

It is getting closer....



It Is BIG



Excellence in
Automation & Drive :
Siemens

It Is VOLVO....



Excellence in
Automation & Drive :
Siemens

... The Chassis is the back bone of every truck



Volvo Truck Australia



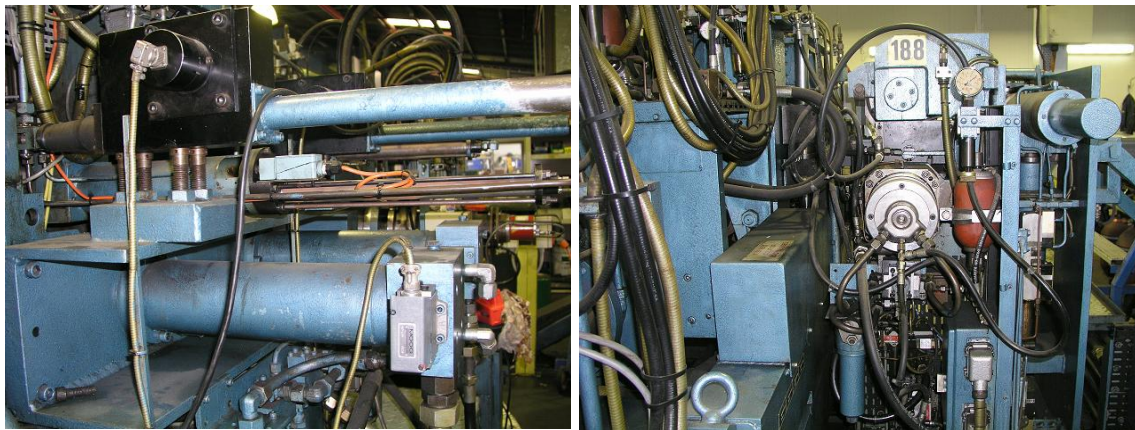
- Well established company and dynamic company.
- Producing trucks under the Volvo, Mack and Renault license
- Quality – trademark in Volvo group.

Volvo's Chassis Rail Punching Machine



- Complete transfer line for rail punching
- Automatic rail transfer (loading, positioning for punch, unloading)
- Multiple punching and nibbling stations
- Various rail types and sizes
- Quick start-up
- Easy recovery in case of punch break or any other punching problem
- Easy maintenance
- Safety integrated
- Future development

Old Technology ...



- Hydraulic servo controls ...
- Old NC controller (Profel) and PLC (Satcon)...
- Un-flexible and Very basic operator interface



... not quite reliable!



- Spare parts problem...
- Slow process...
- No room for development.
- Growing frustration!

A new life using Sinumerik 840D



- 840D/611D digital CNC/servo-drive system
- 9 servo axes including 2 hydraulic axes, 10 virtual axes (measuring probes)
- Interfacing Moog servo valves with HLA module
- Incremental/absolute encoders
- Distributed peripheral Inputs/Outputs via DP Profibus
- Safety system using Safety relay and Sinumerik Safety Integrated technology



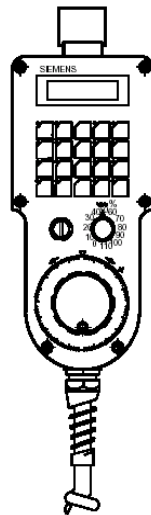
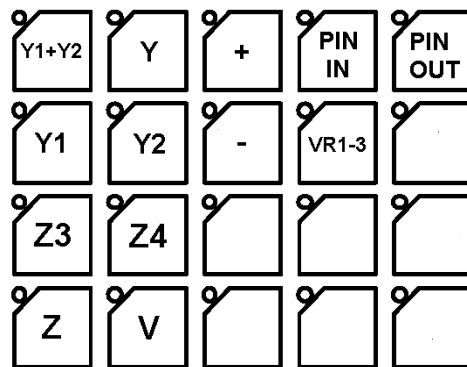
Smart Operator Interface



- PCU50 and data handling PC
- OP15 and 17" TFT screens
- Integration in Volvo's network
- Xerox color Printer integrated via network
- Machine Control Panel
- Full process control from raw data to punch.

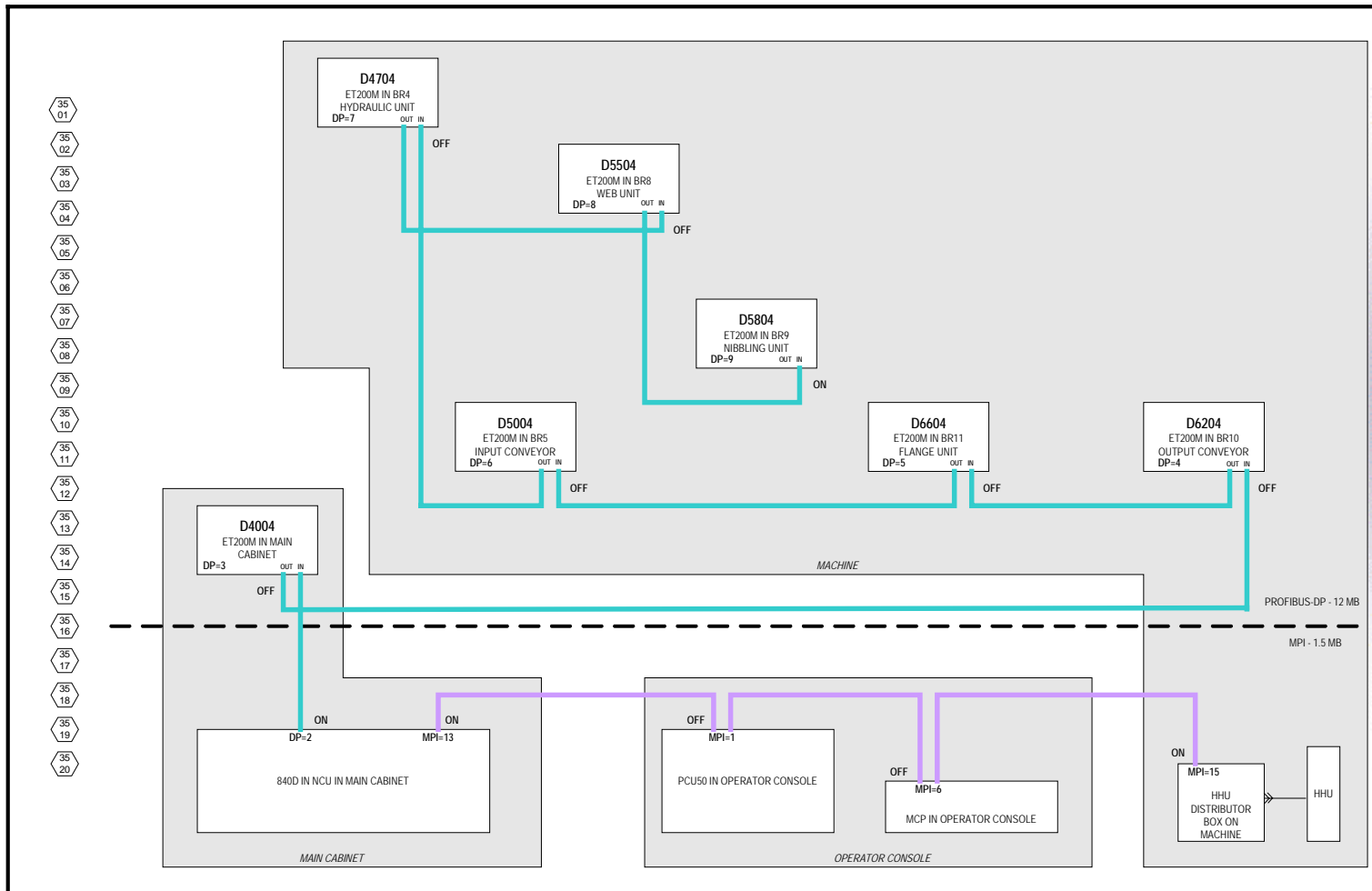


Mobility via Hand Held Unit



- Manual Functions for jogging the axes
- Key Switch for activation
- Enable button
- Hand wheel
- Feed rate override
- Emergency Stop

DP Profibus configuration



- 35 01
- 35 02
- 35 03
- 35 04
- 35 05
- 35 06
- 35 07
- 35 08
- 35 09
- 35 10
- 35 11
- 35 12
- 35 13
- 35 14
- 35 15
- 35 16
- 35 17
- 35 18
- 35 19
- 35 20

This drawing contains information proprietary to CNC Design and is not to be disclosed to a third party without the prior written consent of CNC Design



DATE	22/06/04
DRAWN	S.P.
CHECKED	N.F.
APPR'D	P.E.

