

**MANUAL****ABB MasterFieldbus interface for SAMI Star using SamiMultiNode (PE1293).****SUMMARY**

This document describes the interface between ABB MasterPiece system and SAMI Star frequency convertors. The interface requires a protocol converter unit between ABB MasterFieldbus and Sami protocol. This unit is called SamiMultiNode (PE1293). The use of SamiMultiNode and the necessary settings in SAMI Star as well as in ABB MasterPiece will be described in order to make it possible for various users to connect their SAMI Stars to a ABB Master system in all possible applications.

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1  
DESCRIPTION OF THE INTERFACE

1.1  
SamiMultiNode

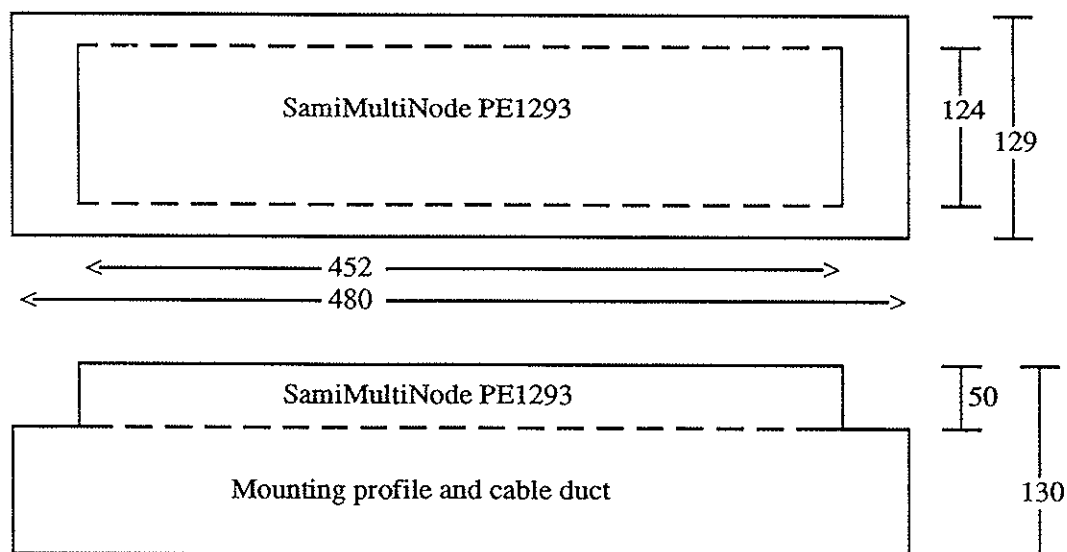
SamiMultiNode (PE1293) is a protocol converter designed to connect up to eight different SAMI Star to ABB MasterFieldbus. It consist of a circuit board with three major parts: power supply, Fieldbus communication and SAMI Star current loop communication. The Fieldbus communication is made with a Intel I8344 microprocessor and the eight different current loops with Sami protocol is made with a Hitachi H8/532 microprocessor. The two microprocessors are communicating with each other with a dualmemory.

1.1.1  
Mounting

SamiMultiNode is mounted in the ABB MasterPiece cubicle if there is enough space and if the distance to the convertors isn't to long. In all other cases is SamiMultiNode mounted in an enclosure together with a DSTC 452 modem and a 24V DC supply unit. SamiMultiNode is mounted in a special Al-profile with a matching cable duct (order no. 2166 0559-R) which will fit in a standard 19" frame. Mounting of the Al-profile should be done with cutting screws to provide a good earth connection.

Note! The Al-profile has to be mounted upside down compared with the normal placement in ABB MasterPiece.

Dimension with mounting profile and cable duct.



Dimension in mm

## 1.1.2

## Technical data

Auxiliary Power	+24V DC, 250mA
SAMI Star serial link	20mA, (24V) current loop. Cable, twisted pair, pair screened, common screened, (FKAR-PIG, FLEAK or equal) 2*2*0.5. Communication, 9600 bps, no parity, 7 bits, 1 stop bit. Connection, 2*3 screw terminal block connectors, max 50m. Note! This value 50m is a preliminary figure, the possible length should be at least 150m but this has not yet been tested (910508).
ABB MasterFieldbus	RS 485, 2 Mbps. Cable, FLFR 3*2*0.34. Communication, half duplex, ISO-HDLC protocol. Connection, 8 screw terminal block connector, max 25m.
Enclosure class	Non enclosed unit.
Environmental data	Surrounding temperature range: Operation +5..+40 degrees C. Storage -40..+70 degrees C.
Ordering code	PE1293 (SamiMultiNode) Orders should be made to Bertil Engelbrekt ABB Drives AB, Dept APO S-721 75 VÄSTERÅS / Sweden Telecopier +46 21 146251

## 1.1.3

## Status indications

Two red leds indicates if any of the microprocessors is halted.

The communication status is indicated on a two segments display which will indicate the actual status on each of the eight different SAMI Star channels with a cyclic presentation. A working communication is indicated with "channel number" (1 -> 8) and with "-". All other possible indications is described in the "SUPERVISION AND FAULT TRACING" part of this document.

1.1.4  
Switch setup

There is one dipswitch on SamiMultiNode.

- |   |        |   |
|---|--------|---|
|   | on/off |   |
| 1 |        | Halt cyclic presentation on display                   |
| 2 |        | No disconnection on three faulty request to SAMI Star |
| 3 |        | Show checksum in display                              |
| 4 |        | Spare   |
| 5 |        | Spare   |
| 6 |        | Spare   |
| 7 |        | Select address mode (100 * bus number)                |
| 8 |        | Select 375 kbps on ABB MasterFieldbus                 |

1.1.5  
Connections

ABB MasterFieldbus:  
SamiMultiNode is connected to ABB MasterFieldbus with an eight terminals connector. Parallell to this is another connector of the same type which is used to connect the next unit in multidrop. If SamiMultiNode is the last unit on the bus, the bus has to be terminated with three jumpers on the SamiMultiNode unit.

Connection of ABB MasterFieldbus to SamiMultiNode.

DSTC408	Conn. unit X90	SC	PE1293 X1	SamiMultiNode
	1		104,124	
	2	DATA	105,125	
	3	DATA-N	106,126	
	4	CLOCK	107,127	
	5	CLOCK-N	108,128	
	6	R	109,129	
	7	R-N	110,130	
	8		111,131	

**SAMI Star current loop:**

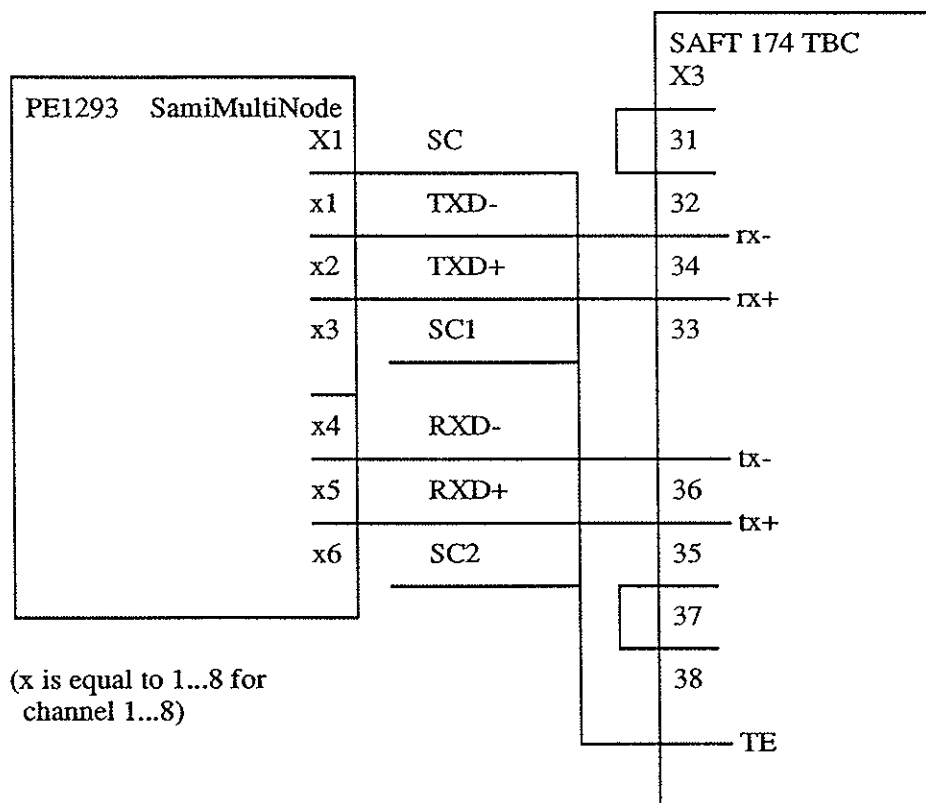
The serial link from SAMI Star to SamiMultiNode is connected with two 3 screw terminal block adapters. The cable should be a FKAR-PIG or FLEAK 2\*2\*0.5, twisted, pair screened, common screened or of a similar type.

There is two different ways to connect the serial link in SAMI Star depending on the equipment in the convertor.

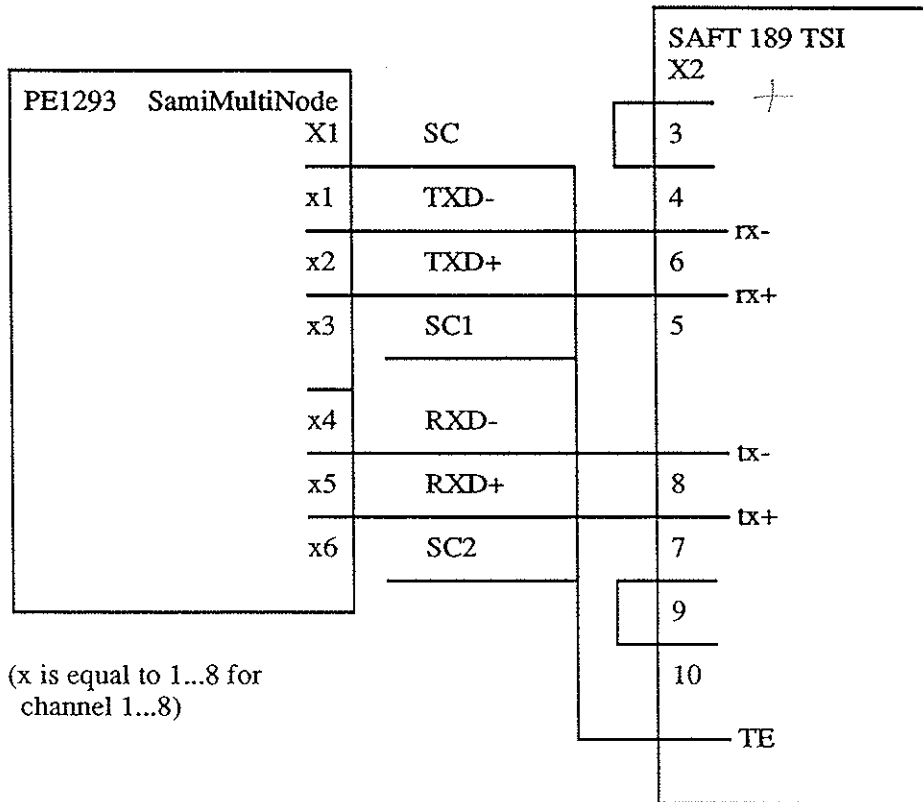
In a single drive is normally a SAFT 174 TBC and a SAFT 188 IOC card used. With SAFT 188 IOC it is only possible to use channel 2 for the serial link.

