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.

REVISION

Ind	Page (P) Chapt.(C)	Description	Date Dep./Init.
0		First version	910701 DRI/APU U.E

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1 DESCRIPTION OF THE INTERFACE

1.1 SamiMultiNode

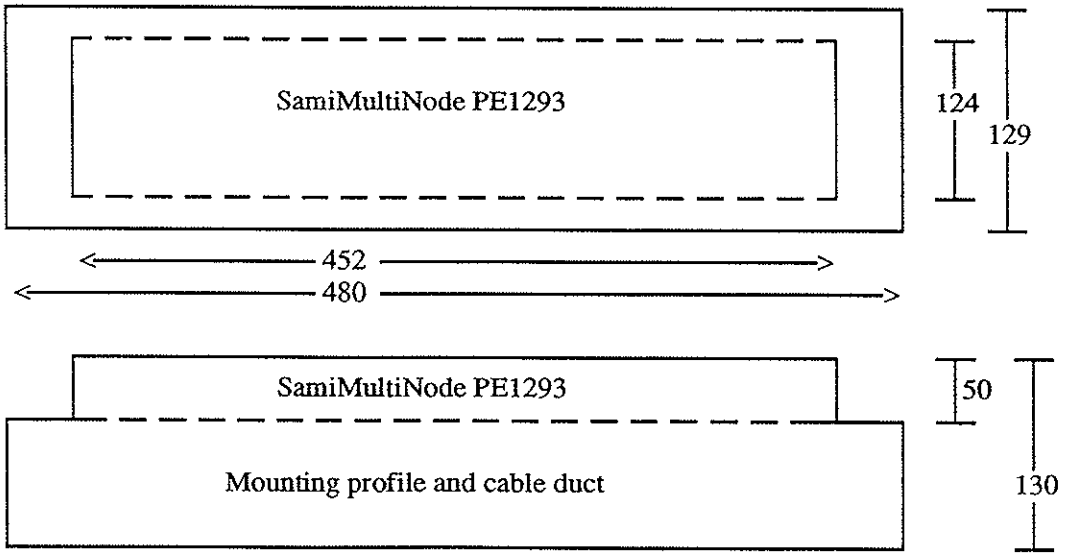
SamiMultiNode (PE1293) is a protocol converter designed to connect up to eight different SAMI Star to ABB MasterFieldbus. It consist of a circuit board with three major parts: power supply, Fieldbus communication and SAMI Star current loop communication. The Fieldbus communication is made with a Intel 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 enclosured unit.
Enviromental 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

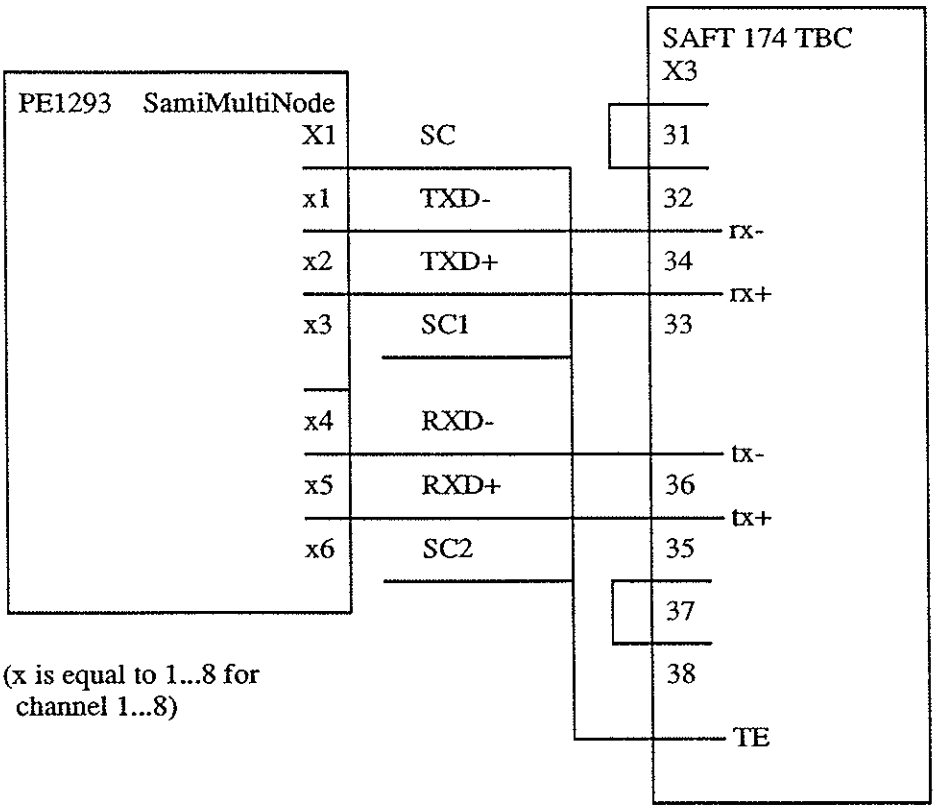
SAMI Star current loop:
The serial link from SAMI Star to SamiMultiNode is connected with two 3 screw terminal block adapters. The cable should be a FKAR-PIG or FLEAK 2*2*0.5, twisted, pair screened, common screened or of a similar type.