TITLE: VOLVO TRUCKS - CHASSIS PUNCH MACHINE
COMMUNICATION BUSES

DRAWING NUMBER	1112017-35
REVISION	NEXT PAGE
26.05	1112017-40



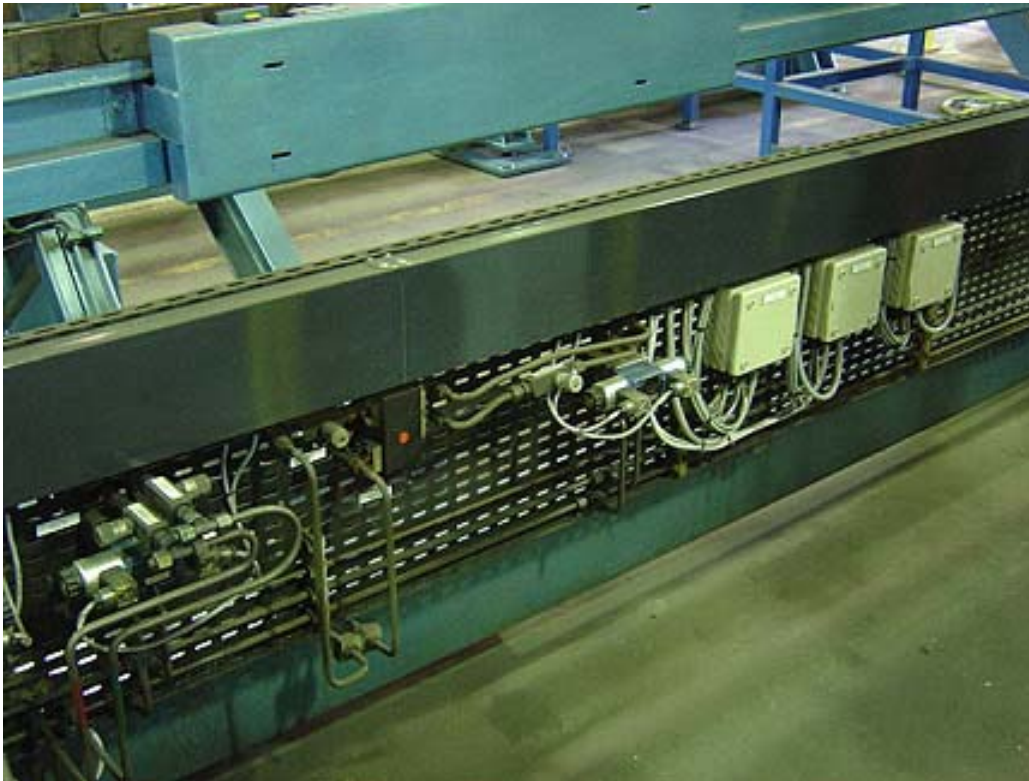
Wiring via ET200M stations



- Local connection for all I/O related to hydraulic units and outputs for web unit



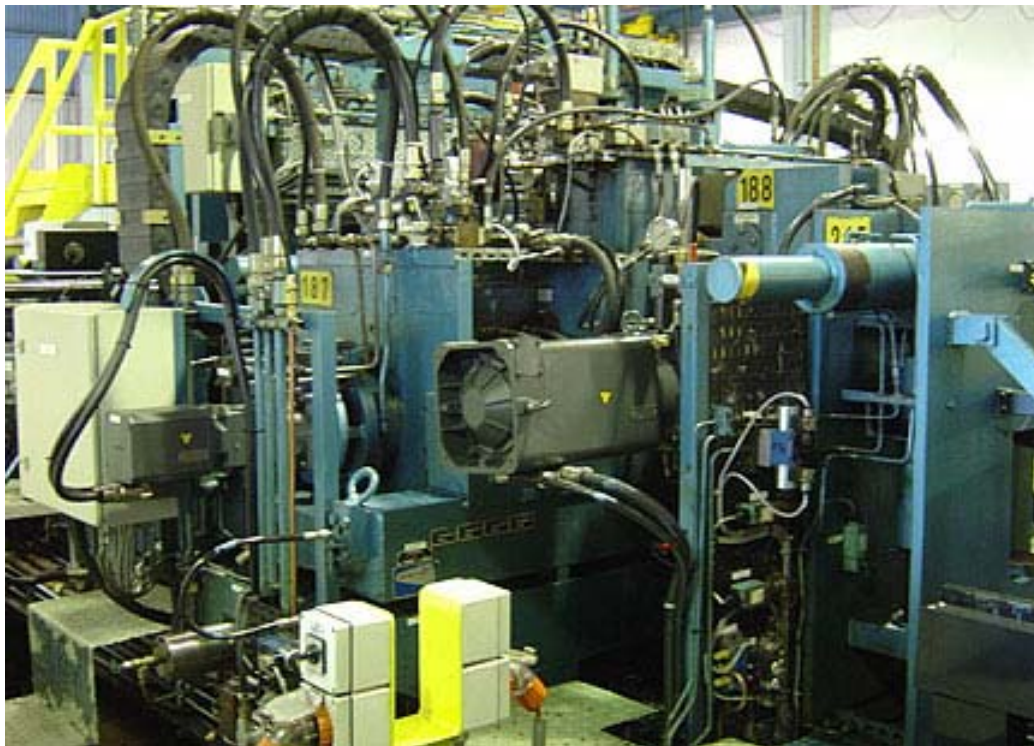
Terminal boxes for local wiring



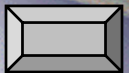
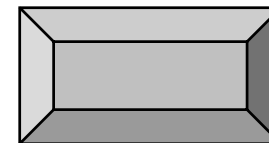
- Local connection for I/O on Input/Output conveyors



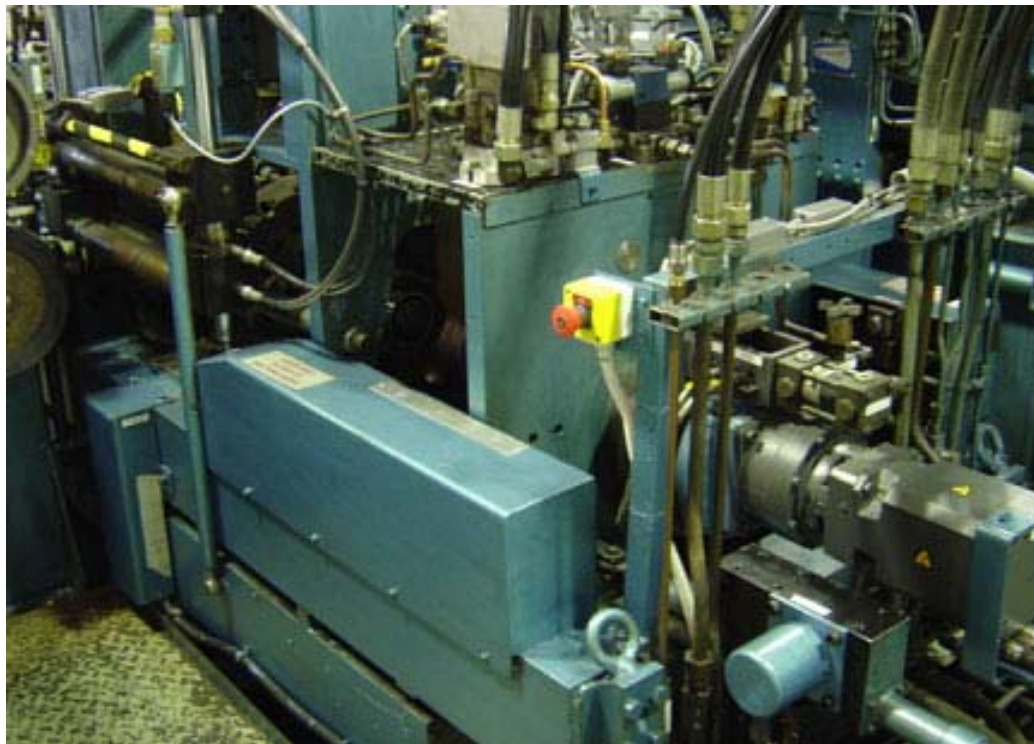
New servomotor system instead hydraulic servos



