the board. The mount line has the following format:

M[number] = [x-position] [y-position] [rotation] [z-mount]

where:
M = Fixed, indicates a mount line
number = Sequence number of the mount line (0,1,..)
x-position = x mount position in block coordinates
y-position = y mount position in block coordinates
rotation = Rotation relative to the rotation at which the component is picked (defined in the feeder file)
z-mount = String of 8 digits. Leading zeroes are not shown. This string has the following format:

ABCDEFGH

A = Point fiducial line number; 0 means not used, 1 to F (hexadicimal) indicates the fiducial line number.
B = Optimize parameter; see below.
0 = sequence of picking / not used
1 = Generated by the CSM.
2 = Generated by the CSM
3 = Generated by the CSM

*Optimizer parameters 1, 2 and 3 are only used in the **00DS** software for simultaneous pick.*

4.3.5. The Line dispense lines

The line dispense lines specify a number of points where a dispense line will be placed. The line dispense and line dispense sub functions are used together, as a set. The line dispense sub functions are shown in the next section. The line dispense lines have the following format:

L[number] = [x-position] [y-position] [rotation] [z-disp]

where:

L	=	Fixed, indicates a line dispense line
number	=	Sequence number of the line dispense line (0..)
x-position	=	x position of the line dispense point
y-position	=	y position of the line dispense point
rotation	=	Indicates the pattern rotation set in the line dispense sub settings
z-disp	=	String of 8 digits. Leading zeroes are not shown. This string has the following format:

ABCDEFGH

A =	Skip -parameter; 0= execute the line, 1 = skip the line
B =	The head number that is used to glue
C =	Not defined
EFGh =	This indicates the number of the pattern set in the line dispense sub settings (SUB NO)

Line Dispense lines are executed only when the skip parameter in z-disp specifies that the line must be executed and the running parameter &B.LDEX indicates that the line dispense jobs must be done.

4.3.6. The Line dispense sub-lines

The line dispense sub lines specify linear patterns called out by the SUB NO, of the line dispense (see previous section). The format of the line dispense sub-lines is the following:

C[number] = [x-position] [y-position] [w-disp] [z-disp]

where:

C	=	Fixed, indicates a line dispense sub line
number	=	Sequence number of the line dispense sub lines (0..)
x-position	=	x position of the line dispense pattern
y-position	=	y position of the line dispense pattern
w-disp	=	String of 5 digits. Leading zeroes are not shown. This string has the following format:

(format shown on the next page)

5.2.2. Cumulative PCB area

The cumulative PCB area contains a collection of data blocks, each for one type of PCB (one PCBNAME).

For each PCB-type the following data is part of this block:-

- PCB Name
- Number or processed boards (QTY)
- Mounting rate (MR)
- Total mounting time (MT)
- Average cycle time (CT)
- Amount of components used for this type (PQ)

Each block contains for each feeder that is used in for the PCB type (determined from board file) the following:-

- feeder number (part number/index in feeder file)
- feeder name (comes from the comment field in the feeder file)
- feed count (incl. errors) (QTY)
- feed errors (ERR)
- feed rate (RATE)

Each block contains for each head the following:-

- head number
- number of feed actions (including retries) (QTY)
- number of feed errors the head was involved in (ERR1)
- feed rate (RATE1)
- number of mounting errors the head was involved in (ERR2)
- mount rate (RATE2)

It also contains per feeder that was is in processing the PCB type and per head:

- feeder number
  {
    - head number
    - feed count
    - error count
    - feed ratio

  }

The layout of the cumulative PCB area is a repetition for each PCB name. The layout is shown on the following page:

```
$CUMULATIVE

PCB NAME        QTY.      MR[%]     MT[S]     CT[S]   PQ
########        ******    ***.*     ***.*     ***.*   ***
$FEEDER
NO   NAME       QTY.      ERR       RATE
**   ########   ******    ***       ***.**%
     ..........
     ..........
**   ########   ******    ***       ***.**%
$HEAD
NO   QTY.       ERR1      RATE1     ERR2      RATE2
1    ******     ****      ***.**%   ****      ***.**%
2    ******     ****      ***.**%   ****      ***.**%
3    ******     ****      ***.**%   ****      ***.**%
4    ******     ****      ***.**%   ****      ***.**%
$F**
H1=  ******  ****  ****
H2=  ******  ****  ****
H3=  ******  ****  ****
H4=  ******  ****  ****
     .......
     .......
$F**
H1=  ******  ****  ****
H2=  ******  ****  ****
H3=  ******  ****  ****
H4=  ******  ****  ****
```

5.2.3. Trip data

The trip data contains identical information as in one section of the cumulative PCB area. It contains the data for the last processed PCB type.