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

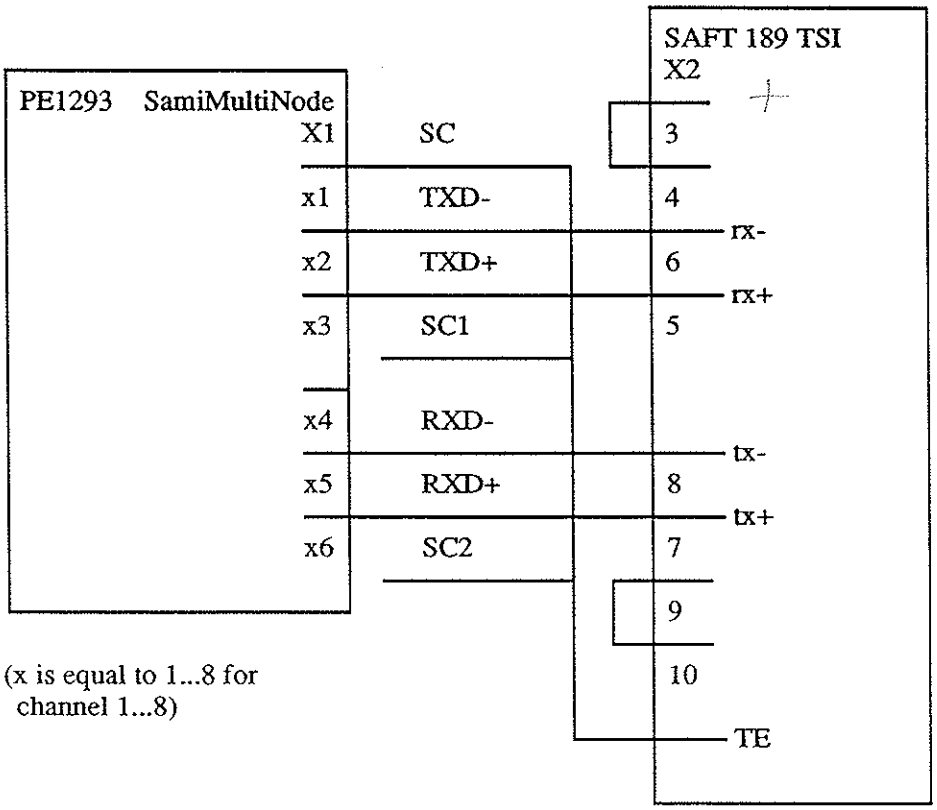
In a single drive is normally a SAFT 174 TBC and a SAFT 188 IOC card used. With SAFT 188 IOC it is only possible to use channel 2 for the serial link.

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
Initalization 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-CVI1 and TCOM-CVO1. 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-CVI1		
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-CVI1

	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-CVI1 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:

Node address = 32 * bus number + 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:

Node address = 100 * bus number + 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-CVI1 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

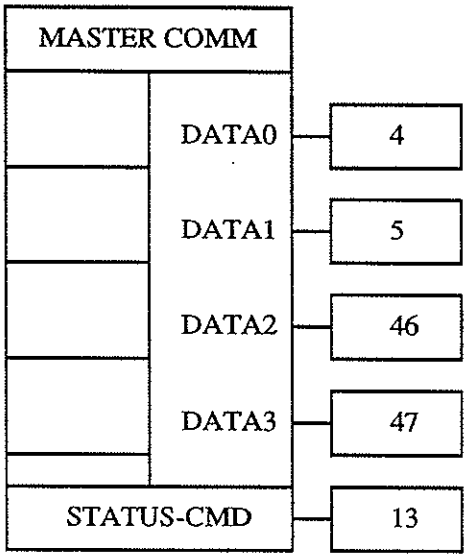
Verified receiving mode:
This mode is used when Sami addresses higher than 255 are used or when the user wants that acknowledgment to SamiMultiNode from SAMI Star has to be sent to be sure that the message was successfully received. This mode is using a so called "mailbox" communication method. It means 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-CVI1 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-CVI1 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-CVI1. Addresses can be in the range 0...255. Intervals has to be choosen 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-CVI1 block are reserved for 16bits packed boolean signals, two for a 32bits integer and nine for numerical signals. Eight of them can be choosen 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-CVI1 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:

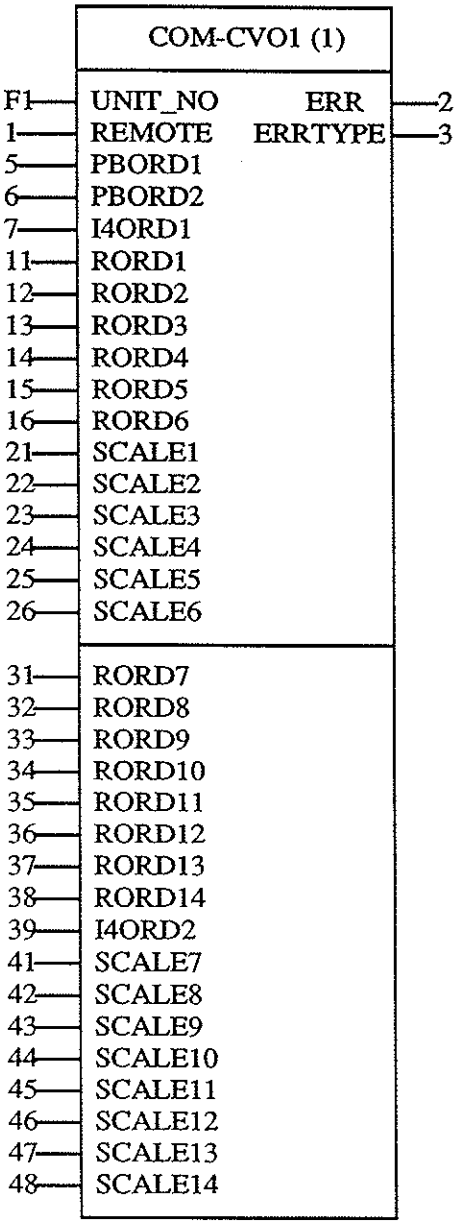
Output (integer) = input (real) * 32768 / scale factor (real)

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-CVI1 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-CVI1 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-CVI1. 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:

Output (real) = signal value (integer) * scale factor (real) / 32768

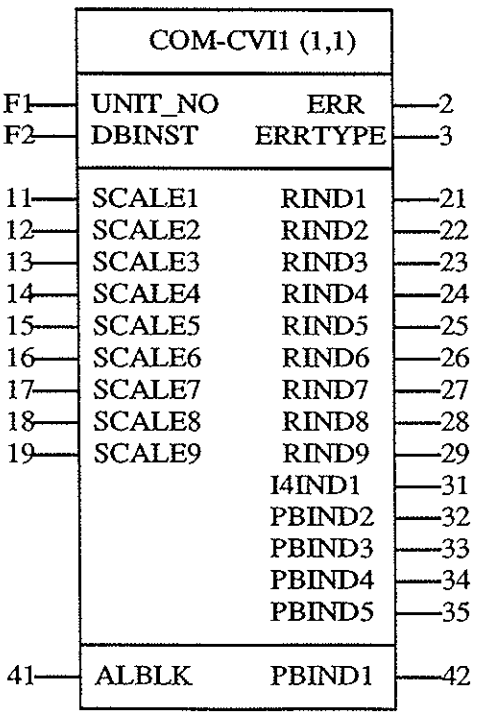
Scaling makes it easy to adjust SAMI Star signals to the scale the user wants to have in the application program. As an example "speed actual" in SAMI Star is given by 20000=100%, but the user might have some other scaling.