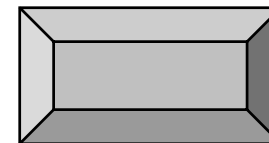
- X2 servomotor
- X1/X2 swapping
- Right flange unit controls
- Flange unit position control using linear scale measuring system and direct encoders



Automatic adjusting for various rail sizes



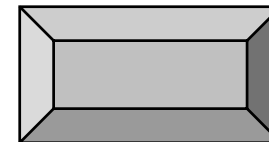
- Left punching head position control using VR1-3 encoder in a pseudo-closed loop position control
- VR1-3 position adjustment based on rail width
- VR1-3 stand by position setup



New servo system replacing hydraulic motors



- X1 servomotor and direct encoder principle
- Y axis servomotors
- Direct measuring probes for precise punching



Diagnose Utility – main screen

Diagnosis Utility	CHAN1	Jog	\CMA.DIR NORMAL_Y1.SPF	Diagnosics Utility
Channel interrupt			Program aborted	
Stop: No Mode Group Ready		ROV		CNCdesign VOLVO
3000	↓	Emergency stop		

Main Menu

Input Conveyor	Flange Unit	Magazines
Input Elevator and X1 DriveWheel	Output Elevator and X2 Drive Wheel	Safety Devices
Web Unit	Output Conveyor	Drives CNC
Nibbler Unit	Power Pack	Auxiliaries
Central Elevator	Scrap Conveyor	Machine's Initial Conditions
Database Maintenance	Exit Diagnostics	

- Access to Diagnostic Utility from machine main menu
- Select an particular area for monitoring
- Machine's Initial Conditions monitoring
- Exit the Diagnosis Utility



Diagnose Utility – machine area monitoring

Diagnosis Utility

CHAN1 Jog \CMA.DIR NORMAL_Y1.SPF Diagnostics Utility

Channel interrupt Program aborted

Stop: No Mode Group Ready ROV

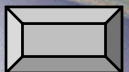
10621 ↓ : Channel 1 axis V rests on software limit switch -

Input Conveyor

Name	Description	Function	PLC	On/Off	Status
C1	Photoel	Rail Present in C1-Saturation	I 40.0	●	OK
C2	Photoel	Rail Present in C2-Saturation	I 40.1	●	OK
C24	Photoel	Rail Present Lo Position	I 40.5	●	OK
C2A	Photoel	Chain Conveyor Empty	I 44.5	●	OK
C3	Photoel	Rail Present Elevator1	I 42.2	●	OK
C4	Photoel	Rail Present Elevator3 - if rail long enough	I 42.3	●	OK
C4L	Photoel	Minimum Rail Length Check	I 44.6	●	OK
C5	Photoel	Rail Present Elevator4 - if rail long enough	I 42.4	●	OK
CS1	Cl Sm (Push Button)	Rail Load button	I 43.2	●	OK
DM1	Pressure	Gathering of Rails (Bridged Out)	I 41.1	●	OK
DM2	Pressure	Guide Rollers Clamped	I 41.2	●	OK
DM3	Pressure	Guide Rollers Clamped	I 41.3	●	OK
DM4	Pressure	Guide Rollers Clamped - if rail long enough	I 41.4	●	OK
DM5	Pressure	Guide Rollers Clamped - if rail long enough	I 41.5	●	OK
E1	Pilot valve (N11)	Accumulator Slider Forwards	Q 40.0	●	OK
E10	Pilot valve (N9)	Unclamping #1 Guiding Rollers	Q 41.1	●	OK
E11	Pilot valve (N10)	Raising Upstream Elevators	Q 41.4	●	OK
E12	Pilot valve (N10)	Lowering Upstream Elevators	Q 41.5	●	OK
E2	Pilot valve (N11)	Accumulator Slider Backwards	Q 40.1	●	OK
E3	Pilot valve (N5)	Raising Accumulating Slider	Q 40.2	●	OK
E32	Pilot valve (N1)	Unclamping #4 Guiding Rollers	Q 41.7	●	OK
E4	Pilot valve (N5)	Lowering Accumulating Slider	Q 40.3	●	OK
E5	Pilot valve (N3)	Advance Chain Conveyor	Q 40.4	●	OK
E7	Pilot valve (N2)	Infeed Cross Conveyor	Q 40.5	●	OK
E70	Pilot valve (N4)	Clamping #3 Guiding Rollers	Q 41.3	●	OK
E71	Pilot valve (N4)	Unclamping #3 Guiding Rollers	Q 41.2	●	OK
E72	Pilot valve (N1)	Clamping #4 Guiding Rollers	Q 41.6	●	OK
E75	Pilot valve (N6)	Unclamping #2 Guiding Rollers	Q 42.0	●	OK

Alarms Details Circuit Diagram Sort by: Name Print Records Back

- Monitoring individual devices from an machine area
- On/Off state monitoring
- Status intelligent monitoring
- Device details
- Link to electrical drawings
- Alarms logging for every device



Diagnose Utility – link to electrical drawings

Diagnosis Utility CHAN1 Jog \CMA.DIR
NORMAL_Y1.SPF Diagnostics Utility

Channel interrupt Program aborted

Stop: No Mode Group Ready ROV

3000 : Emergency stop

CNCdesign VOLVO

Input Conveyor - C1

Address	Description
1	RAIL PRESENT IN C1 - SATURATION
2	RAIL PRESENT IN C2 - SATURATION
3	RAIL PRESENT ELEVATOR1
4	RAIL PRESENT ELEVATOR3
5	RAIL PRESENT ELEVATOR4
6	RAIL PRESENT LO POSITION
7	RAIL HIGH POSITION
8	RAIL HIGH POSITION
9	RAIL HIGH POSITION
10	RAIL HIGH POSITION
11	RAILS (BRIDGED) GUIDE ROLLERS CLAMPED
12	RAILS (BRIDGED) GUIDE ROLLERS CLAMPED
13	RAILS (BRIDGED) GUIDE ROLLERS CLAMPED
14	RAILS (BRIDGED) GUIDE ROLLERS CLAMPED
15	RAILS (BRIDGED) GUIDE ROLLERS CLAMPED

Back

- On screen display of the electrical drawings
- Hyper link to relevant drawing for every device included in Diagnosis Utility
- Drawings easy update
 - E:\software\diagnosis\drawings\electrical