In a sectional drive is normally a SAFT 189 TSI card used. This card has two serial links that may be used for the communication to SamiMultiNode and in most cases channel 1 is used. Channel 2 is usually reserved for the transmission of the torque reference in a master - slave configuration.

Connection of SamiMultiNode to SAMI Star with SAFT 174 TBC and SAFT 188 IOC.



Connection of SamiMultiNode to SAMI Star with SAFT 189 TSI.



1.2

Initialization table in SAMI Star

SamiMultiNode needs to receive a certain amount of data from SAMI Star to create a connection between ABB Master protocol and Sami protocol. This data that is related to the application stored in the SAMI Star EEPROM memory by the application designer. This data can be changed with the normal procedure that is described in the SAMI Star users manual.

**Note!** This initialization data is only read by SamiMultiNode when the power is turned on or when the SAMI Star serial link is connected. It is impossible to change this data in SamiMultiNode after the initialization although it is possible to change the data in SAMI Star. It is necessary to break the communication on the serial link to SAMI Star to reinitialize the connection between ABB MasterPiece and SAMI Star. The communication is broken if SamiMultiNode or SAMI Star are turned off or if the physical connection is removed.

The address blocks in SAMI Star that contains the SamiMultiNode initialization data are called TCOM-CV11 and TCOM-CV01. The first one is for the data sent from SAMI Star to ABB MasterPiece (indications) and the other one is for the data received from ABB MasterPiece (orders). The



selection of signals that should be transmitted and received is depending on the application. The serial link has to be given an individual number on the ABB MasterFieldbus. This number has to match with the node number in the ABB MasterPiece program.

TCOM-CVII		
UNIT-NR	2250	
SAMI-SER-CH	2251	
REFRESH-IVAL	2252	
	2253	
PBIND1	2254	addr
	2255	ival
PBIND2	2256	addr
	2257	ival
PBIND3	2258	addr
	2259	ival
PBIND4	2260	addr
	2261	ival
PBIND5	2262	addr
	2263	ival
I4IND1-MSW	2264	addr
	2265	ival
I4IND1-LSW	2266	addr
	2267	ival
RIND1	2268	addr
	2269	ival
RIND2	2270	addr
	2271	ival
RIND3	2272	addr
	2273	ival
RIND4	2274	addr
	2275	ival
RIND5	2276	addr
	2277	ival
RIND6	2278	addr
	2279	ival
RIND7	2280	addr
	2281	ival
RIND8	2282	addr
	2283	ival
RIND9	2284	addr
	2285	ival

("addr" is equal to the Sami table address and "ival" is the interval of transmission. The interval is given in 24ms steps, i.e 1=24ms, 2=48ms, ...)

TCOM-CVII

TCOM-CVO1		
PBORD1	2295	addr
PBORD2	2296	addr
I4ORD1-MSW	2297	addr
I4ORD1-LSW	2298	addr
RORD1	2299	addr
RORD2	2300	addr
RORD3	2301	addr
RORD4	2302	addr
RORD5	2303	addr
RORD6	2304	addr
RORD7	2305	addr
RORD8	2306	addr
RORD9	2307	addr
RORD10	2308	addr
RORD11	2309	addr
RORD12	2310	addr
RORD13	2311	addr
RORD14	2312	addr
I4ORD2-MSW	2313	addr
I4ORD2-LSW	2314	addr

("addr" is equal to Sami table address)

TCOM-CVO1

1.2.1

Node address

Each node on ABB MasterFieldbus has to have an unique address. In MasterPiece PC-elements COM-CVO1, COM-CVII and database CV the application designer gives the needed node address. In SAMI Star this address is given in the same way (some older verisions of SAMI Star has to use another equation for node address).

ABB MasterPiece 200/1 can support four buses with 16 nodes on each bus. Each bus requires one DSCS131 board.

The node address in some versions of SAMI Star is formed in the following way:

$\text{Node address} = 32 * \text{bus number} + \text{node number}$
---

Note! The node address is only used in SamiMultiNode and the only reason to use the "old" calculation is that the old version of SAMI Star has a parameter limit equal to 143. It is still possible to use the "new" calculation but then all values above 143 has to be given with the use of the "DEBUG" function (address 216T and 217T).

In MasterPiece PC-elements and new SAMI Stars the address is formed in the following way:

$$\text{Node address} = 100 * \text{bus number} + \text{node number}$$

In both equations is bus number = 1...4  
and node number = 0...15

**Note! A selection of the address mode "32 \* bus number" or "100 \* bus number" has to be done with a dipswitch on the SamiMultiNode board and this selection will be valid for all eight channels on the unit.**

Example: SAMI Star is the node number two on bus number one.

=> Node address in MasterPiece and SAMI Star = 102

=> Node address in old type of SAMI Star = 34

In SAMI Star the node address is stored into the Sami table address 2250TEE.

### 1.2.2

#### Orders to SAMI Star from ABB MasterPiece

The orders from ABB MasterPiece are sent to SamiMultiNode on the ABB MasterFieldbus according to a specific Fieldbus protocol. The Fieldbus is updating SamiMultiNode every 2..30ms depending on the number of nodes on the bus.

The address block TCOM-CVO1 is the place in SAMI Star where the user has to give the necessary information of which signals to receive.

There are two different modes to send data from SamiMultiNode to SAMI Star. They are:

- 1, Regular receiving mode
- 2, Verified receiving mode

When the user is choosing the Sami signal addresses in the Sami table to which he wants to send data from MasterPiece he has to choose one of the modes mentioned above.

Two addresses in the TCOM-CVO1 block are reserved for 16bits packed boolean signals, four for two 32bits integers and fourteen for numerical signals.

Regular receiving mode:

This mode can be used for Sami table addresses 0...255. Always when the contents of the signal coming to SamiMultiNode via MasterFieldbus are changed a message to SAMI Star is transmitted. Typical timedelay in SamiMultiNode for putting the message to transmitbuffer in this mode is about 5ms. Also a message is sent to SAMI Star according to refreshment interval which has been set in the TCOM-CV11 block address 2252TEE. The

refreshment transmitting becomes active if no change has been done in the contents of the signals from the COM-CVO1 element in SamiMultiNode during a refreshment interval.

**Note!** The shortest refreshment interval that may be used is two seconds and SamiMultiNode will only update one signal each 100ms. I.e if the changes on the COM-CVO1 signals suddenly stops the first used signal in the TCOM-CVO1 block will be updated after the refreshment interval and the second signal after the refreshment interval plus 100ms. This extra delay will only appear when the first execution of the refreshment is done. In the later executions, until the signals have changed their values, is the refreshment time correct.

When the user wants to initialize a certain Sami signal to be transmitted from SamiMultiNode to SAMI Star in the regular mode he has to write the address of the signal into the block TCOM-CVO1.

**Example:** The user wants to send speed reference to SAMI Star from SamiMultiNode in regular mode. He can use the address 2299T RORD1 to inform SamiMultiNode to send this data to Sami address 27T. In practise it is done by writing number 27 in Sami address 2299T.

=> (2299T) = 27

**Verified receiving mode:**

This mode is used when Sami addresses higher than 255 are used or when the user wants that acknowledgment to SamiMultiNode from SAMI Star has to be sent to be sure that the message was successfully received. This mode is using a so called "mailbox" communication method. It means that two messages are needed to change the value of the address in Sami table. Naturally this mode is slower than regular mode. Typical time for sending a new value from MasterPiece to SAMI Star in verified mode is about 140..160ms.

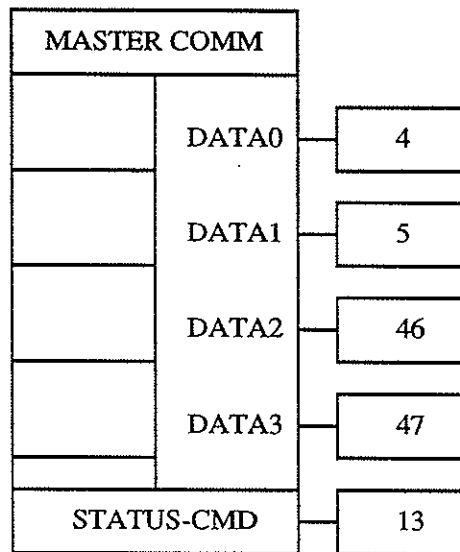
When verified mode is chosen, SamiMultiNode has to be informed about this. It is done by writing the Sami address as a negative value in block TCOM-CVO1.

**Example:** The user wants to send "Status" command to SAMI Star in verified mode. The status command address in Sami table is 13T. For this purpose the user can choose PBORD1 address from TCOM-CVO1 in Sami table. He will write to address 2295T PBORD1 a negative value -13.

=> (2295T) = -13

**Application block:**

A special application block "MASTER COMM" has been developed for application designers to use free Sami addresses and to document the interface in a simple way in application program documents. The use of this block is anyhow not necessary, it simply offers one way to make documentation easier. This block is described in the "APPLICATION BLOCKS MANUAL".



Sami application block MASTER-COMM

### 1.2.3

#### Signals from SAMI Star to ABB MasterPiece

Two modes are available for the feedback signals from SAMI Star to ABB MasterPiece. The address block TCOM-CV11 is the place in SAMI Star where the user has to give the necessary information of which signals to transfer and how often. There are eight positions for automatic transmission of feedback signals on the serial channel. The COM-CV11 element has more than eight signals and to use these it is necessary to use another mode. Also if the address of the signal is higher than 255 it is normally impossible to transmit it with automatic intervals.

The modes for transmitting from SAMI Star to SamiMultiNode (and ABB MasterPiece) are:

- 1, Regular transmitting mode
- 2, Request transmitting mode

#### Regular transmitting mode:

This mode is initialized by writing suitable addresses and intervals to Sami addresses in block TCOM-CV11. Addresses can be in the range 0...255. Intervals has to be chosen with care because SAMI Star has only limited capacity to transmit. The transmitting program in SAMI Star executes about every 24ms and the intervals are multiples of 24ms. With 9600 bps baudrate it is possible to send two signals at 24ms interval. The other intervals has to be at 48ms or a higher level. SAMI Star is automatically calculating the transmitting load and if overload exists the intervals will be automatically increased.