The layout is, apart from the keyword TRIP (which is CUMULATIVE in the previous section), identical to that of the cumulative PCM area:

```
$TRIP
PCB NAME        QTY.      MR[%]     MT[S]     CT[S]   PQ
########        ******    ***.*     ***.*     ***.*   ***
$FEEDER
 NO  NAME       QTY.      ERR       RATE
 **  ########   ******    ***       ***.**%
     ..........
     ..........
**   ########   ******    ***       ***.**%
$HEAD
NO   QTY.       ERR1      RATE1     ERR2      RATE2
1    ******     ****      ***.**%   ****      ***.**%
2    ******     ****      ***.**%   ****      ***.**%
3    ******     ****      ***.**%   ****      ***.**%
4    ******     ****      ***.**%   ****      ***.**%
```

(continued on next page)

UFOS FILE DESCRIPTION

$HEAD

NO	QTY.	ERR1	RATE1	ERR2	RATE2
1	0	0	0.00%	0	0.00%
2	4	3	25.00%	0	100.00%
3	0	0	0.00%	0	0.00%

$F19

H1=	0	0	0
H2=	4	3	0
H3=	0	0	0

$CUMULATIVE

PCB NAME	QTY.	MR[%]	MT[S]	CT[S]	PQ
ERIC	10	100.0	3.3	3.3	1

$FEEDER

NO	NAME	QTY.	ERR	RATE
22	0603	5	0	100.00%
40	0603	6	2	66.67%

$HEAD

NO	QTY.	ERR1	RATE1	ERR2	RATE2
1	0	0	0.00%	0	0.00%
2	11	2	81.82%	0	1100.00%
3	0	0	0.00%	0	0.00%

$F22

H1=	0	0	0
H2=	5	0	0
H3=	0	0	0

$F40

H1=	0	0	0
H2=	6	2	0
H3=	0	0	0

$TRIP

PCB NAME	QTY.	MR[%]	MT[S]	CT[S]	PQ
ERIC	10	100.0	3.3	3.3	1

$FEEDER

NO	NAME	QTY.	ERR	RATE
19	1206	0	0	0.00%
22	0603	5	0	100.00%
40	0603	6	2	66.67%

$HEAD

NO	QTY.	ERR1	RATE1	ERR2	RATE2
1	0	0	0.00%	0	0.00%
2	11	2	81.82%	0	100.00%
3	0	0	0.00%	0	0.00%

$F19

H1=	0	0	0
H2=	0	0	0
H3=	0	0	0

$F22

H1=	0	0	0
H2=	5	0	0
H3=	0	0	0

$F40

H1=	0	0	0
H2=	6	2	0
H3=	0	0	0

It can be cleared by initializing the memory of the CSM or by explicitly initializing the file:

@INIT MEM = This deletes more then just PRDII (eg. VIS, BRD, MCH, FDR)

@INIT PRD

5.4.2. Cumulative PCB area

The cumulative data for all PCB-types can be obtained by reading the PCB file. The data for all PCB types are concatenated. The entire data block is terminated by an empty line (just CR/LF).

@READ PCB = Read entire cumulative area

The data for a PCB type is deleted when the board file is deleted. It cannot be deleted in another way through on-line commands. However, it is possible to clear the figures through the monitor.

@ERA B<TEST> = Clear board data and also MIS

5.4.3. Trip data

The trip data can be read via the file TRP. The block of data is terminated by an empty line.

@READ TRP

It is cleared during the first time a @PCBRUN command is executed after giving a @SWI command. It can explicitly be cleared by an initialize command:

@INIT TRP

5.5. Example MIS Data

```
$PRD$
/OPR/
      179H 18M 40S     0H  3M 33S
/RUN/
      49H 10M 34S      0H  0M  0S
/RAT/
      27.43%           0.00%

$CUMULATIVE
PCB NAME        QTY.      MR[%]     MT[S]     CT[S]     PQ
TOPSIDE         0         100.0     0.0       0.0       0
$FEEDER
 NO NAME        QTY.      ERR       RATE
 19   206       4         3         25.00%
```

```
$F**
H1= ******   ****   ****
H2= ******   ****   ****
H3= ******   ****   ****
H4= ******   ****   ****
   .........
   .........
$F**
H1= ******   ****   ****
H2= ******   ****   ****
H3= ******   ****   ****
H4= ******   ****   ****
```

5.3. Update of data

The data of the various parts of the MIS data are updated or initialized as described below.

The cumulative time fields are set to zero when memory is initialized explicitly (@INIT MEM).

The single time fields are set to 0 when the machine is powered-up.

An entry for a PCB type is created in the cumulative PCB data when the board file for the PCB is compiled (so during execution of the @PCBRUN command after a @SWI command).

An entry for a PCB type is deleted from the cumulative area when the board file for it is deleted (@ERA B<...>) or when the PRD file is initialized (@INIT PRD).

The trip data is cleared and initialized when another PCB type is selected, during compilation of the board file (so during execution of the @PCBRUN command after a @SWI command).

The PCB/TRP data is updated when the head moves up at the end of a pick cycle and when the head moves up at the end of mounting a component.

5.4. Files

The MIS data can be obtained in various parts:

5.4.1 All data

All data can be obtained by reading the PRD file. It is a concatenation of the time data, cumulative PCB area and trip data (in this sequence).

Each section is terminated by an empty line (just CR/LF).

```
@READ PRD
```