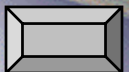


Diagnose Utility – Data base management

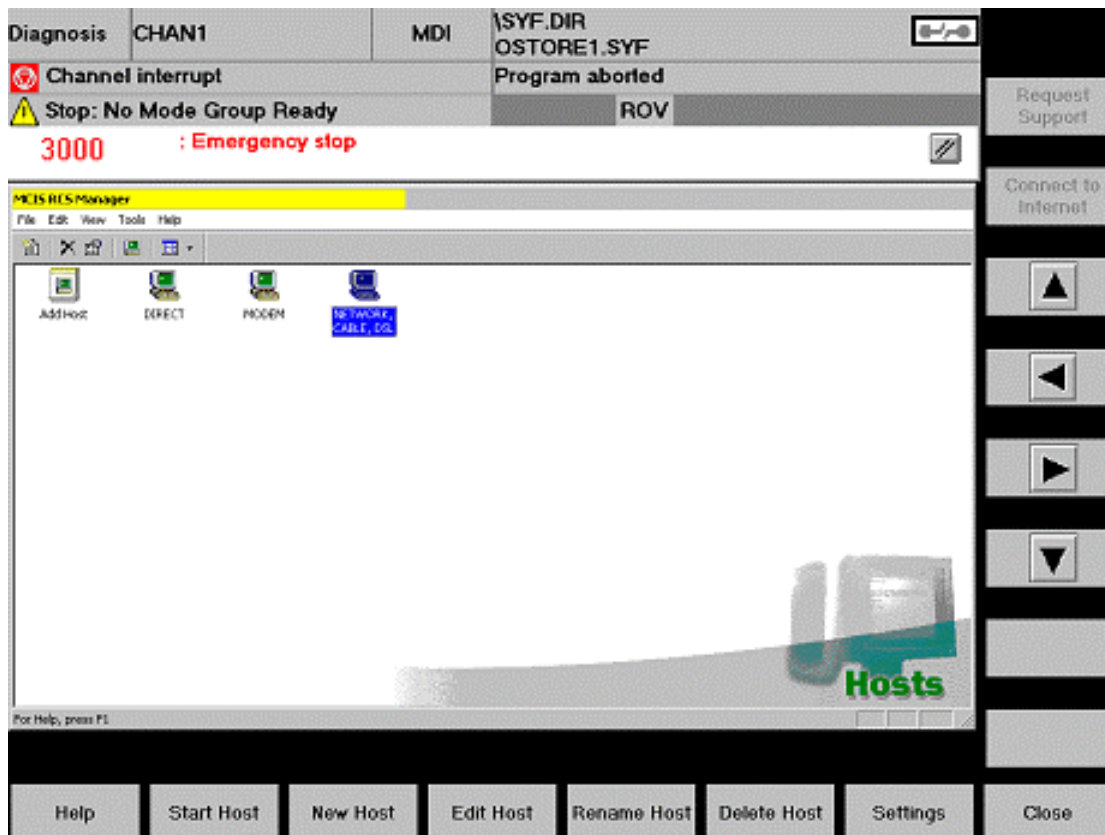
The screenshot shows the 'Diagnosis Utility' interface for a machine. At the top, it displays 'CHAN1' and 'Jog' mode. A status bar indicates 'Channel interrupt' and 'Stop: No Mode Group Ready' with a '3000' timer and an 'Emergency stop' button. The main window is titled 'Database Management' and is divided into several sections:

- Section Name:** Input Conveyor
- Name:** C1 (with a 'PLC Variable?' checkbox)
- Description:** Photocell
- Function:** Rail Present in C1-Saturation
- PLC Signal Bit Address:** I 40.0
- PLC Status Bit Address:** DB 227 DBX 40.0
- Startup Status:** Initial Condition? (with a dropdown menu)
- Circuit Diagram:** A list of drawing files (e.g., 1112017-34.vsd to 1112017-50.vsd) with a 'Circuit Diagram?' checkbox.
- Database Info:** Size of database is 0.15 MB, Space remaining on drive is 503.97 MB, and a 'Compress Database' button.
- Navigation:** Buttons for 'Add', 'Delete', 'Edit', and 'Back' are located at the bottom.

- Password protected access to data base management
- Add/Edit/Remove devices from area
- Include device in Initial conditions list
- Select electrical drawings link
- Link to intelligent status monitoring system
- Compressing data base



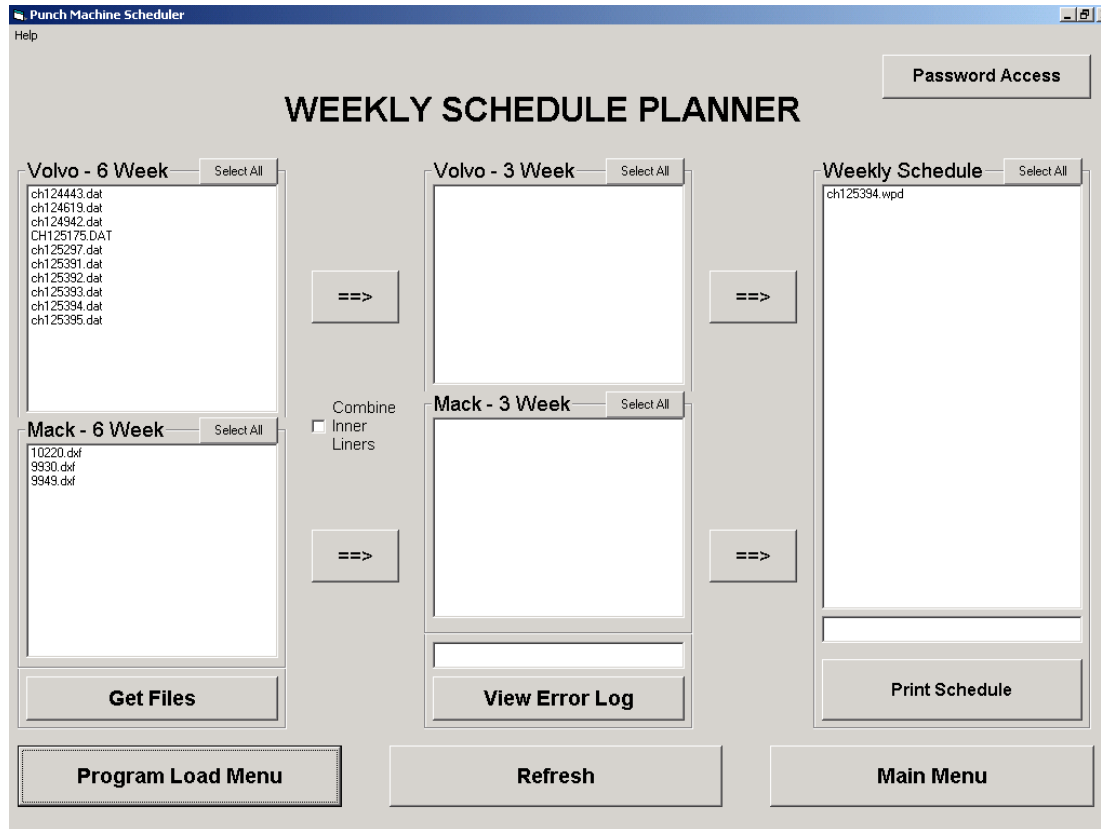
Diagnose – Remote diagnose



- Remote diagnose principle
- Start the Host in Remote Diagnose screen
- Close the Host in Remote diagnose



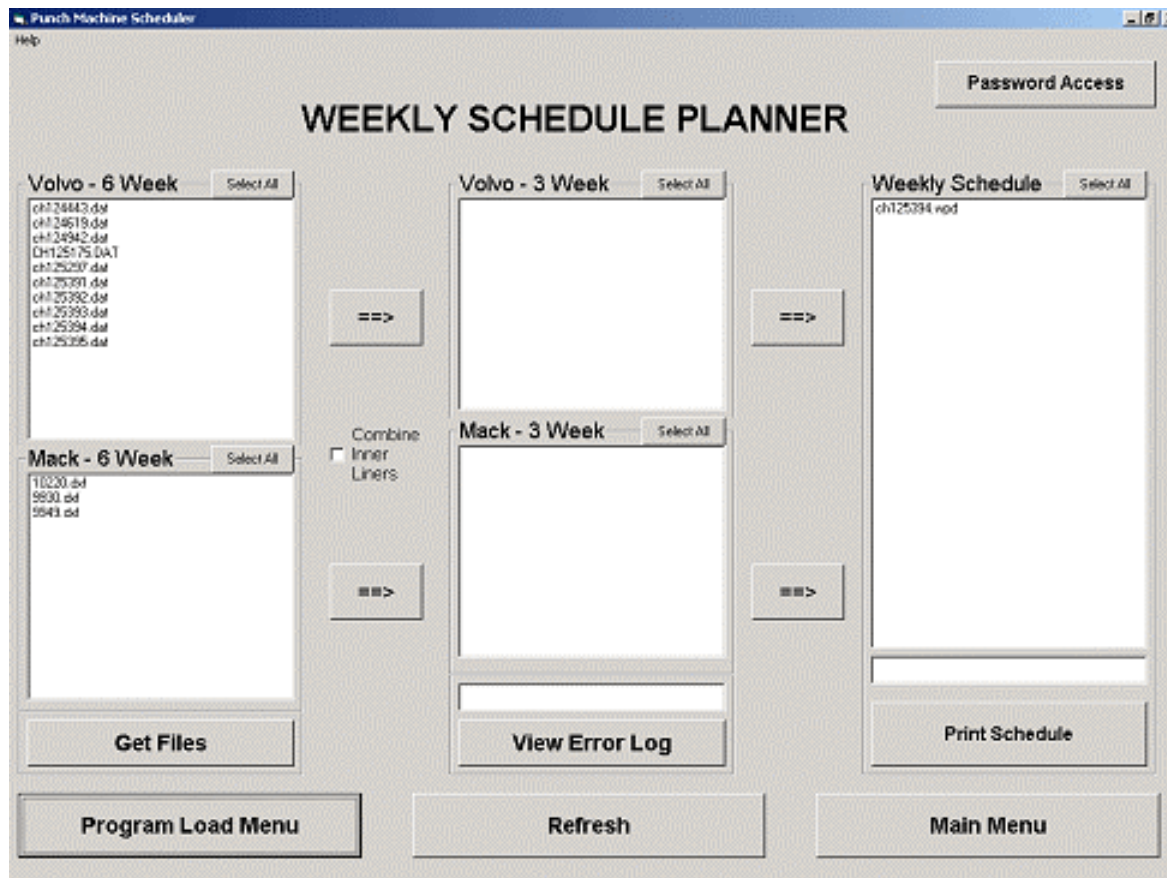
Data Handling – from raw data/DXF to punch