Five addresses in the TCOM-CVII block are reserved for 16bits packed boolean signals, two for a 32bits integer and nine for numerical signals. Eight of them can be chosen for regular transmitting. In practise it is done by writing the correct signal address to the right place and choosing the necessary interval level.

Example: To send "SPEEDACT" 203T to SamiMultiNode (and ABB MasterPiece) at 100ms interval, the user has to write the following:  
=> (2268T) = 203 and (2269T) = 4 (4\*24ms=96ms).

Request transmitting mode:

This mode has to be used with signals that have addresses greater than 255 or if the user want to have more than eight signals. The transferring of the signal value from Sami table to SamiMultiNode is done by SamiMultiNode requesting the contents of the chosen signal according to the "mailbox" method. This request is initiated by the interval set by the user. The action takes about 60...80ms and the minimum request interval is 100ms. It means that the interval parameter has to be at least -5 (5\*24ms=120ms). The minus sign is telling to SamiMultiNode that the respective signal has to be transferred with request mode.

Example: The user wants to build an application in which ABB MasterPiece needs to have the value of identified rotortimeconstant "TR" 411T every second. The necessary settings are: to choose address "RIND6" 2278T for sending the signal concerned and 2279T for the request interval. The result is:  
=> (2278T) = 411 and (2279T) = -40 (40\*24ms=960ms).

### 1.3

#### Communication in ABB MasterPiece

Communication with electrical drives such as TYRAK-L and SAMI Star is done with two PC-elements in ABB MasterPiece; COM-CVII and COM-CVO1. These elements and their use is described in the different ABB MasterPiece manuals. This document will just give an overview of the elements and their use as an interface to SAMI Star.

#### 1.3.1

##### COM-CVO1 PC-element

The function of this element is to transmit data from ABB MasterPiece application program to a specified node on ABB MasterFieldbus. This node can be a TYRAK-L or a SAMI Star. Every node has its own communication PC-element and a database element of type CV. The application designer will give the node address (UNIT\_NO) for the PC-elements and the database when the application is made.

The PC-element COM-CVO1 has the same signals (2 packed boolean "PBORD1..2", 2 32bits "I4ORD1..2", 14 numerical "RORD1.. 14") as in the Sami table address block TCOM-CVO1. There is also scaling parameters to the numerical values RORD1....RORD14. The numerical values are of the

type "real" but they are converted to 16bit integers for the ABB MasterFieldbus with the scaling parameters.

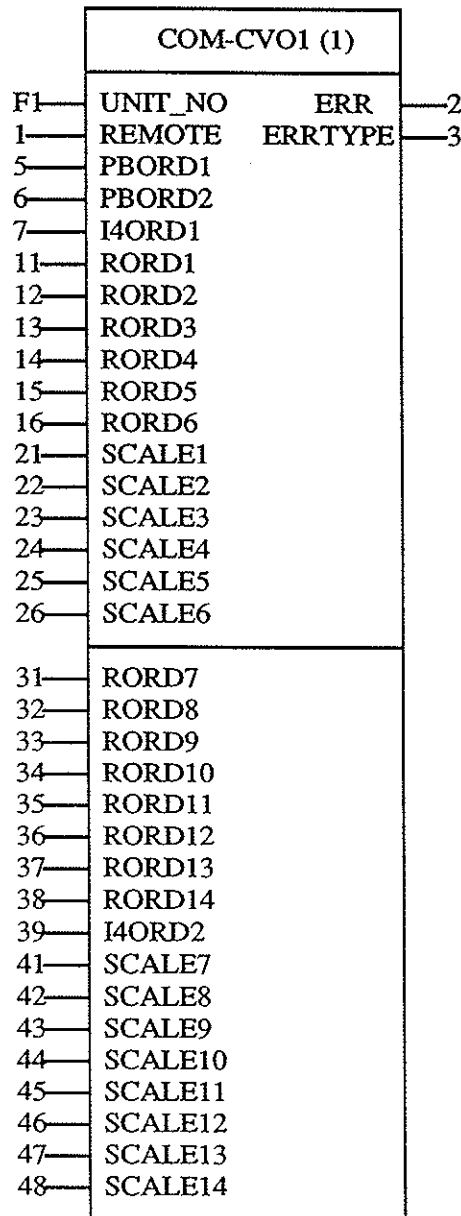
The scaling formula is as follows:

$$\text{Output (integer)} = \text{input (real)} * 32768 / \text{scale factor (real)}$$

With the scale inputs it is very easy to scale as an example the speed reference values to the scale used in SAMI Star (100%=20000).

Note! SAMI Star do not have any 32bit integers but it is still possible to use the I4ORD signal from ABB MasterPiece to SAMI Star. This may be done in two different ways:

- 1, One value that is less then 32768 is used, i.e I4ORD is equal to I4ORD-LSW in the TCOM-CVO1 table.
- 2, Two values is added in such a way that the first value is equal to I4ORD-LSW and the second is equal to I4ORD-MSW in the TCOM-CVO1 table, i.e the formula is (I4ORD = first value + second value \* 65536).



COM-CVO1

1.3.2  
COM-CVII PC-element

The function of this element is to act as a link between the signals fetched from the node on the ABB MasterFieldbus and the PC-application program. A database element of type CV is also required for the communication.



The PC-element COM-CV11 has the same signals (5 packed boolean "PBIND1..5", 1 32bits "I4IND1" and 9 numerical "RIND1..9") as in the Sami table address block TCOM-CV11. There is also scaling parameters to the numerical values RIND1...RIND9. The values arrive on ABB MasterFieldbus to ABB MasterPiece as integers but they can be scaled to real values. The scaling formula is as follows:

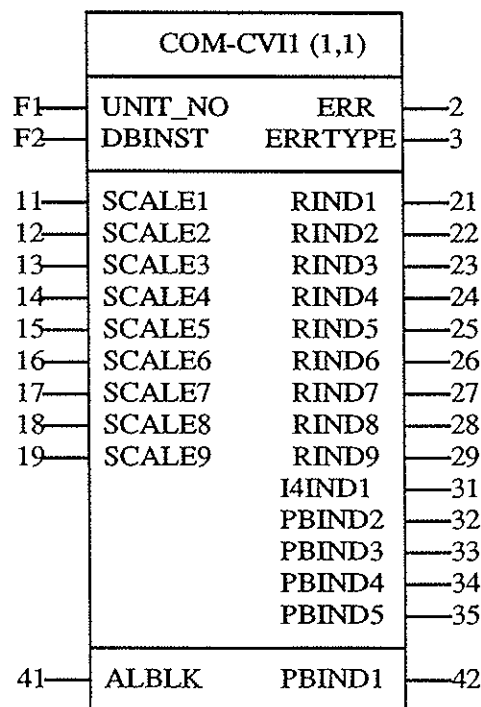
$$\text{Output (real)} = \text{signal value (integer)} * \text{scale factor (real)} / 32768$$

Scaling makes it easy to adjust SAMI Star signals to the scale the user wants to have in the application program. As an example "speed actual" in SAMI Star is given by 20000=100%, but the user might have some other scaling.

Note! SAMI Star do not have any 32bit integers but it is still possible to use the I4IND signal from SAMI Star to ABB MasterPiece. This may be done in two different ways:

- 1, One value is used, i.e I4IND1-LSW is equal to I4IND1 in the COM-CV11 PC-element.
- 2, Two values is used and these values is recalculated in the ABB MasterPiece PC-program. The formula is as follows: (I4IND1 / 65536 = I4IND1-MSW and the reminder = I4IND1-LSW).

One node may have many COM-CV11 elements. This is useful when some signals needs fast updating but the other ones may be processed with a slower time.

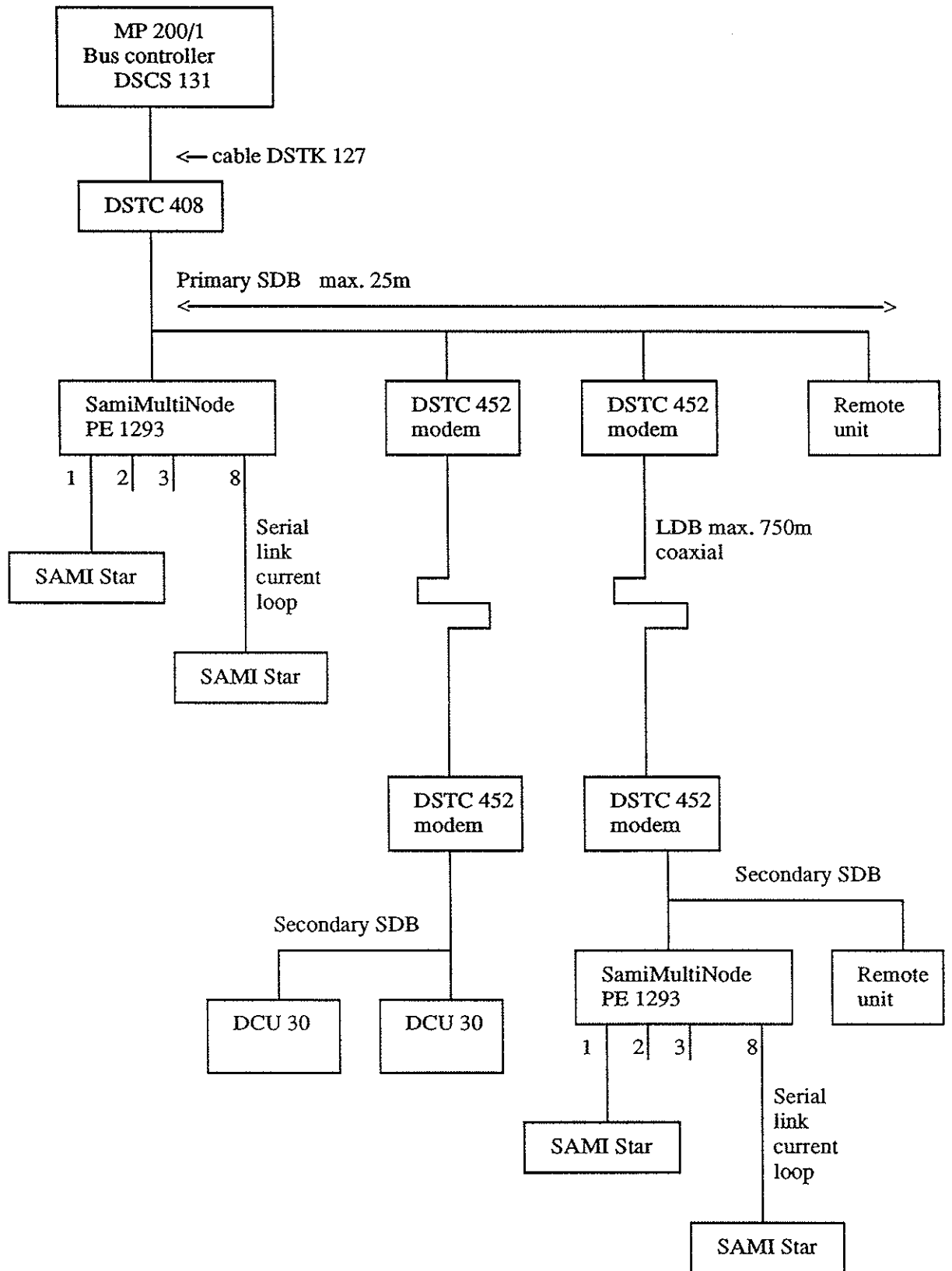


COM-CV11

#### 1.4 ABB MasterFieldbus

ABB Master automation system has many different communication buses. ABB MasterFieldbus has been developed for high speed communication between MasterPiece 200/1 and field automation equipment like for example SAMI Star AC-drive, TYRAK-L DC-drive, Remote I/O units, MasterPiece 51 programmable field unit and DCU 30 desk control unit. One bus controller board DSCS 131 can control 16 nodes which can be any of the units mentioned above. Connection Unit DSTC 408 is a link between DSCS 131 controller and primary Short Distance MasterFieldbus (SDB). The maximum length of SDB is about 25m. It is possible to connect to SDB with a Long Distance MasterFieldbus (LDB) via an electric modem DSTC 452. LDB uses a coaxial cable which can be maximum 750m long. (There exists also an optic modem which enables distances up to 4.5km). In this document we talk about SDB when ABB MasterFieldbus is mentioned.