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-CVI1 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-CVI1 elements. This is useful when some signals needs fast updating but the other ones may be processed with a slower time.

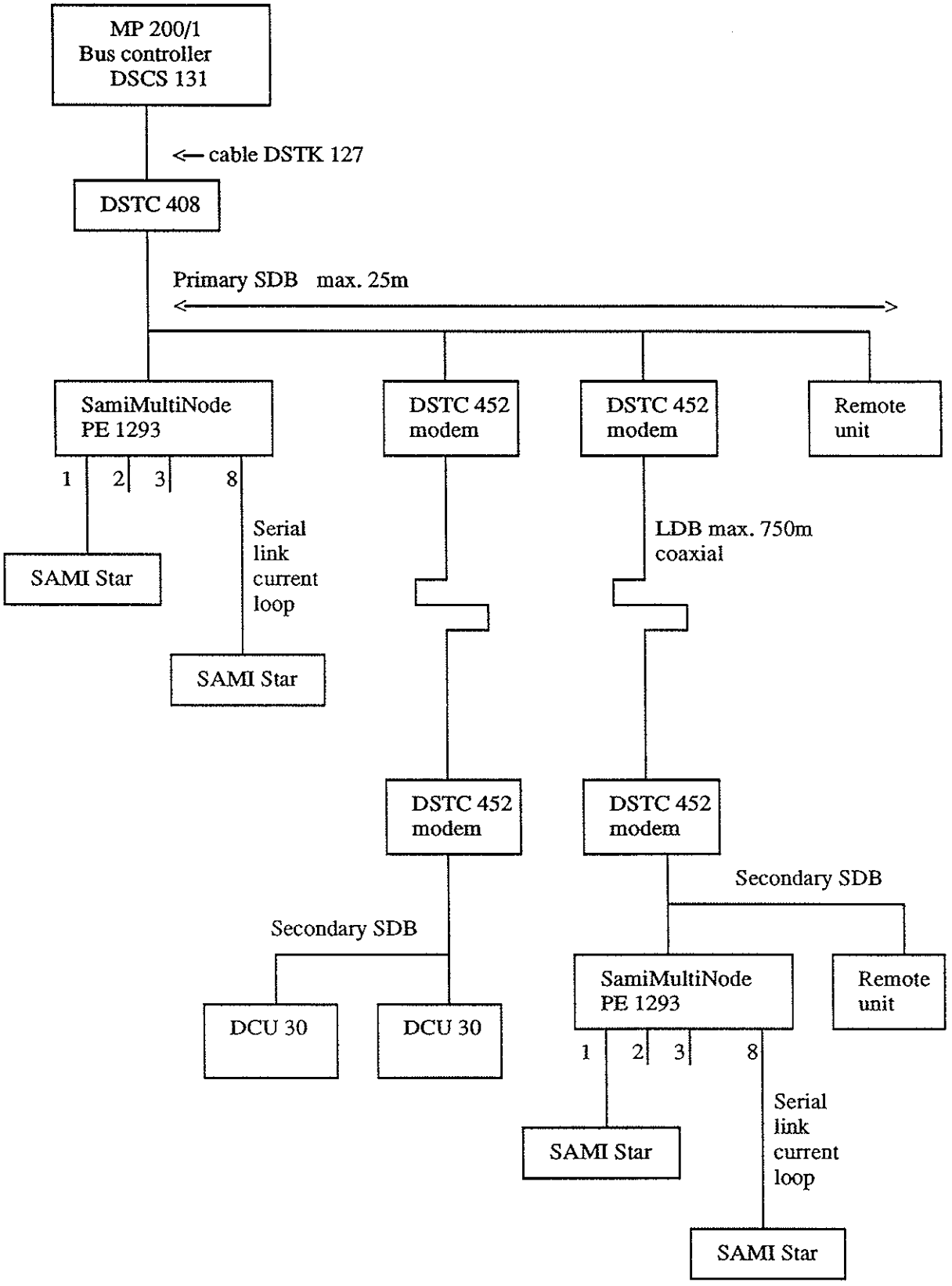


COM-CVI1

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 configurated 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-CVI1 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-CVI1 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 continously. 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 automatical 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 controler in MasterPiece polls continously 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 occured 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-CVI1 and COM-CVO1 for one SAMI Stare 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-CVI1 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-CVI1.
=> RINDx1 (address) and RINDx2 (data).

3, Write the following data for the respective Sami addresses in address blocks TCOM-CVI1 and TCOM-CVO1.
=> (RORDz1) = -132 and (RORDz2) = -133
=> (RINDx1) = +132 and (RINDx2) = +133
=> interval (RINDx1 + 1) = -10 and (RINDx2 + 1) = -10

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-CVI1.
- The display shows (4) to indicate writing TCOM-CVI1 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-CVI1 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 nuber 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 continously 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 enviroment 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 unsucessful 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-CVI1.
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-CVI1 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 to 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 usefull when the user want 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 continously 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".