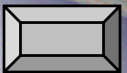
- Creating punching programs from raw data
- Production Scheduling
 - 6 weeks schedule
 - 3 weeks schedule
 - Daily schedule
- Chassis data backup system



Data Handling – creating part programs from DXF format



- Creating punching programs from DXF formats
- Chassis data backup system



Data Handling – from raw data to punching program

```
File Edit Format Help
|10014000800125394YVPRO77H 0414114-1111000000*YV5J4CFD74D125394*04000
45020365155111 102 39327141002645020510155 39327141003115020360155 393271410
090205583631012977011990090111 102 39555750012690011070090 16287180012935020
2060022116010600155 16292060023116010600155111 102 81370440023116010600155 8
16012400155 16288121033116010600155 16288121033116012400155111 102 162880600
102 39328171041616012400155 8193025004116011200155 819302510431160118001552
16012400155222 102 39320441053616010600155 39320441053616011200155 393204410
155 39324351058116011800155222 102 39324351058116010600155 39324351058616011
0360061931010730155205140361061991011560155222 102 39324351058116010600155
16011200155 81930251070616011800155 81930251070616011800155222 102 393281800
102205046231004735020360155205046231005205020510155222 102 395505020365155
83010900155111 102 39324581010943012060155 3932458101155222 102 393245810
155 81370391021616012400155111 102 81370391022116010600155 8137039102211601
2060033616010600155 39327860034616011200155111 102 39327861035222 102 3932786
16011800155 16292240044616010600090 39328160045116010600155222 102 3932786
102 39320441060116012400155 39320441060616010600155 39320441060616011200155
16011200155222 102 39324371055116011800155 39324371055116012400155 3932437
155 16292240044616010600090 39328160045116010600155222 102 39327861035222 102
```

- Creating punching programs from raw data
- Scheduling

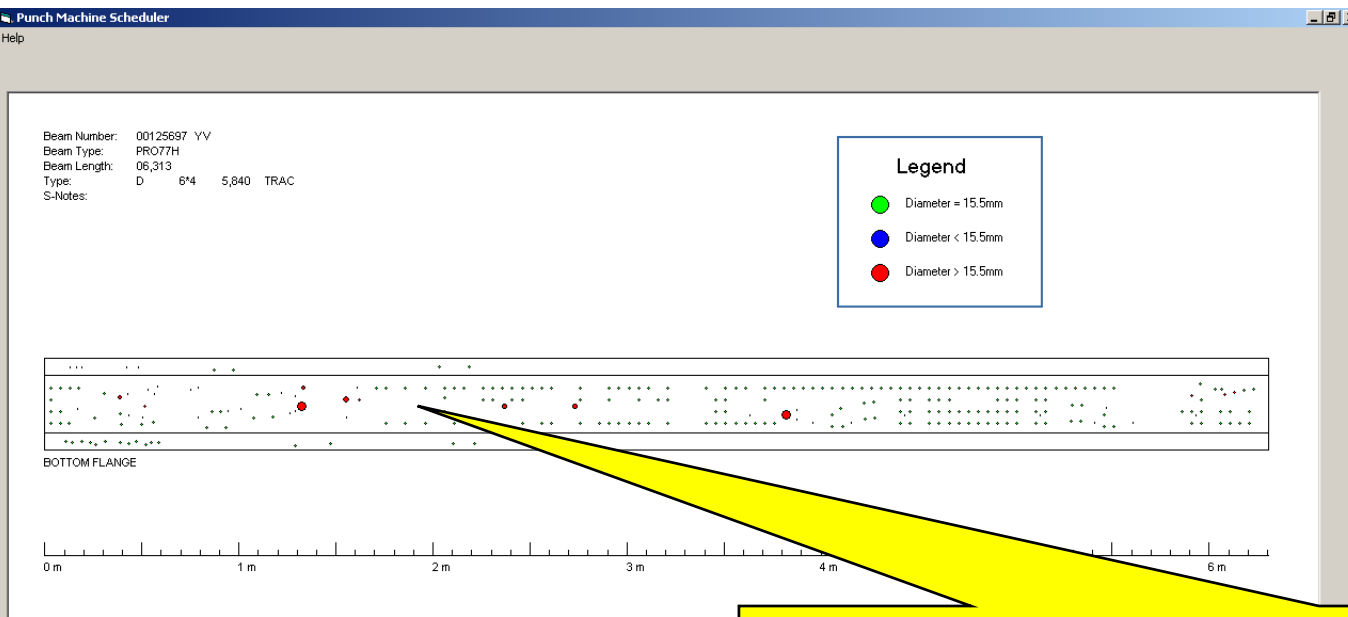
```
;Planning Number = 260020
;chassis Number = 00125692
;Rail Position = YV
;Rail Type = PRO77H
;Rail Length = 06,513
```

;Below is the punching program

```
LOAD_TO_X1
PROGRAM_INIT
WEB_PUNCH(425.6, -120, 15.5, 10) ;Hole 1
WEB_PUNCH(425.6, -180, 15.5, 10) ;Hole 2
WEB_PUNCH(425.6, -240, 15.5, 10) ;Hole 3
WEB_PUNCH(425.6, -60, 15.5, 10) ;Hole 4
```



Data Handling – quick test before punching



- Printing rail preview
- Hole quick check list

Rail Length : 06,413
 Web Width : 300
 Flange Width : 90
 Truck Model : D
 axle : 6*4
 W_base : 5,940
 style : TRAC
 Snote : S53521

1	Xf=35	B_W=120	T_W=	B_F=	T_F=	D=15.5
2	Xf=35	B_W=180	T_W=	B_F=	T_F=	D=15.5
3	Xf=35	B_W=240	T_W=	B_F=	T_F=	D=15.5
4	Xf=35	B_W=60	T_W=	B_F=	T_F=	D=15.5
5	Xf=85	B_W=60	T_W=	B_F=	T_F=	D=15.5