The communication protocol for the ABB MasterFieldbus is a subset of the standard protocol ISO-HDLC. This means that the serial bus controller cyclically polls the nodes i.e. the remote units, which responds in turn. If a remote unit fails to respond within a certain time period, the next unit will be polled. If an unit fails to respond to a number of consecutive pollings the bus controller will indicate that the unit is faulty. However, the node in question will continue to be polled during each program cycle and the fault indication will cease as soon as the node responds. This means that remote units may be coupled in and out without disturbing the operation of the rest of the system. It also means that communication will start automatically with a new unit which is connected, provided that the unit has been configured in the data base. Maximum cycle time at high speed (2Mbps) with 16 SAMI Star nodes is approx 30ms, but depends much on the load on the bus.



Basic connection of MasterFieldbus

## 2 OPERATION

This chapter describes the initialization and normal operation of the SAMI Star - ABB MasterFieldbus Interface. The basic idea of designing applications with this interface is to understand that it is totally up to the user to decide which standard Sami signals he wants to use in his unique application. The result of this approach is that the designer has only to be (in addition to SamiMultiNode) familiar with the standard SAMI Star operation and standard ABB MasterPiece PC-elements.

### 2.1 Initialization

The user has the responsibility to write the necessary parameters to address blocks TCOM-CVO1 and TCOM-CV11 that are physically located in the EEPROM memory of the Sami control board. The minimum required parameters are as follows:

- 1, UNIT-NO           The address of the node.
- 2, SAMI-SER\_CH    The serial channel of Sami.
- 3, REFRESH-IVAL Refreshment interval for orders to SAMI Star from SamiMultiNode.

The remaining parameters are application dependent. If they are all zero then no information will be exchanged between SAMI Star and ABB MasterPiece. For feedback signals to MasterPiece (PBINDx...RINDx) the user has to give the Sami address and updating interval. For orders to SAMI Star (PBORDx...RORDx) only the Sami address of the respective signal has to be given.

These values are stored into EEPROM and after that the SamiMultiNode can be initialized. This is done after that power has been connected to SamiMultiNode or after that the communication (current loop) has been connected and a delay of five seconds has passed. SamiMultiNode starts to communicate with SAMI Star according to Sami protocol and it asks the contents of the address blocks TCOM-CV11 and TCOM-CVO1. This initialization takes normally about ten seconds. After completing this procedure the normal communication between SAMI Star and SamiMultiNode starts.

If SamiMultiNode is already physically connected to MasterFieldbus and if the Database in ABB MasterPiece is properly built, the communication between SAMI Star and ABB MasterPiece will also commence. SamiMultiNode does not read the initialization blocks continuously. It happens only when the power has been connected or when the communication between SamiMultiNode and SAMI Star has been connected. For this reason it is impossible to change the communicated Sami addresses during normal operation. When power is on, initialization is done only after that SamiMultiNode has noticed a fatal error in the communication with SAMI Star.

Note! It is necessary to provide SamiMultiNode with the same "no-break" power as SAMI Star if automatic restart after power failure is used.

## 2.2

### Normal communication

During the normal communication the signals specified by the user are communicated between SAMI Star and ABB MasterPiece. According to ABB MasterFieldbus protocol, bus controller in MasterPiece polls continuously SamiMultiNode with a cycle between 2...30 ms.

SamiMultiNode sends to Sami only those values that have changed. Some signals will be sent with verified receiving mode. A signal will be sent even if no changes has occurred when a refreshment interval has passed off. Most of the feedback signals from SAMI Star are transmitted according to regular transmitting mode. The signals and intervals depend on the application. If signals with parameter number greater than 255 are needed or if the number of transmitted signals are greater than eight then request transmitting is used.

The priorities between the messages are as follows:

From SamiMultiNode to SAMI Star:

- 1, A changed signal value according to verified receiving.
- 2, A changed signal value according to regular receiving.
- 3, Refresh of a signal value that has not been updated during the refresh interval.

From SAMI Star to SamiMultiNode:

- 1, A signal value according to request transmitting.
- 2, A signal value according to regular transmitting.

Between ABB MasterPiece and SamiMultiNode:

- 1, All signals in COM-CV11 and COM-CV01 for one SAMI Star are sent as one request and one answer.

## 2.3

### Communication failures

Fatal communication errors:

A fatal error in this context means that communication between ABB MasterPiece and SAMI Star is not working. The different possible situations are as follows:

A, Communication between ABB MasterPiece and SamiMultiNode has stopped.

Consequences: SamiMultiNode sends a message to Sami address 1 with a data value 1. It is up to the user's application program how Sami reacts on this. If this message does not reach Sami (serial link broken) Sami will see this as a too long communication break and acts accordingly.

B, SamiMultiNode has not received any message from Sami Star during supervision interval. This interval is the same as the refreshment interval. A default value is two seconds.

Consequences: SamiMultiNode sends a message to Sami address 1 with a data value 2 and stops the communication to ABB MasterPiece.

C, Any fatal error in the operation of SamiMultiNode program.

Consequences: The complete reinitialization of communication between SamiMultiNode and SAMI Star is started. First communication to Sami is stopped for five seconds to notify Sami about a fatal error situation.

Note! When no fatal error in communication occurs SamiMultiNode sends a message with a data value 0 to Sami address 1 with supervision interval.

Nonfatal communication errors:

When SamiMultiNode notices a nonfatal error in the communication from SAMI Star to SamiMultiNode it sends a message to Sami address 6T with a data value informing on the number of nonfatal communication errors since the initialization.

## 2.4

(Setting parameters on-line from ABB MasterPiece)

**Note! This function is not yet implemented in SamiMultiNode (91-04-29).**

This chapter introduce a useful facility for reading and setting any Sami parameter from ABB MasterPiece via MasterFieldbus. This facility requires a configuration tool MasterAid 215/220 (MA 215/220) to be connected to MasterPiece 200/1. With this MA 215/220 it is possible to configurate MasterPiece application programs by combining PC-elements and defining necessary Database elements. Also it can be used for "on-line" supervision of the program and for changing parameters in the application program in operating mode.

If there are two signals (RINDx1 and RINDx2 + RORDz1 and RORDz2) left unused in both of the elements COM-CV11 and COM-CVO1, then they can be used for the purpose of reading or setting parameters in SAMI Star. The program in SamiMultiNode has been designed so that it can read or change any Sami address data when it has been initialized for this facility.

The initialization is done in the following way:

- 1, Choose two unused addresses in the PC-element COM-CVO1 for this purpose.  
=> RORDz1 (address) and RORDz2 (data).
- 2, Choose in the same way addresses in the PC-element COM-CV11.  
=> RINDx1 (address) and RINDx2 (data).
- 3, Write the following data for the respective Sami addresses in address blocks TCOM-CV11 and TCOM-CVO1.  
=> (RORDz1) = -132 and (RORDz2) = -133  
=> (RINDx1) = +132 and (RINDx2) = +133  
=> interval (RINDx1 + 1) = -10 and (RINDx2 + 1) = -10

*Handwritten notes:*  
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 and my skirt  
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 v a d

After initialization SamiMultiNode will now be ready for this facility. The simplest way to use this facility with MA 215/220 is the function "GETAB". The user can collect the communication signals chosen for this purpose on a table on the screen. Reading the data of a parameter would be done simply by giving the Sami address concerned as a data to the RORDz1 signal. As a response SamiMultiNode will send the data of that Sami address to ABB MasterPiece in the signal RINDx2. To change the data after reading it first, the user only has to write a new value for RORDz2. As a response there will now be the new value on RINDx2. RINDx1 will always respond with the Sami address concerned.

### 3 SUPERVISION AND FAULT TRACING

This chapter will give some help for diagnostics and trouble shooting when using ABB MasterFieldbus and SamiMultiNode with SAMI Star.

#### 3.1 Initialization

Initialization of interface:

After power has been connected to SamiMultiNode and the current loop has been connected to a working SAMI Star the following procedure will take place:

- The display shows (2) to indicate "time out sequence" i.e waiting five seconds before it tries for reconnect.
- The display shows (3) to indicate reading of Sami address block TCOM-CVII.
- The display shows (4) to indicate writing TCOM-CVII values to the transmission block in SAMI Star.
- The display shows (5) to indicate reading of Sami address block TCOM-CVO1.
- The display shows (6) to indicate updating of COM-CVII values in SamiMultiNode.
- The display shows (1) to indicate normal communication between SamiMultiNode and SAMI Star.
- The display shows (-) to indicate normal communication between ABB MasterPiece and SAMI Star.
- The yellow led (node) on ABB MasterPiece communication board DSCS 131 is on.

=> Communication between SAMI Star and ABB MasterPiece is functioning.

#### 3.2 Normal communication

When communication between ABB MasterPiece and SAMI Star is functioning the following indications can be observed:

On ABB MasterPiece communication board DSCS 131 is the yellow node led on and the red fault led is off.



On SamiMultiNode is the two segments display showing the sequence (00), (1x), (2x), (3x), (4x), (5x), (6x), (7x), (8x), (00)... where the number indicates the channel on SamiMultiNode and "x" the actual status. The status should be "-" for a working communication and "2" or "A" for a not connected current loop. The indication "2" stands for "time out sequence" or waiting for reconnect and "A" stands for no signal received from SAMI Star during supervision interval.