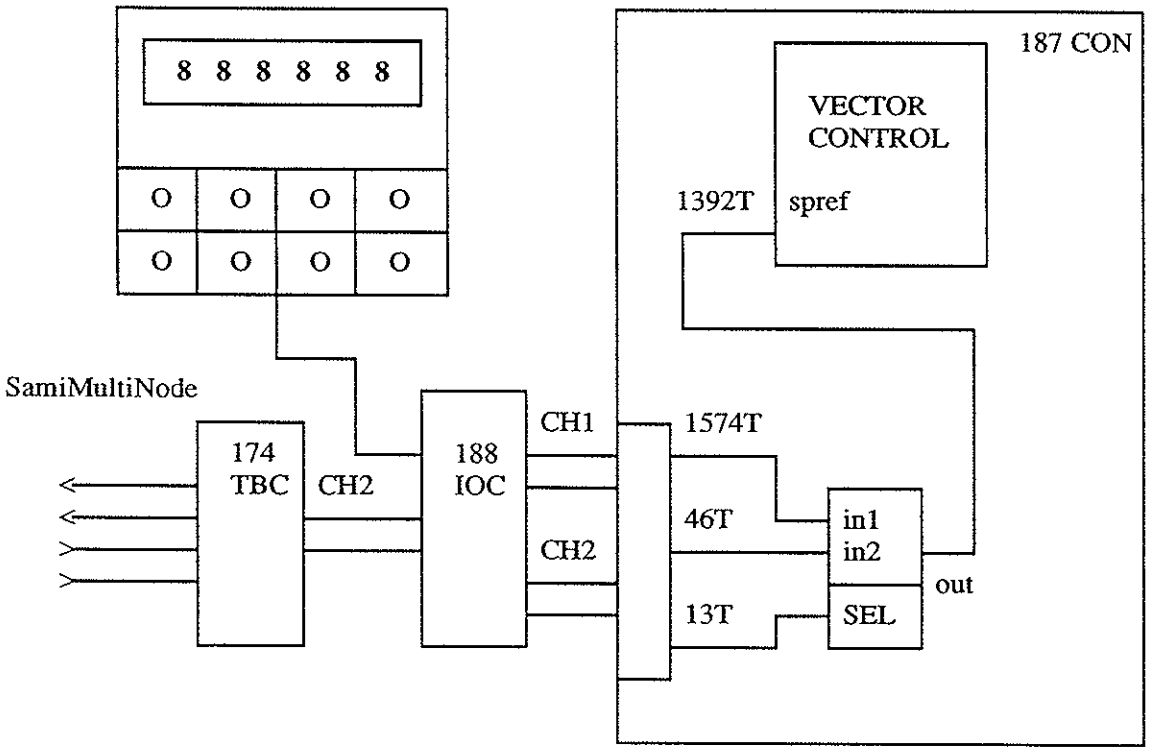
4
CONTROL PANELS WITH SamiMultiNode

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 usualy 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.

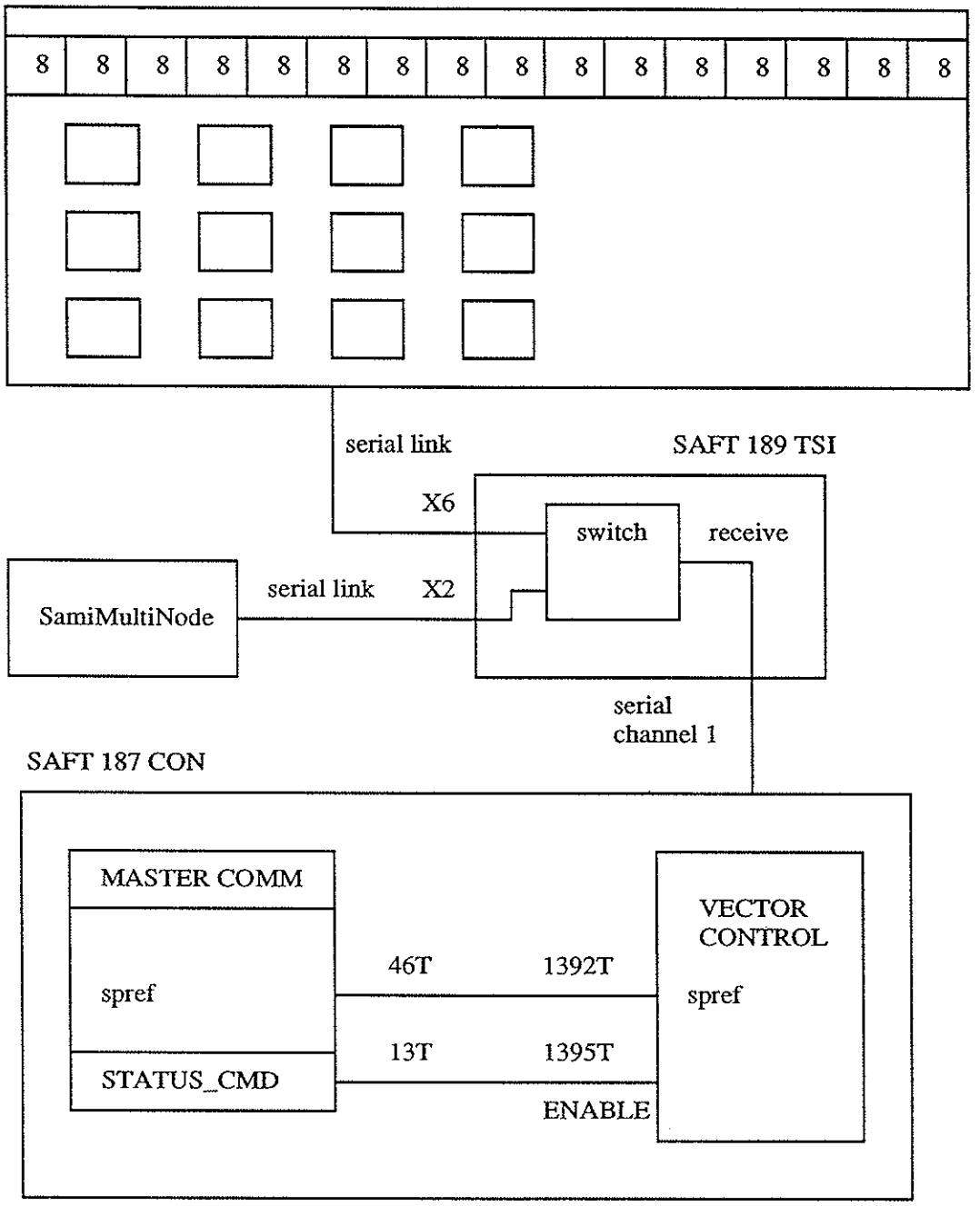
Channel 1 is used both by CP2 and SamiMultiNode and this causes some problems. On the receiving line on board 189 TSI there is a hardware switch that reserves the line physically always for a certain fixed time for that source which has been reserving the line first. This time has been set such that 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.