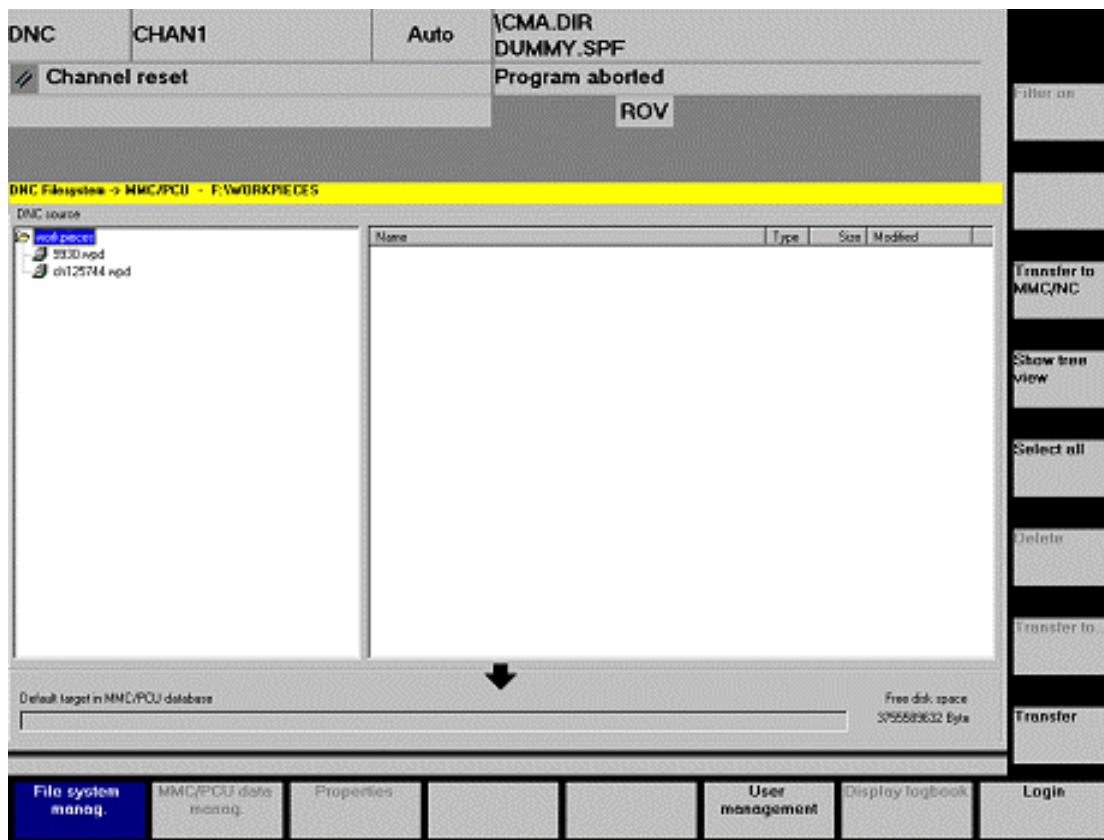
Print

Zoom Out

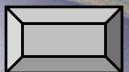
Zoom In



DNC – Sinumerik standard programs handling



- DNC system starting
- Configuring the DNC system and link into machine data handling system



HMI - Program Workpieces (Chassis) selection

Program CHAN1 Auto \CMA.DIR
DUMMY.SPF
Channel reset Program aborted
ROV

Program overview

Name	Type	Loaded	Length	Date	Enable
CH100036	WPD	X		07/06/2004	X
CH100640	WPD	X		07/06/2004	X
CH100840	WPD	X		17/06/2004	X
CH125395	WPD	X		07/06/2004	X
CH125727	WPD	X		17/06/2004	X

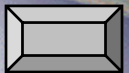
Free memory: Hard disk : 3,755,589,632 NCU : 2,246,652

Press the Input key to open a program with the text editor

Work-pieces	Part programs	Sub-programs	Standard cycles	User cycles	Manufact. cycles
-------------	---------------	--------------	-----------------	-------------	------------------

New...
Load HD -> NC
Unload NC -> HD
Simulation
Manage programs
Select

- Sinumerik HMI programs storing management



HMI – Programs for a chassis

Program CHAN1 Auto \CMA_DIR DUMMY.SPF

Channel reset Program aborted

ROV

Program overview

Name	Type	Loaded	Length	Date	Enable
CH100036	WPD	X		07/06/2004	X
CH100036L	MPF	X	12617	07/06/2004	X
CH100036R	MPF	X	11993	07/06/2004	X
CH100640	WPD	X		07/06/2004	X
CH100840	WPD	X		17/06/2004	X
CH125395	WPD	X		07/06/2004	X
CH125727	WPD	X		17/06/2004	X

Free memory: Hard disk : 3,755,589,632 NCU : 2,246,652

Press the Input key to open a program with the text editor

Work-pieces Part programs Sub-programs Standard cycles User cycles Manufact. cycles

New...
Load HD -> NC
Unload NC -> HD
Simulation
Manage programs
Select

- Programs for a chassis
- Selecting a particular program



WEB_PUNCH cycle

- WEB_PUNCH(X position, Y position, Hole diameter, Tool number)

Example: WEB_PUNCH(2500, -120, 27, 5)

Obs:

Y position positive value => datum from right flange

Y position negative value => datum from left flange

Hole diameter not important, only for display

Tool number important for selecting the correct tool

In MDA mode, the forbidden areas are not evaluate



NIBBLE cycle

- NIBBLE(X position, V position, Hole diameter, Number of steps)

Example: NIBBLE(4500, 150, 50, 12)

Obs:

V position positive value => datum from right flange

V position negative value => datum from left flange

Hole diameter and number of steps are selected by converter

Manual entry also possible (for MDA tests)

In MDA mode, the forbidden areas are not evaluate



L_PUNCH,R_PUNCH cycle

- L_PUNCH(X position, Z position, Hole diameter, Tool Number)

Example: L_PUNCH(4500, 150, 11.5, 0)

Obs:

Z position only positive

Hole diameter and Tool number are selected by converter

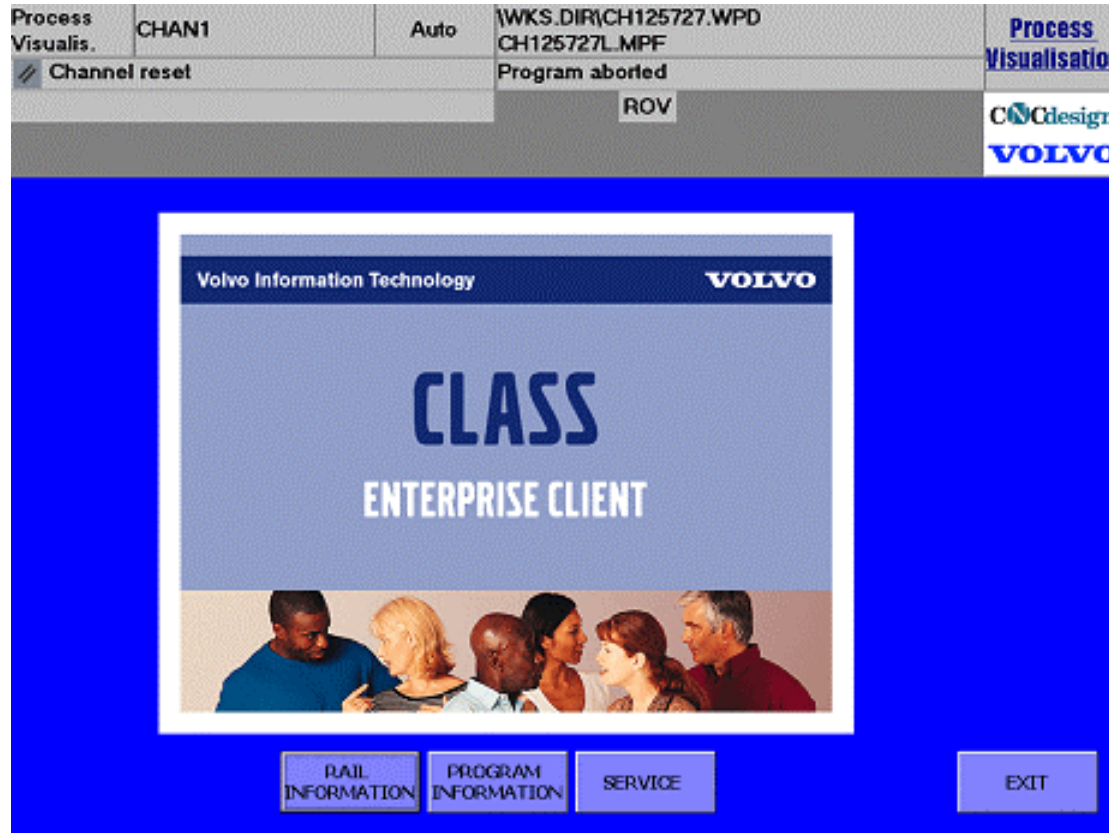
Hole diameter not important

Tool number is the one who selects the hole diameter

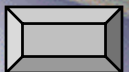
In MDA mode, the forbidden areas are not evaluate



Process Visualisation – main screen



- Process Visualisation – the main screen
- Booting screen for punching machine
- Changing booting screen to Machine screen



Process Visualisation – Program Information

Process Visualis.	CHAN1	Auto	\WKS.DIR\CH125727.WPD CH125727L.MPF		Rail Information
Channel reset		Program aborted			
		ROV			CNCdesign VOLVO

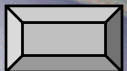
TRUCK INFORMATION					
Truck Model:	D	Volvo		Mack	
Truck Id:	00125727	Chassis No.		Order No.	