During normal communication is SamiMultiNode sending a message with a data content of "0" to Sami address 1T according to the refreshment interval. SamiMultiNode is also sending the number of nonfatal communication errors in the transmission from SAMI Star to SamiMultiNode since initialization to Sami address 6T.

During normal communication some faulty messages may occur but usually they do not cause interruption in the communication because most of the messages are sent continuously and after one faulty message there will be a correct one after a short interval.

### 3.3

#### Fault indications

Communication can be affected by many kinds of interference. Sometimes the communication breaks totally or it may just become slower. The environment can cause electrical or physical interference in the communication system.

Concerning faults in ABB MasterPiece, PC-elements, communication board and MasterFieldbus cable, we refer to specific documents of these products (ABB MasterPiece 200/1 system documents). We list, however, some indications of communication faults in MasterPiece 200/1.

- System messages may appear on the screen of MasterAid 215 or 220 informing of communication problems.
  - faulty or missing bus control unit
  - the node has reported an error which does not prevent continued execution
  - communication with the node has been interrupted.
  - the node has reported an error which prevents continued execution
  - the node has resumed operation
- The communication board has one red fault led and 16 yellow node leds which can be used for troubleshooting (see ABB document Remote I/O - MasterFieldbus). Usually the red led is off and the node led is on if the communication to the node is functioning properly.

- Communication board DSCS 131 contains a counter which counts the number of unsuccessful pollings of units on each MasterFieldbus. It is possible to access the readings via MA 215/220 and thereby derive an indication of the communication quality. The command for this is, "LMFS" (List MasterFieldbus Status). See document Remote I/O - MasterFieldbus.
- The capacity of the MasterFieldbus is higher than the capacity of the current loop. It is therefore possible to overload the communication from SamiMultiNode to SAMI Star. This overload will be indicated in the SamiMultiNode with a (c) on the display.

In a previous chapter it is described how SamiMultiNode behaves when communication faults are detected:

- Line between SamiMultiNode and ABB MasterPiece is cut:  
This fault is indicated in the ABB MasterPiece but it may be indicated on the display with (1) which indicates that the communication to SAMI Star is working but not the communication to ABB MasterPiece. A message is sent by SamiMultiNode to address 1 with data 1.
- Line from SAMI Star to SamiMultiNode is cut and no "request" transmitting mode is used:  
After the supervision interval (it is the same as the refreshment interval) SamiMultiNode sends a message to Sami address 1 with data 2 and the communication to ABB MasterPiece is stopped. After a delay of five seconds a reinitialization of the communication between SamiMultiNode and SAMI Star is attempted. If the communication supervision time in SAMI Star is shorter than five seconds a fault tripping "FL 17" (COMMUNICATION FAULT) will occur. Resetting of SAMI Star is required to start the communication.
- Line from SAMI Star to SamiMultiNode is cut and "request" transmitting with interval shorter than supervision interval is used:  
SamiMultiNode will, after two unsuccessful requests, stop the communication to ABB MasterPiece and to SAMI Star. After a delay of five seconds a reinitialization of the communication is attempted. This fault, failing in request, will be indicated with a (A) on the display. If communication supervision in SAMI Star is shorter than five seconds a fault tripping with a text "FL 17" (COMMUNICATION FAULT) occurs. If this delay in SAMI Star is longer than five seconds reinitialization messages between SamiMultiNode and SAMI Star inhibit the indication of "FL 17". No messages to Sami address 1 is sent. If reinitialization is successful the communication to ABB MasterPiece will resume. If "FL 17" has occurred then resetting of SAMI Star is required.
- A fatal error in the operation of SamiMultiNode:  
The communication to ABB MasterPiece and SAMI Star is stopped and after a delay of five seconds a reinitialization of the communication is attempted.

- A halted processor on SamiMultiNode is indicated with its led and with the common relay output.
- The rate of nonfatal errors can be supervised from Sami address 6T which is updated by SamiMultiNode according to supervision (or refresh) interval with a data of the counted nonfatal errors in the communication from SAMI Star to SamiMultiNode. These errors do not cause reinitialization or fault tripping but they indicate the quality of the communication.
- The two segments display in SamiMultiNode will show a number of fault indications, these are described in the next part of this document.

### 3.4

#### Display indications

The display is used to give a cyclic presentation of the actual status of the communication for each channel. The indication for the eight channels and the central functions is made in the following way: (0,y), (1,x), (2,x), (3,x), (4,x), (5,x), (6,x), (7,x), (8,x), (0,0), (1,y) ..... where y and x are codes.

Code (y)	Description
----------	-------------

0	No central errors.
E	Checksum error in H8 Prom.

Code (x)	Description
----------	-------------

-	Normal communication between ABB MasterPiece and SAMI Star.
1	SAMI Star init phase, Normal communication between SamiMultiNode and SAMI Star.
2	SAMI Star init phase, Time out, waiting five seconds before reinitialization.
3	SAMI Star init phase, Reading Sami address block TCOM-CVII.
4	SAMI Star init phase, Writing Sami transmission block.
5	SAMI Star init phase, Reading Sami address block TCOM-CVO1.
6	SAMI Star init phase, Reading first values for the COM-CVII element.
A	No messages received from SAMI Star during the supervision interval or three requests has failed.
b	More than eight signals are defined for automatical transmission or a faster time then -5 is used.

- c The transmission from SamiMultiNode to SAMI Star is choked, i.e. too fast update from ABB MasterPiece.
- d Failure in verification of a signal from ABB MasterPiece to SAMI Star.
- E Checksum error in signal from SAMI Star.
- F Communication fault (UART FAULT). Overrun, framing or parity error.
- J Wrong number on the serial channel in SAMI Star.

**Note!** It is possible to halt the cyclic presentation on any channel with the dipswitch S1.1. This is useful when the user wants to study the behaviour of a certain channel.

### 3.5

#### Fault tracing with a Personal Computer

It is possible to use a Personal Computer to supervise and trace faults in the communication through SamiMultiNode. A special program in the computer gives the following possibilities:

- 1, To read the TCOM-CVO table and the actual values in the communication on each channel.
- 2, To read the TCOM-CVI table and the actual values in the communication on each channel.
- 3, To read a number of communication and fault counters for each channel.
- 4, To store the information mentioned above continuously on a file.
- 5, A description of error codes and switch settings.

More information about the possibilities and use of this function is given in a separate document "MultiNodeAid".

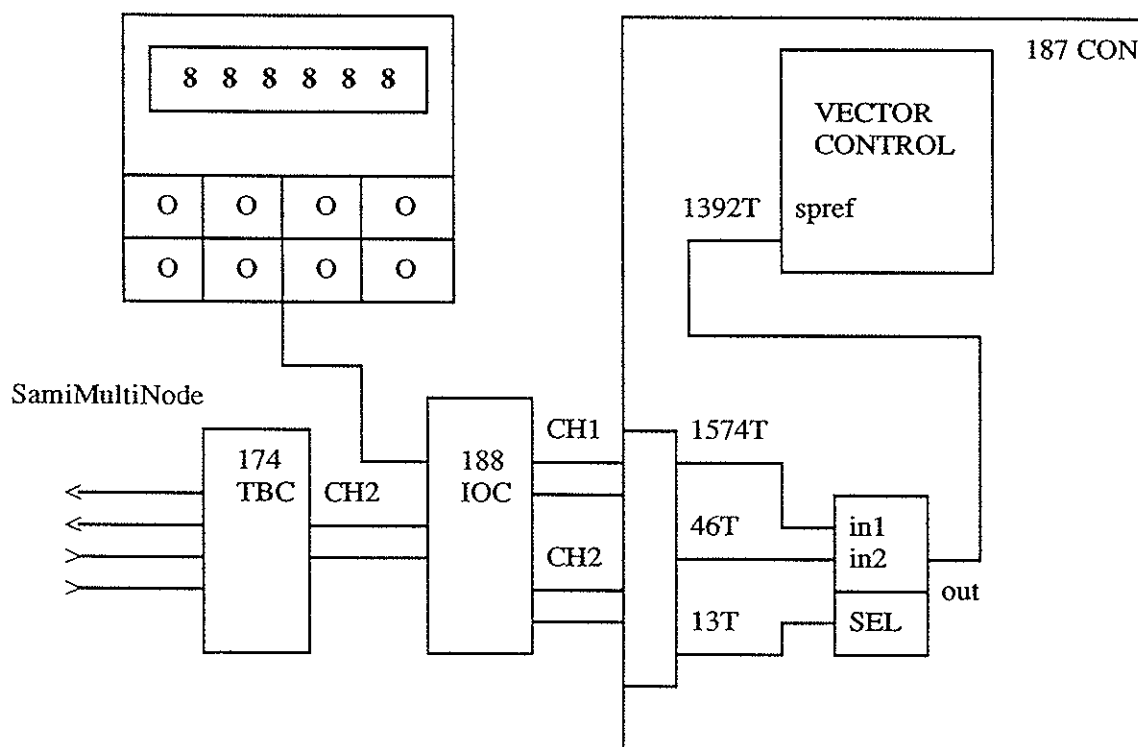
4  
CONTROL PANELS WITH SamiMultiNode

There are two control panels that can be used for controlling and supervising SAMI Star. Control panel 1 (CP1) is mainly used with single drives and Control panel 2 (CP2) with sectional drives.

4.1  
Control panel 1 (CP1)

CP1 is usually attached on the front door of the SAMI Star cubicle. It communicates with interface card SAFT 188 IOC using a flat cable. It can not be used with sectional drive interface card SAFT 189 TSI. CP1 has a display with six segments and it can be adjusted to show any signal from Sami table, as an example: "current actual" or "speed actual". There are eight pushbuttons which can also be adjusted for application specific use. The start, stop, coast stop and other types of logical control signals can be given through CP1. When CP1 is used with ABB MasterFieldbus interface the user has the responsibility to build a SAMI Star application program that handles properly the change between local and remote control. One possible solution is the one presented in the appendix at the end of this document.

CP1 together with ABB MasterFieldbus interface:



## 4.2

## Control panel 2 (CP2)

CP2 is designed for sectional drive applications. It is connected via a serial link to either of the SAMI Star serial channels. In practical solutions CP2 is usually connected to channel 1. In sectional drives the interface card is usually SAFT 189 TSI which has two external serial channels available. If so called master-slave connection is used the channel 2 will be reserved for this purpose only and this means that CP2 will be connected to channel 1. Physically it has to be done via Test adapter X6 because SamiMultiNode is also using channel 1 and it is connected to serial link 1 with terminal block adapter.