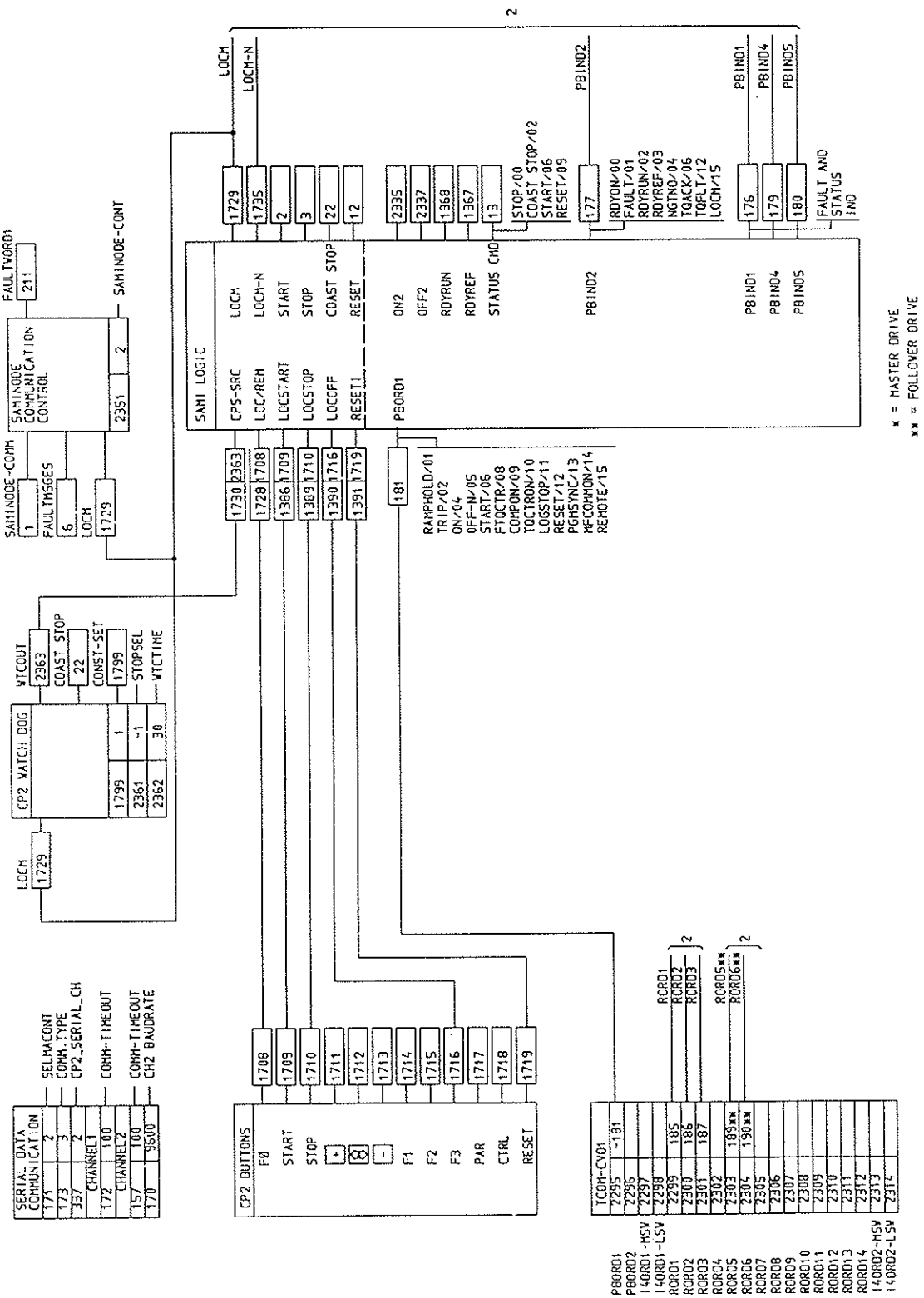


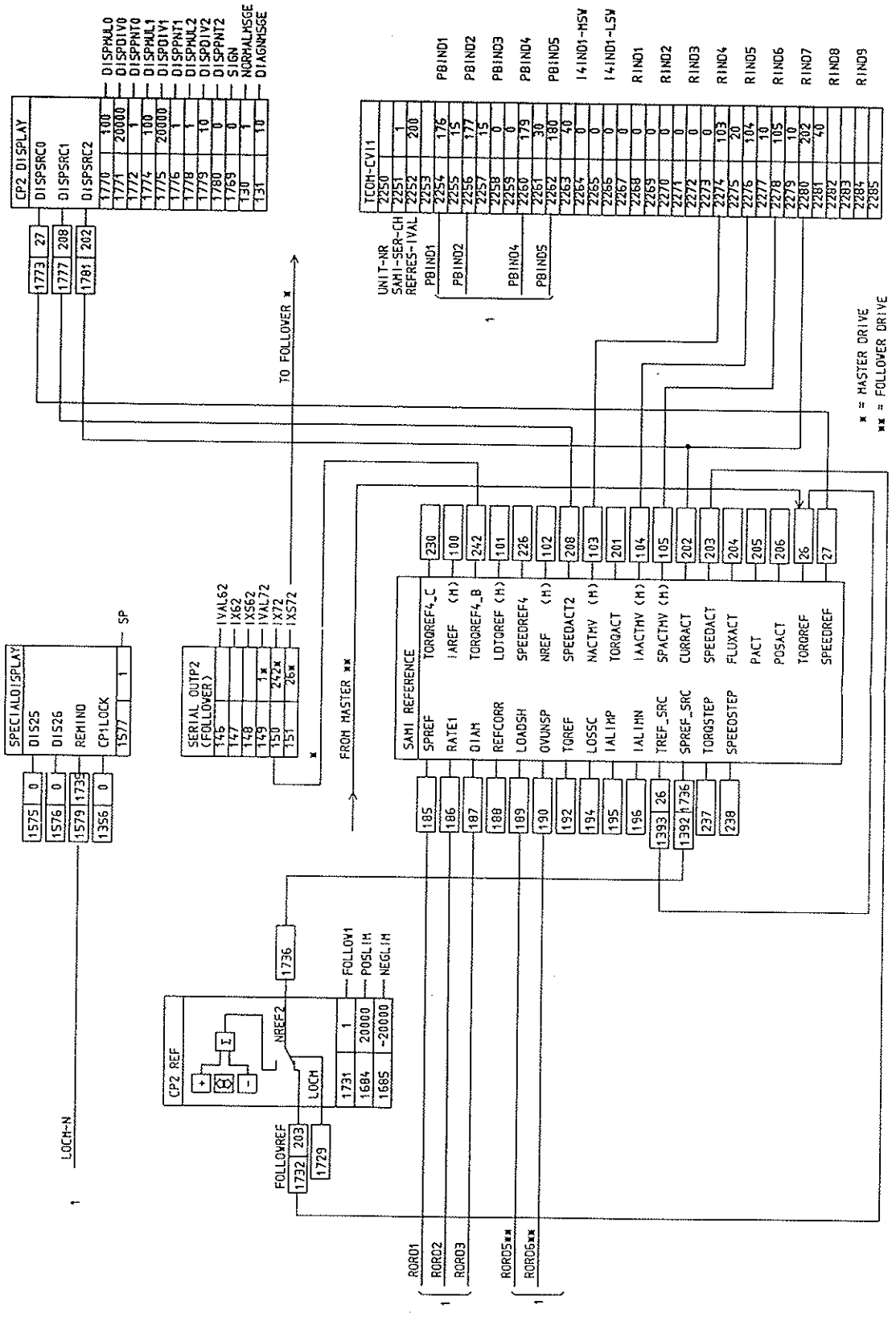
"STATUS_CMD" 13T can be connected to address 1395T "ENABLE" (INVERTED) and if ABB MasterPiece sends to SAMI Star "STATUS_CMD" 13T data not equal to zero, the speed reference and controls are not possible to be given from CP2. If "STATUS_CMD" becomes zero the CP2 can control the drive.