RAIL INFORMATION					
	Required	Actual	Required	Actual	
Rail Profile:	PRO88H				
Rail Length:	06,513 mm	0 mm			
Rail Width:	300.00 mm	301.01 mm			
Tolerance:	2.00 mm	1.01 mm			
Type of Rail:	L	LH Rail		RH Rail	
		INHIBIT		INHIBIT	
		LH Liner 1		RH Liner 1	
		INHIBIT		INHIBIT	
		LH Liner 2		RH Liner 2	
		INHIBIT		INHIBIT	

RAIL POSITION IN MACHINE	
Rail in Elev 1:	YES

MAIN MENU

- Program information
- Rail actual length
- Inhibition for programs



Process Visualisation – Rail Information

Process Visualis.	CHAN1	Auto	WKS.DIR\CH125727.WPD CH125727L.MPF		Program Information
Channel reset			Program aborted		
			ROV	CNCdesign	VOLVO

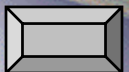
PROGRAM HOLE CO-ORDINATES	Left Hand Rail / Liner		Right Hand Rail / Liner	
	Required	Actual	Required	Actual
X axis position:	514.00	478.30		
Y axis position:	-240.00	-239.99		
V axis position:	142.00	141.99		
Z axis position:	40.00	39.95		
VR1-3 position:	289.01	289.82		

TOOL MAGAZINES POSITIONS				
Y1 tool lock position:	10	10	Web Punch	IN IN/OUT
Y2 tool lock position:	10	10	LOCK Web Die	IN IN/OUT
Z3 tool lock position:	0	0	LOCK LH Flange	IN IN/OUT
Z4 tool lock position:	0	0	LOCK RH Flange	IN IN/OUT

DRIVE WHEELS		Drive wheel X1	Drive wheel X2	Current Hole	Last Hole
		ACTIVE	NON-ACTIVE	8	7

MAIN MENU

- Rail and Heads positions
- Turrets monitoring
- Lock in tools
- Turrets index control
- Punched Holes monitoring



Process Visualisation – Service screen

Process Visualis.	CHAN1	Jog	\CMA.DIR NORMAL_Y1.SPF	Service
Channel interrupt			Program aborted	
Stop: No Mode Group Ready			ROV	

700019 ↓ : Emergency Stop 3 - near web unit - activated

Service Mode OFF

SERVICE X1	<input type="checkbox"/> OFF
SERVICE X2	<input type="checkbox"/> OFF

INPUT UNIT	
MOVE CHAIN CONVEYOR	

LENGTH MEASURING PARAMETERS	
NIBBLER TOOL DIA	36,00

ENCODER REFERENCING	
REFERENCE EC2	REFERENCE EC3
REFERENCE EC4	REFERENCE EC5
REFERENCE EC6	REFERENCE EC7
REFERENCE EMC1	REFERENCE EMC2
REFERENCE VR1-1	REFERENCE VR1-3

STAND-BY PARAMETERS	
Y AXIS	150,00
V AXIS	150,00
Z AXIS	98,00
VR1-3 AXIS	362,00

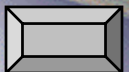
LENGTH MEASURING PARAMETERS	
PHOTOCELL OFFSET	395,00
TOLERANCE	50,00

HEAD ADJUSTMENT PARAMETERS	
PUNCH OFFSET	12,00
TOLERANCE	2,00
FRONT LIMIT	200,00
BACK LIMIT	390,00

SENSORS SAFETY PARAMETERS	
Y SAFETY LIMIT	250,00
V SAFETY LIMIT	250,00

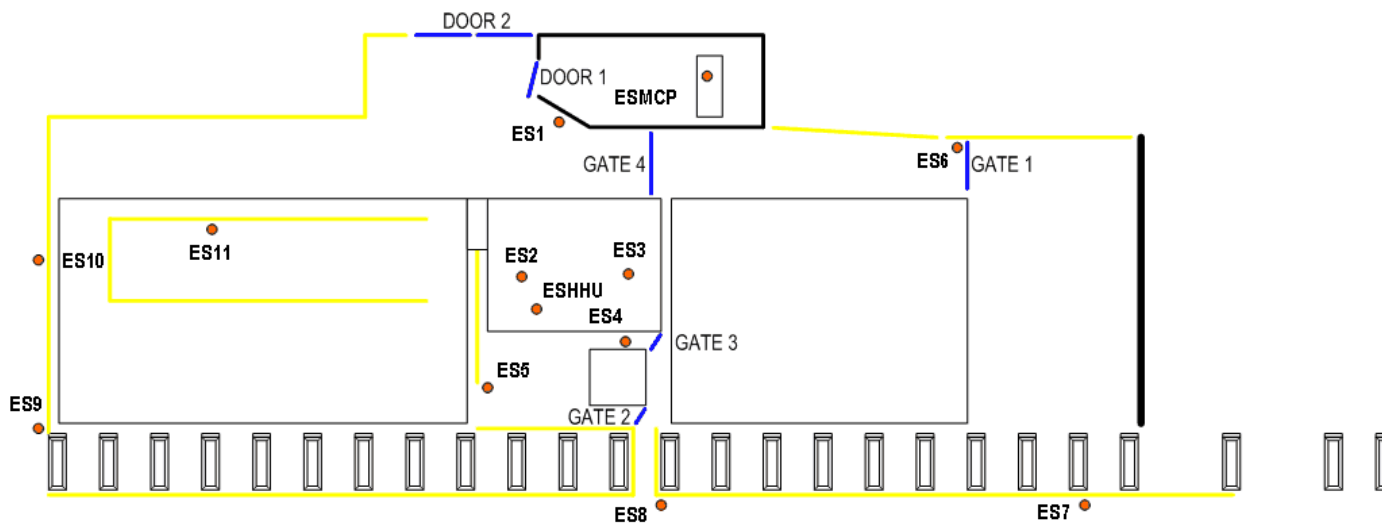
MAIN MENU

- Activating Service mode for X1/X2 driving wheels
- Encoders referencing procedure
- Left flange Punching head adjustment
- Machine stand-by parameters adjust
- Rail length parameters
- Nibbling tool diameter
- Web and nibbling Sensors parameters setup