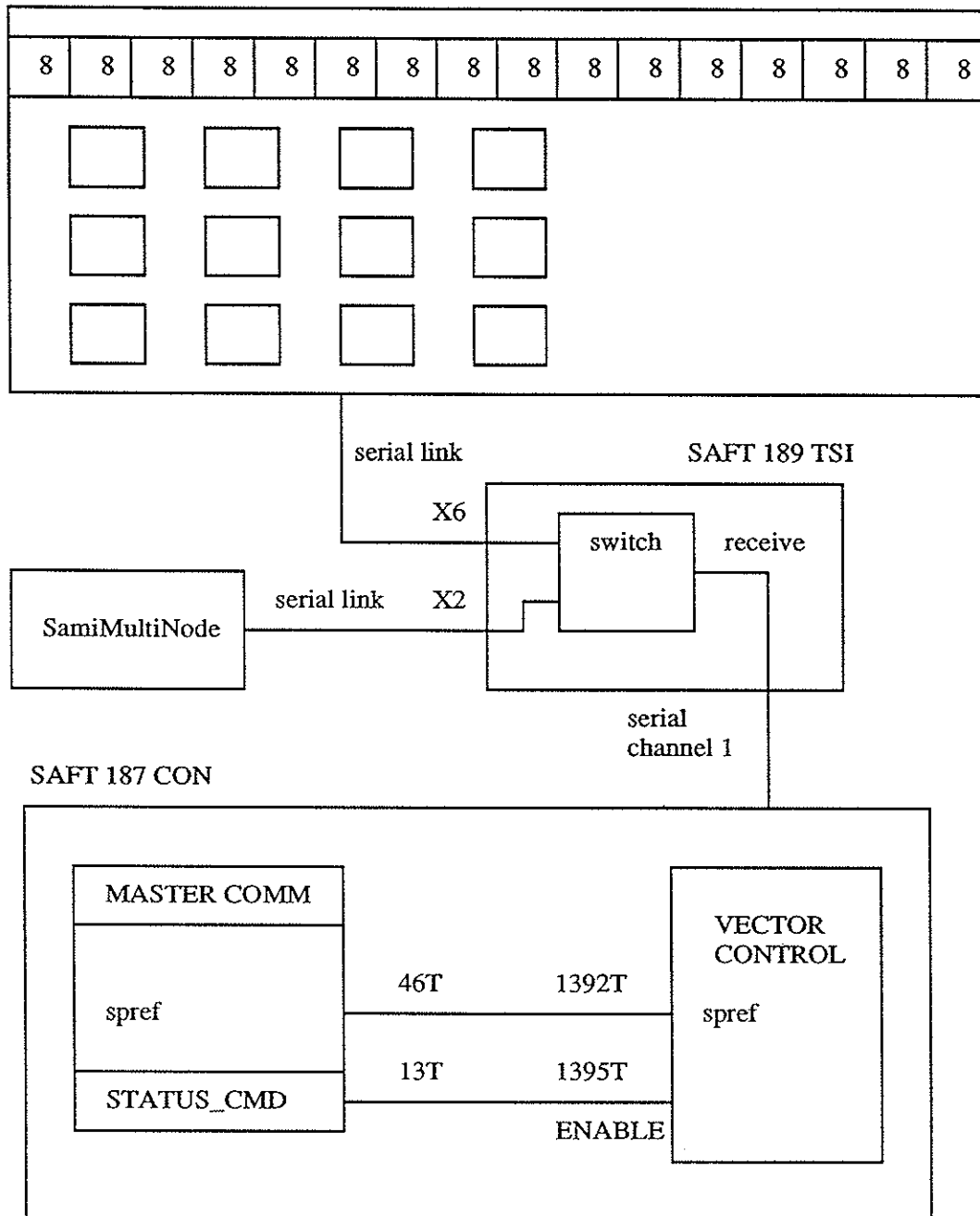
Channel 1 is used both by CP2 and SamiMultiNode and this causes some problems. On the receiving line on board 189 TSI there is a hardware switch that reserves the line physically always for a certain fixed time for that source which has been reserving the line first. This time has been set such that it is just enough for one Sami message (9 characters). If communication is very intensive it might be difficult to reserve the line.

For security reasons SamiMultiNode and CP2 are using different addresses for "mail box" communication. CP2 sends with fixed interwall (600ms in testpanelmode) its buttonsword to SAMI Star. This means that CP2 must be used with care for control of SAMI Star in parallel with SamiMultiNode. SAMI Star sends to CP2 via the serial channel normal messages and diagnostic messages but they don't disturb the function of SamiMultiNode. It means that CP2 can be used as a supervising and parameter-setting tool although SamiMultiNode is on the same channel.

Note anyhow that every 600ms there will be buttonsword from CP2 and they can cause a loss of one message from SamiMultiNode to SAMI Star. This will also be indicated in the fault counters that are used to supervise the communication. The only way to use the fault counters in this configuration is to connect the CP2 unit, make a measurement, disconnect the unit, wait at least one hour, connect the unit again and make a new measurement. It is also important to remember that speed reference cannot be given from CP2 if not special application program is made.

Regarding Sami application programs is the user to refer to other documents like "SAMI APPLICATION BLOCKS" and "VECTOR CONTROL MANUAL".

CP2 connected to SAMI Star together with SamiMultiNode.

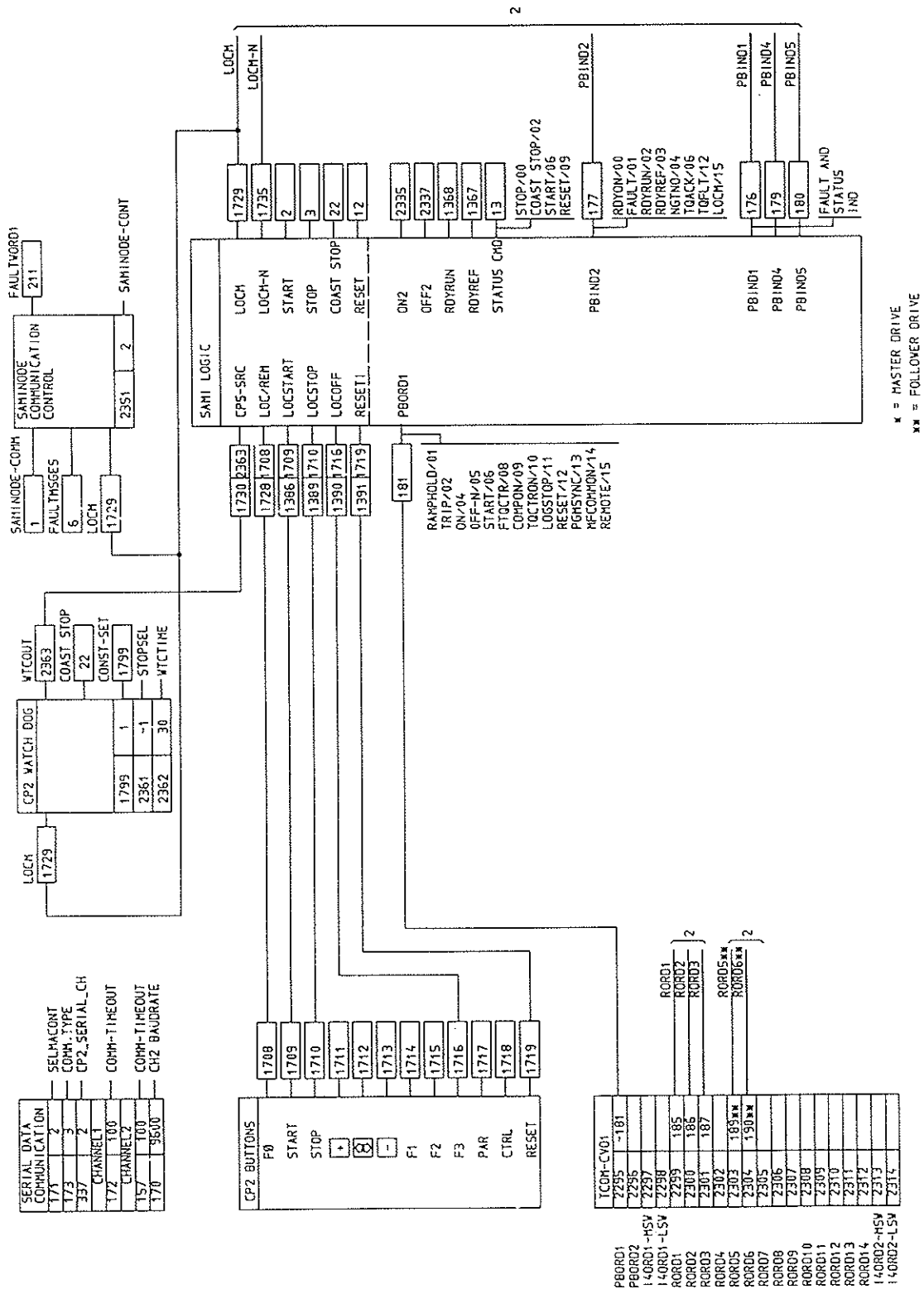


"STATUS\_CMD" 13T can be connected to address 1395T "ENABLE" (INVERTED) and if ABB MasterPiece sends to SAMI Star "STATUS\_CMD" 13T data not equal to zero, the speed reference and controls are not possible to be given from CP2. If "STATUS\_CMD" becomes zero the CP2 can control the drive.