5
APPENDIX

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

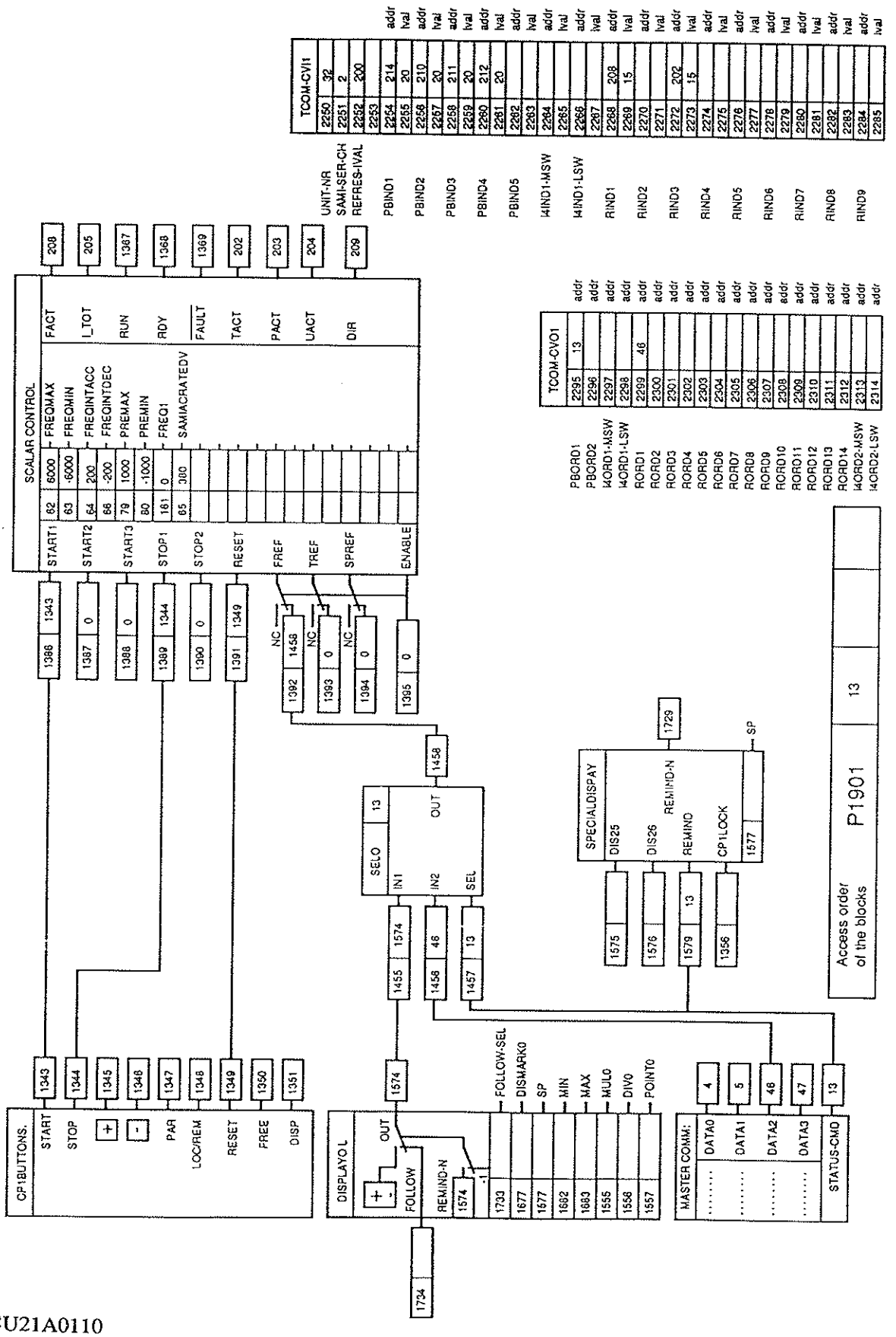
ABB MasterFieldbus interface for vector control in Pulp and Paper.