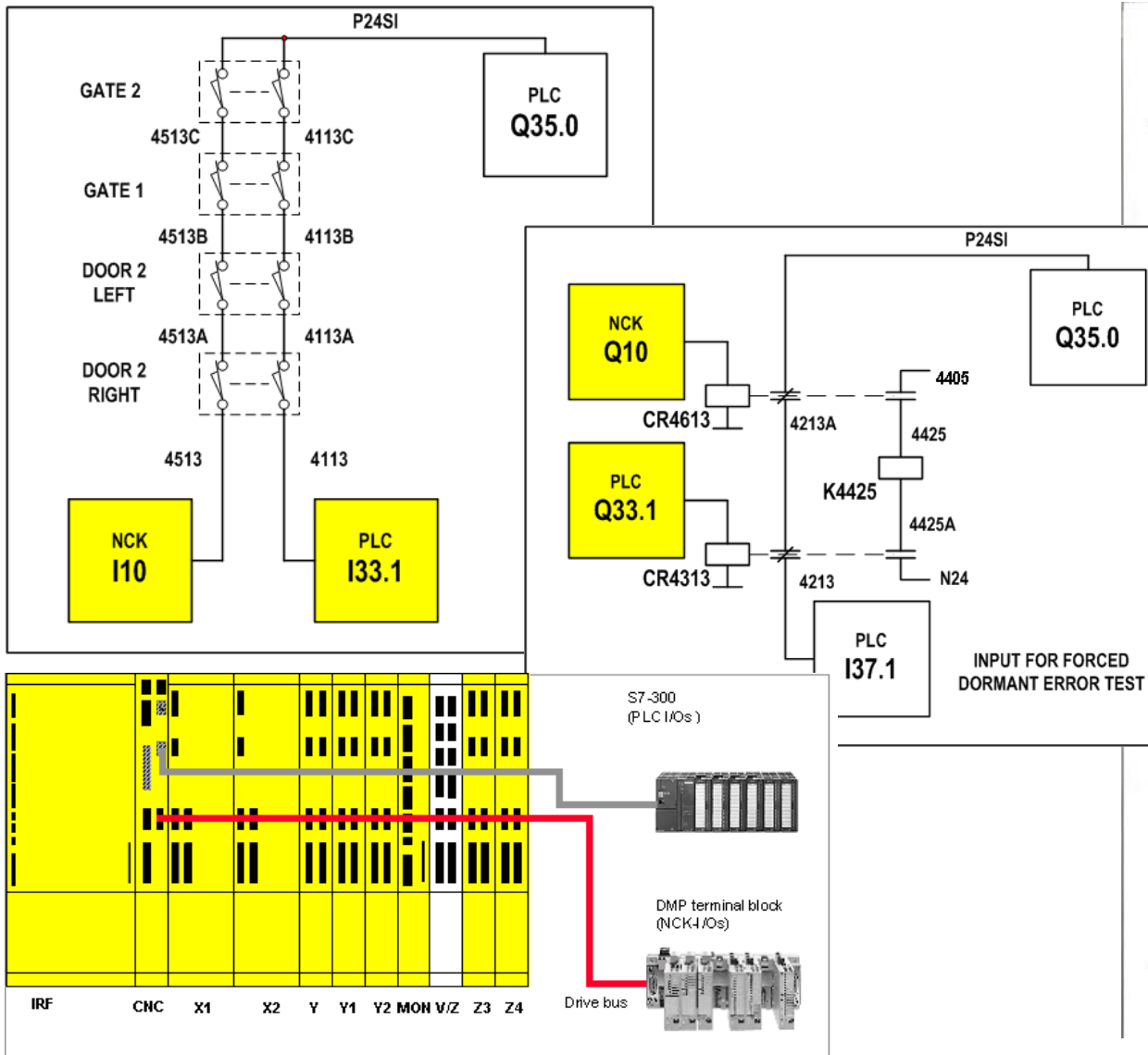


Safety via Safety Integrated option for Sinumerik 840D

- Emergency Stop
- Safety Integrated Technology
- External Gates
- Internal Gates
- Hand Held Unit



Safety Integrated protecting shield for the operator



Volvo Truck Australia – Safety Integrated Certificate

Certificate

Safety Integrated®

Acceptance Certificate, SI Functions

Project	Volvo Truck Australia – Profel rail punching machine
Type	Punching machine/840D/611D
Serial No.	1112017

Acceptance test – execution

This confirms that the appropriate listed tests and checks were correctly carried-out.

Date	Name	Company/Dept.	Signature
02.07.09	Sorin Purdea	CNC Design Pty Ltd	
02.07.09	Nick FELEGGAKIS	CNC Design Pty Ltd	

Counter-signed, Client

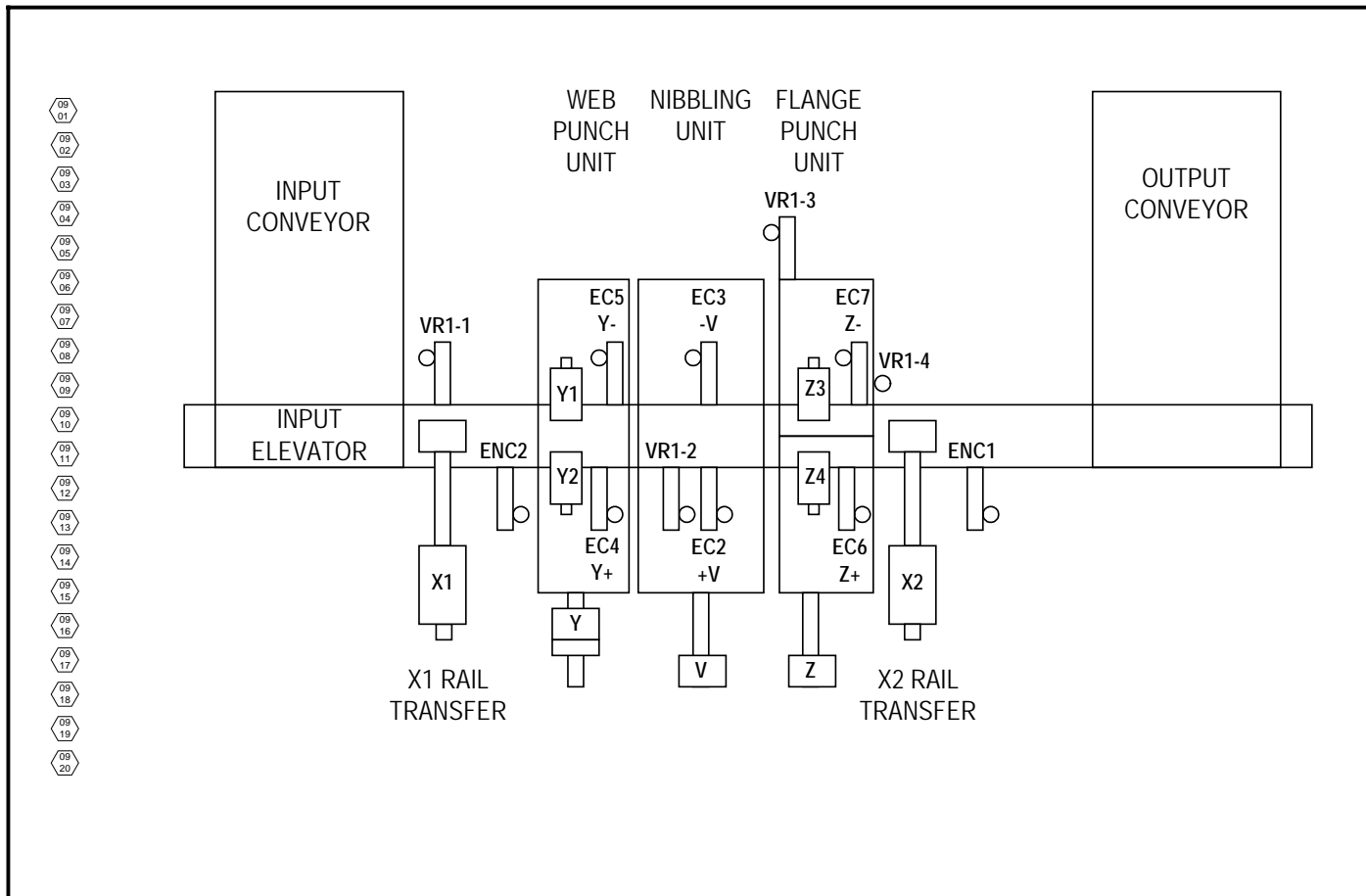
Confirms the correctness of the limit values documented and specified above.

Date	Name	Company/Dept.	Signature
2/7/09	Philip PANE	Volvo Truck Australia Pty Ltd	

SINUMERIK
Safety Integrated



Punching Machine



- 09 01
- 09 02
- 09 03
- 09 04
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- 09 20

This drawing contains information proprietary to CNC Design and is not to be disclosed to a third party without the prior written consent of CNC Design

LAST EDIT DATE: 29/06/04 PRINT DATE: 29/06/04



DATE	29/06/04
DRAWN	N.F.
CHECKED	S.P.
APPRD	P.E.

TITLE: VOLVO TRUCKS - CHASSIS PUNCH MACHINE
MACHINE ENCODERS OVERVIEW

DRAWING NUMBER	1112017-09
REVISION	NEXT PAGE
11.06.04	1112017-10