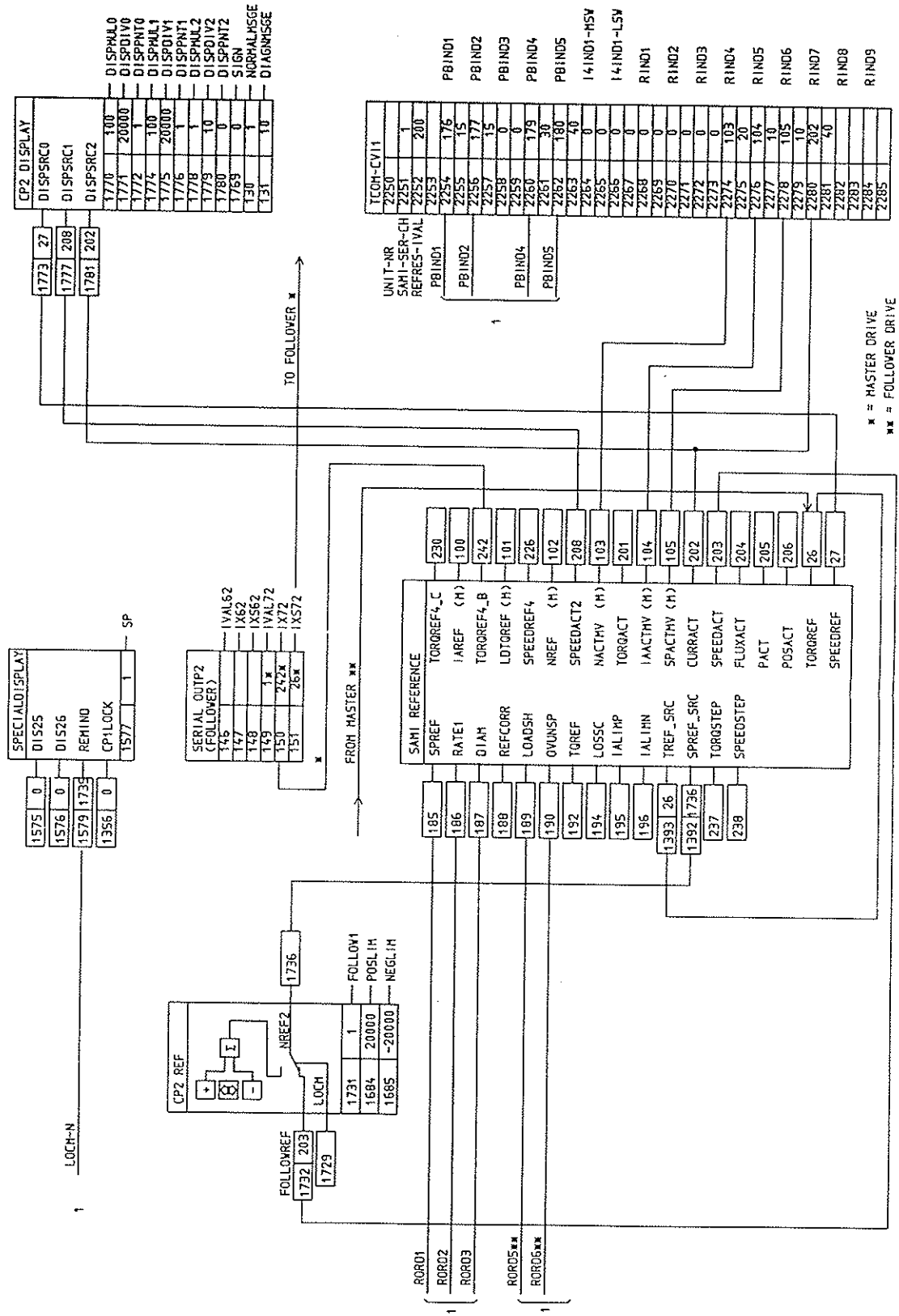
5  
APPENDIX

5.1  
Example no 1, SAFRVG 4.00 - sectional or single drive applications

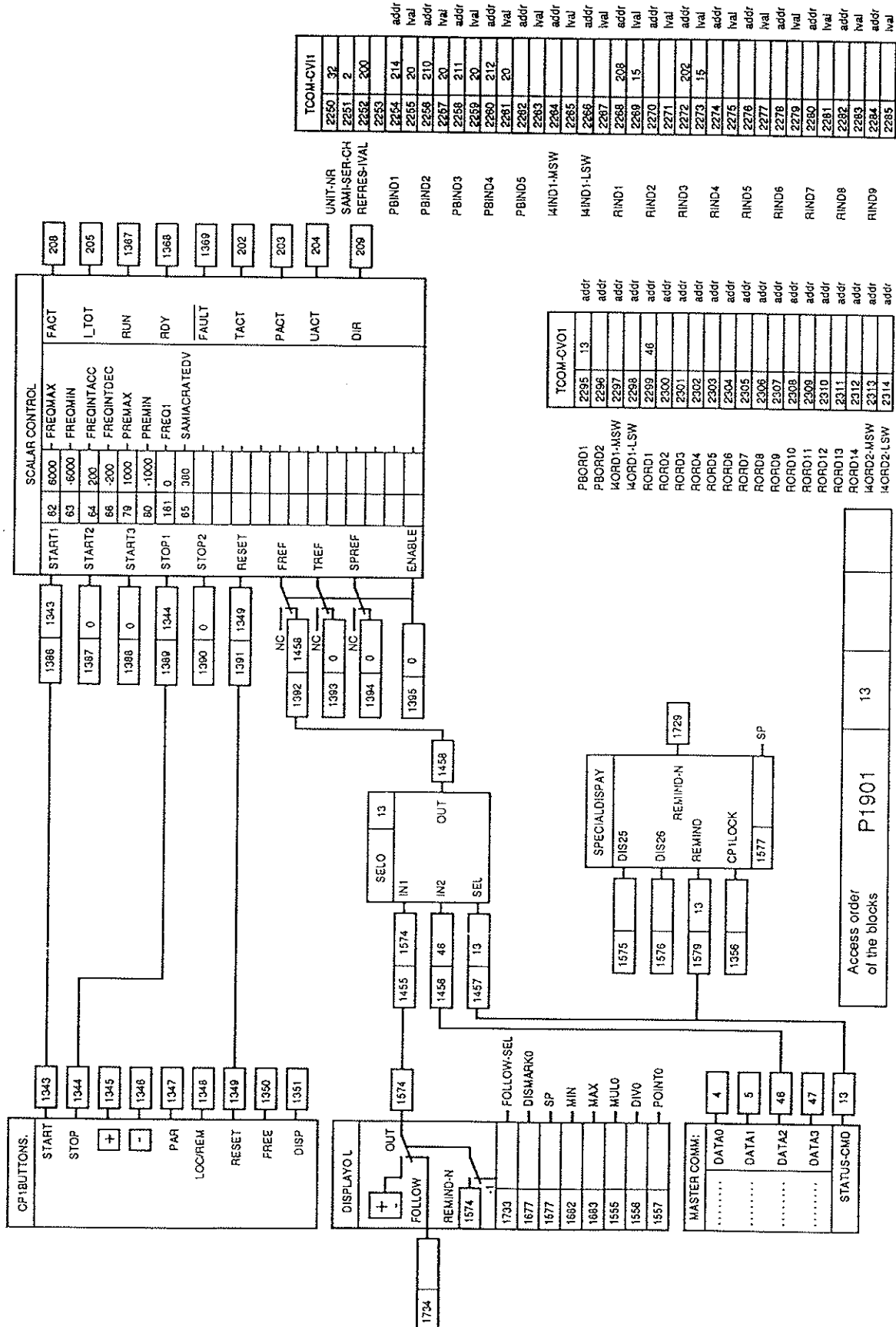
ABB MasterFieldbus interface for vector control in Pulp and Paper.