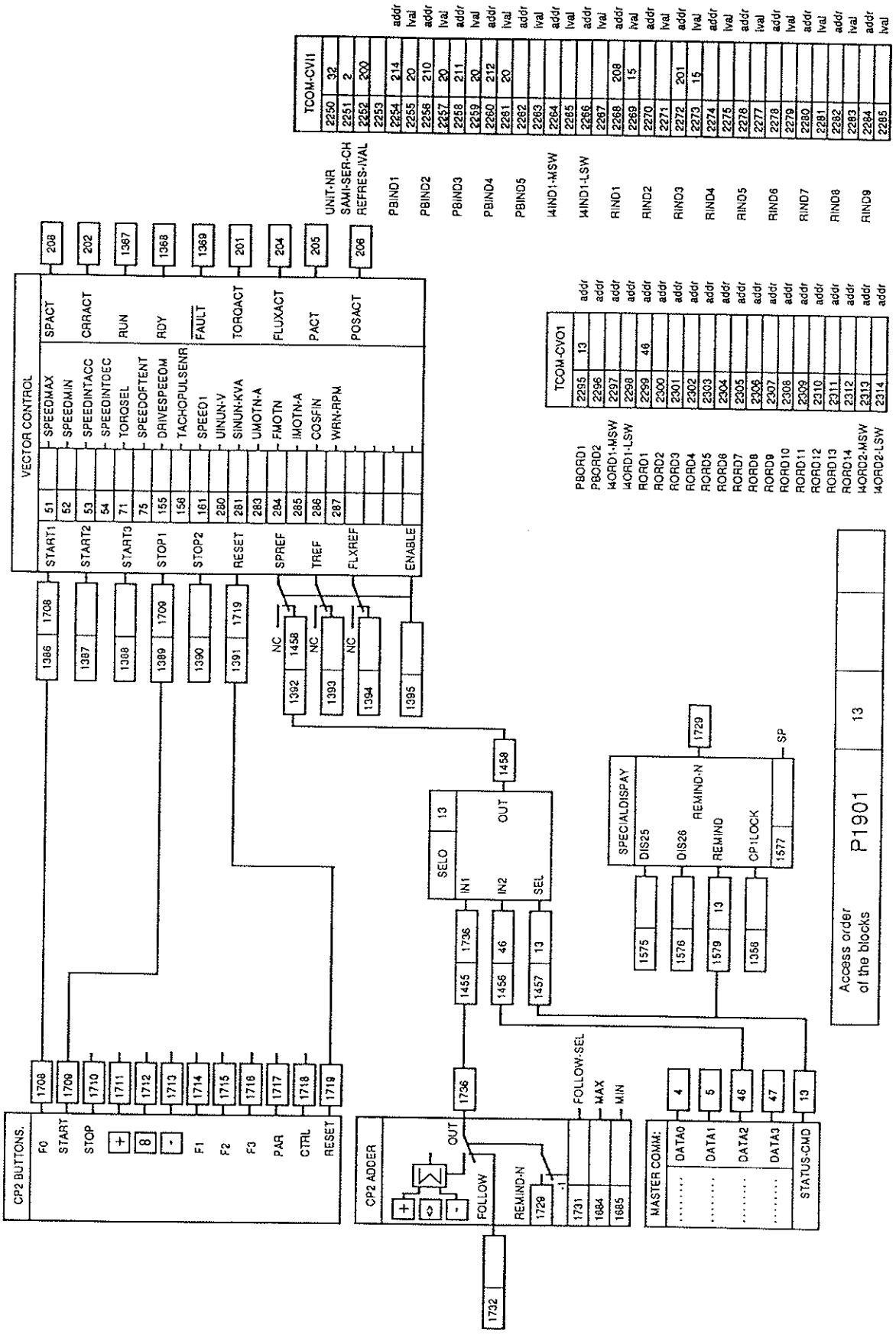

CP2_DISPLAY
DISPSRC0
DISPSRC1
DISPSRC2
DISPVAL0
DISPDIV0
DISPPNT0
DISPVAL1
DISPDIV1
DISPPNT1
DISPVAL2
DISPDIV2
DISPPNT2
SIGN
NORMALMSGE
DIAGNMSGE
TCOM-CVI1
PBIND1
PBIND2
PBIND3
PBIND4
PBIND5
14IND1-MSW
14IND1-LSW
RIND1
RIND2
RIND3
RIND4
RIND5
RIND6
RIND7
RIND8
RIND9
UNIT-NR
SAMI-SER-CH
REFRES-IVAL
TO FOLLOWER **
FROM MASTER **
* = MASTER DRIVE
** = FOLLOWER DRIVE
SPECIALDISPLAY
DIS25
DIS26
REMIND
CP1LOCK
SP
SERIAL OUTP2 (FOLLOWER)
IVAL62
IX62
IXS62
IVAL72
IX72
IXS72
SAMI REFERENCE
SPREF
RATE1
DIAM
REFCORR
LOADSH
OVUNSP
TQREF
LOSSC
IALIMP
IALIMN
TREF_SRC
SPREF_SRC
TORQSTEP
SPEEDSTEP
TORQREF4_C
IAREF (H)
TORQREF4_B
LDTQREF (H)
SPEEDREF4
NREF (H)
SPEEDACT2
NACTHV (H)
TORQACT
IAACTHV (H)
SPACTHV (H)
CURRACT
SPEEDACT
FLUXACT
PACT
POSACT
TORQREF
SPEEDREF
CP2 REF
NREF2
LOCM
LOCH-N
FOLLOWREF
FOLLOW1
POSLIM
NEGLIM
RORD1
RORD2
RORD3
RORD5**
RORD6**