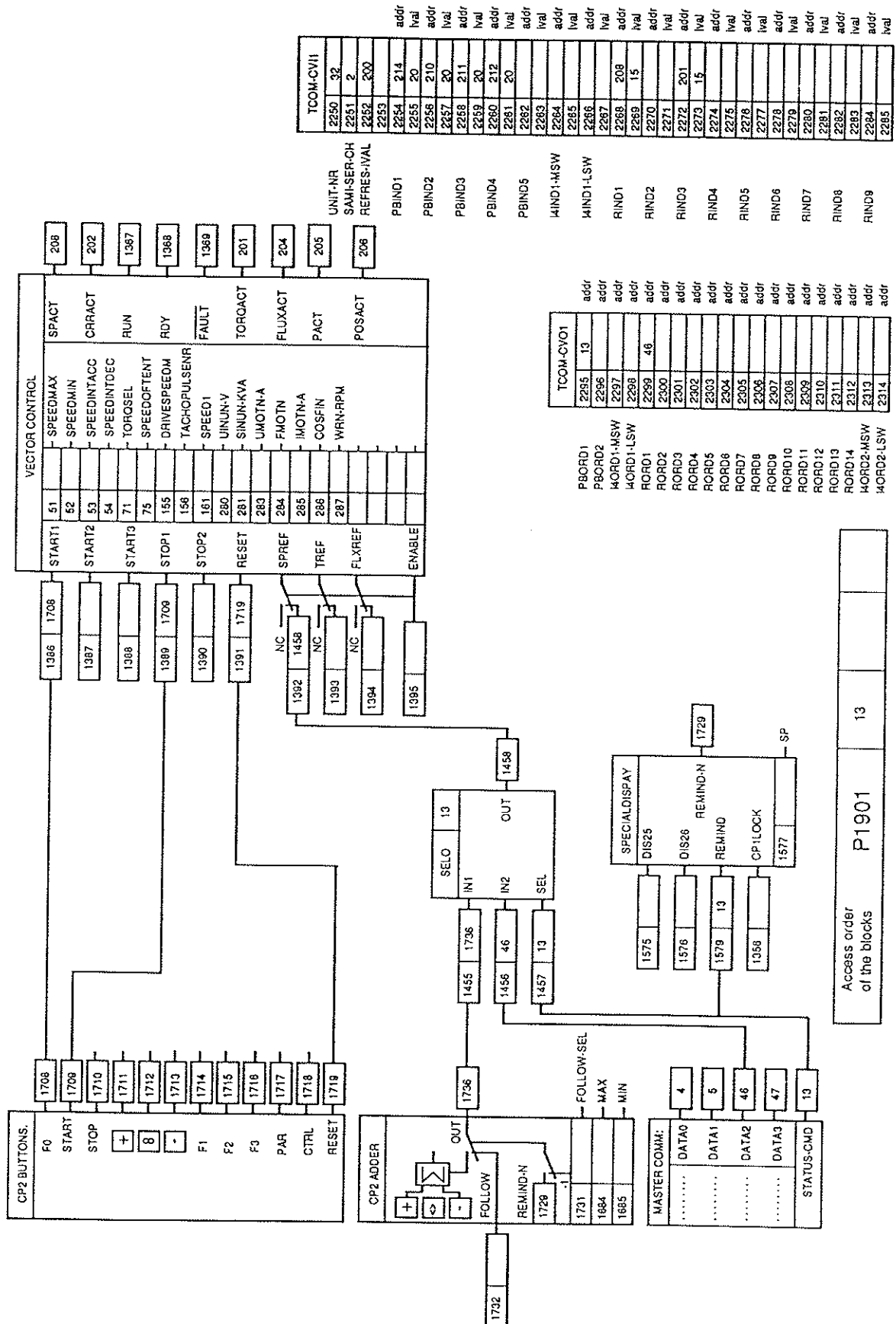




5.2 Example no 2, SAFRSC 4.04 - single drive applications



5.3  
Example no 3, SAFRVC 4.00 - sectional drive applications





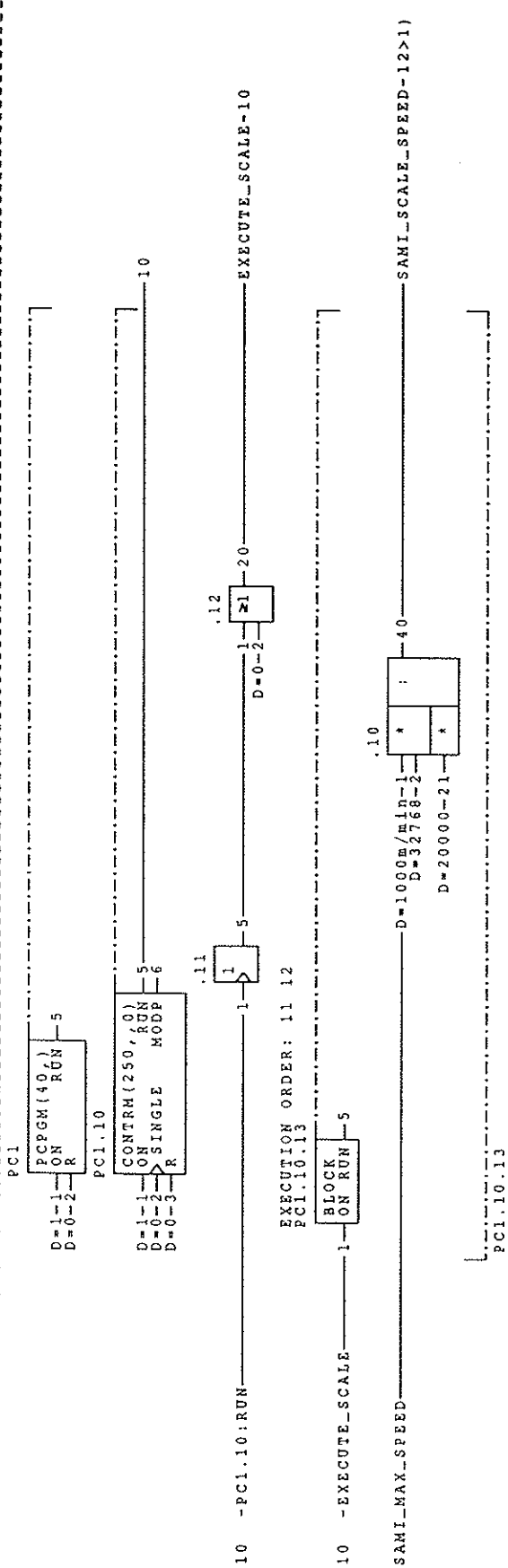
## 5.5

Example no 5, ABB MasterPiece PC-program for SAMI Star

```
START ITEM DESIGNATION: PC1
PC1 PCPGM (40,)
.10 CONTRM (250,,0)
.11 TRIGG
.12 OR (2)
.13 BLOCK
.10 DIV-MR (2,1)
.21 COM-CV11 (1,1)
.22 PM-SPLIT (I,1)
.23 PM-SPLIT (I,1)
.24 PM-SPLIT (I,1)
.25 PM-SPLIT (I,1)
.31 MOVE (B,16)
.32 PM-PACK (0,1,0)
.33 SW-C (R,1)
.41 COM-CV01 (0)
```

COMMON IDENTITY:

ABB Process Automation 1991-07-01/17:39:50



1) SAMI\_SCALE\_SPEED-12 20

-----

Design ch: Ulf Ekberg  
 Tech ref: Ulf Ekberg  
 Resp dept: DRI/ABU  
 Date: 91-05-08

-----

PC DIAGRAM:  
 SamiMultiNode  
 PE1293

-----

APPLICATION WITH  
 SBRVC 4.00A WITH  
 SINGLE SECTION

-----

SAMI STAR SCALING OF SIGNALS  
 Language: E  
 Rev and: 1  
 Sheet: 10  
 Cont: 12



ABB Process Automation 1991-07-01/17:39:50  
----- COMMON IDENTITY: PCI.10 -----

.2)

```

F=100-F1-----
F=0-F2-----
D=0-11-----
D=32768-12-----
D=0-13-----
D=0-14-----
D=0-15-----
D=0-16-----
D=0-17-----
D=0-18-----
D=0-19-----
D=0-41-----

```

COM-CVII(1,1)	ERR	1
UNIT_NO	ERR	2
DBIND1	ERR	3
SCALE1	ERR	4
SCALE2	ERR	5
SCALE3	ERR	6
SCALE4	ERR	7
SCALE5	ERR	8
SCALE6	ERR	9
SCALE7	ERR	10
SCALE8	ERR	11
SCALE9	ERR	12
ALBLR	ERR	13
SCALE1	ERR	14
SCALE2	ERR	15
SCALE3	ERR	16
SCALE4	ERR	17
SCALE5	ERR	18
SCALE6	ERR	19
SCALE7	ERR	20
SCALE8	ERR	21
SCALE9	ERR	22
SCALE10	ERR	23
SCALE11	ERR	24
SCALE12	ERR	25
SCALE13	ERR	26
SCALE14	ERR	27
SCALE15	ERR	28
SCALE16	ERR	29
SCALE17	ERR	30
SCALE18	ERR	31
SCALE19	ERR	32
SCALE20	ERR	33
SCALE21	ERR	34
SCALE22	ERR	35
SCALE23	ERR	36
SCALE24	ERR	37
SCALE25	ERR	38
SCALE26	ERR	39
SCALE27	ERR	40
SCALE28	ERR	41
SCALE29	ERR	42
SCALE30	ERR	43
SCALE31	ERR	44
SCALE32	ERR	45
SCALE33	ERR	46
SCALE34	ERR	47
SCALE35	ERR	48
SCALE36	ERR	49
SCALE37	ERR	50
SCALE38	ERR	51
SCALE39	ERR	52
SCALE40	ERR	53
SCALE41	ERR	54
SCALE42	ERR	55
SCALE43	ERR	56
SCALE44	ERR	57
SCALE45	ERR	58
SCALE46	ERR	59
SCALE47	ERR	60
SCALE48	ERR	61
SCALE49	ERR	62
SCALE50	ERR	63
SCALE51	ERR	64
SCALE52	ERR	65
SCALE53	ERR	66
SCALE54	ERR	67
SCALE55	ERR	68
SCALE56	ERR	69
SCALE57	ERR	70
SCALE58	ERR	71
SCALE59	ERR	72
SCALE60	ERR	73
SCALE61	ERR	74
SCALE62	ERR	75
SCALE63	ERR	76
SCALE64	ERR	77
SCALE65	ERR	78
SCALE66	ERR	79
SCALE67	ERR	80
SCALE68	ERR	81
SCALE69	ERR	82
SCALE70	ERR	83
SCALE71	ERR	84
SCALE72	ERR	85
SCALE73	ERR	86
SCALE74	ERR	87
SCALE75	ERR	88
SCALE76	ERR	89
SCALE77	ERR	90
SCALE78	ERR	91
SCALE79	ERR	92
SCALE80	ERR	93
SCALE81	ERR	94
SCALE82	ERR	95
SCALE83	ERR	96
SCALE84	ERR	97
SCALE85	ERR	98
SCALE86	ERR	99
SCALE90	ERR	100

SAMI\_SPEED  
SAMI\_TORQUE  
SAMI\_FAULTWORD0-14  
SAMI\_FAULTWORD1-16  
SAMI\_FAULTWORD2-16  
SAMI\_STATUS-14

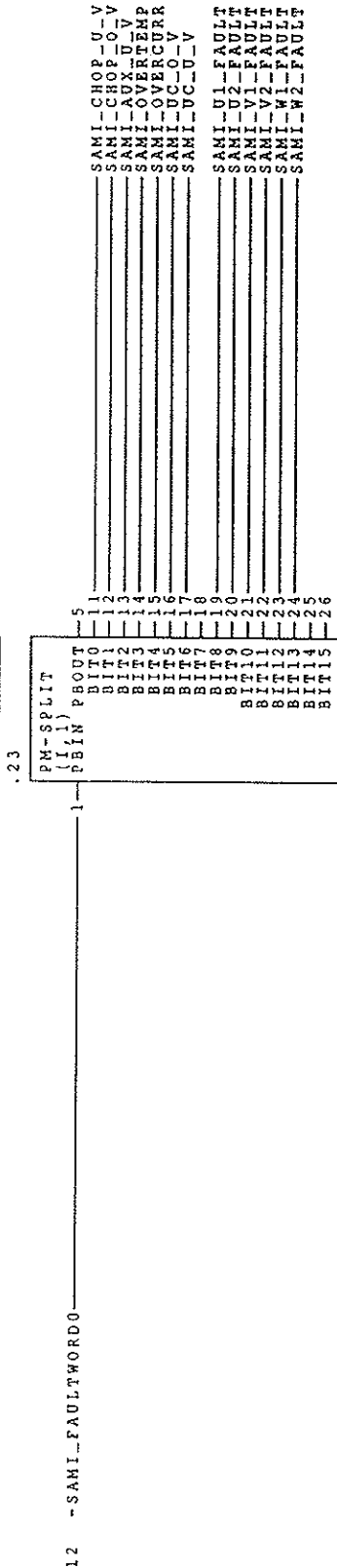
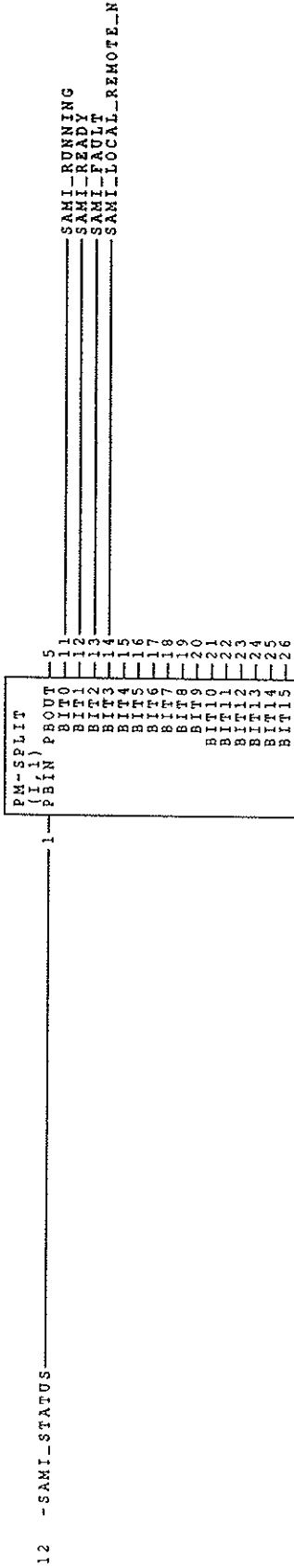
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----- SAMI STAR, INPUT FROM SAMI STAR -----
APPLICATION WITH
SAFEVC 4.00A
SINGLE SECTION
SAMI STAR, INPUT FROM SAMI STAR
Language: E
Rev. In: 1
Sheet: 12
Cont: 14
-----
PC DIAGRAM:
SamiMultiNode
PE1293
-----
Design Ch: ULF Ekberg
Tech Ref: DAI Ekberg
Date Dept: DAI/ABU
Date: 91-05-08
-----

```



ABB Process Automation 1991-07-01/17:39:50  
COMMON IDENTITY: PCI.10



EXECUTION ORDER: 22 23

PC DIAGRAM: SamiMultiNode PE1293

Design ch: Ulf Ekberg  
 Tech ref: Ulf Ekberg  
 Resp dept: DRI/KPU  
 Date: 91-05-08

APPLICATION WITH  
 SAMPVC 400A  
 SINGLE SECTION

SAMI STAR, STATUS AND FAULTS

Language: E  
 Rev ind: 1  
 Sheet: 14  
 Cont: 16