5.2

Example no 2, SAFRSC 4.04 - single drive applications



5.3
Example no 3, SAFRVC 4.00 - sectional drive applications



5.4
Example no 4, SAFRVC 4.00 - single drive applications

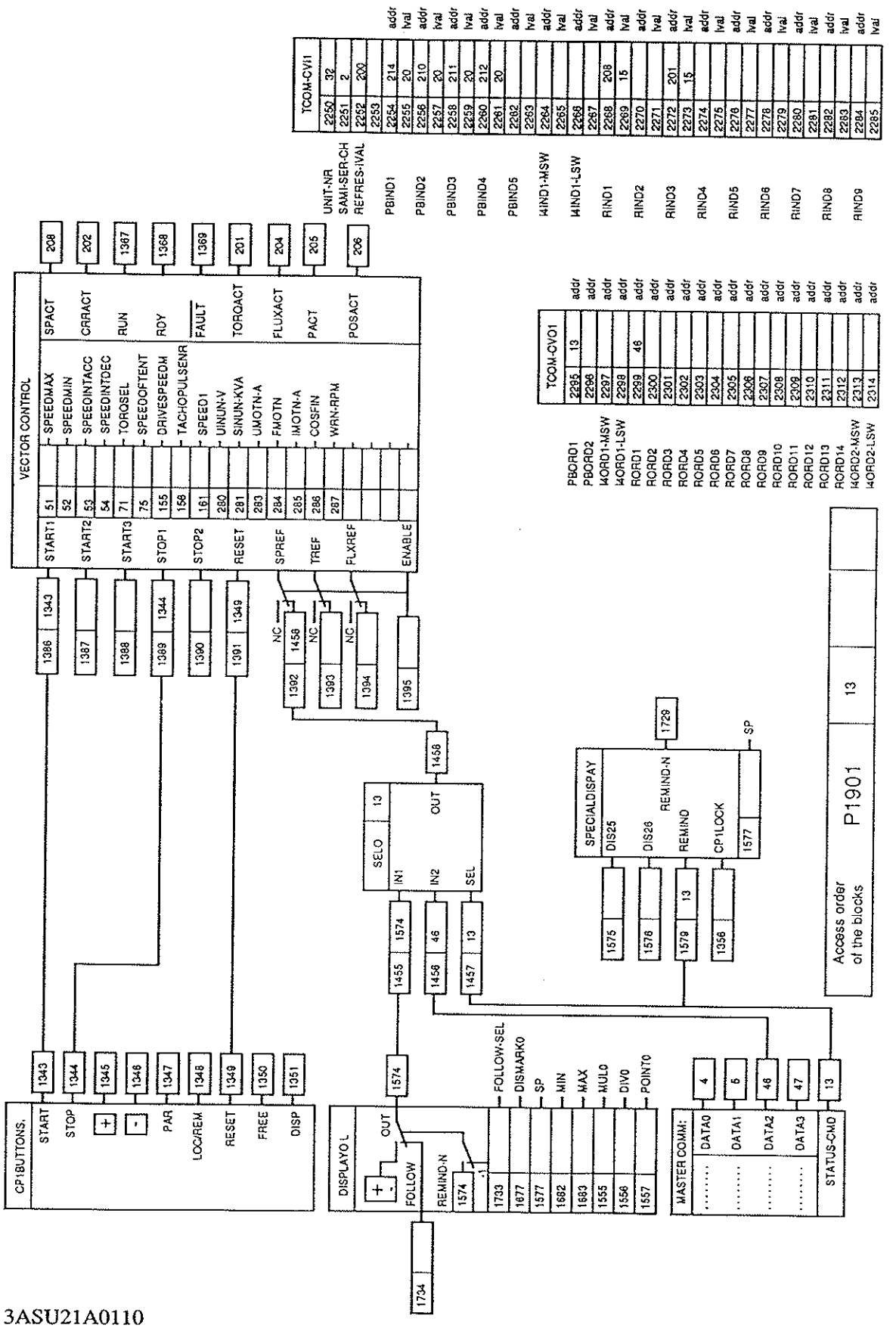
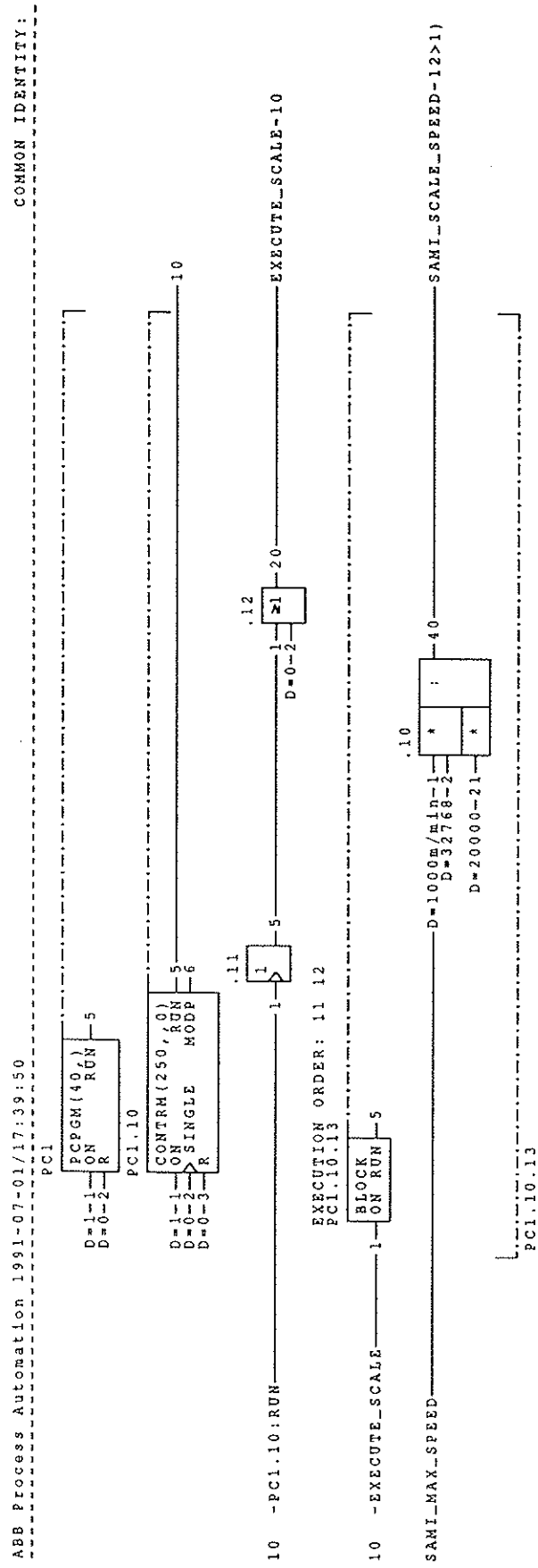


ABB
ASEA BROWN BOVERI

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-CVI1 (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-CVO1 (0)
```



SAMI STAR, SCALING OF SIGNALS.

APPLICATION WITH
SAFRVC 4.00A
SINGLE SECTION

Language: E
Rev ind : 1
Sheet: 10
Cont : 12

PC DIAGRAM:
SamiMultiNode

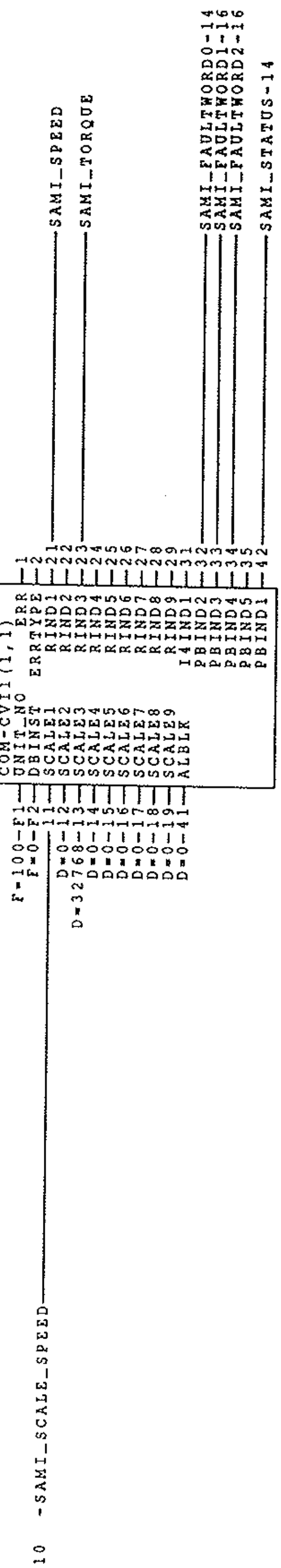
PE1293

1) SAMI_SCALE_SPEED-12 20

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

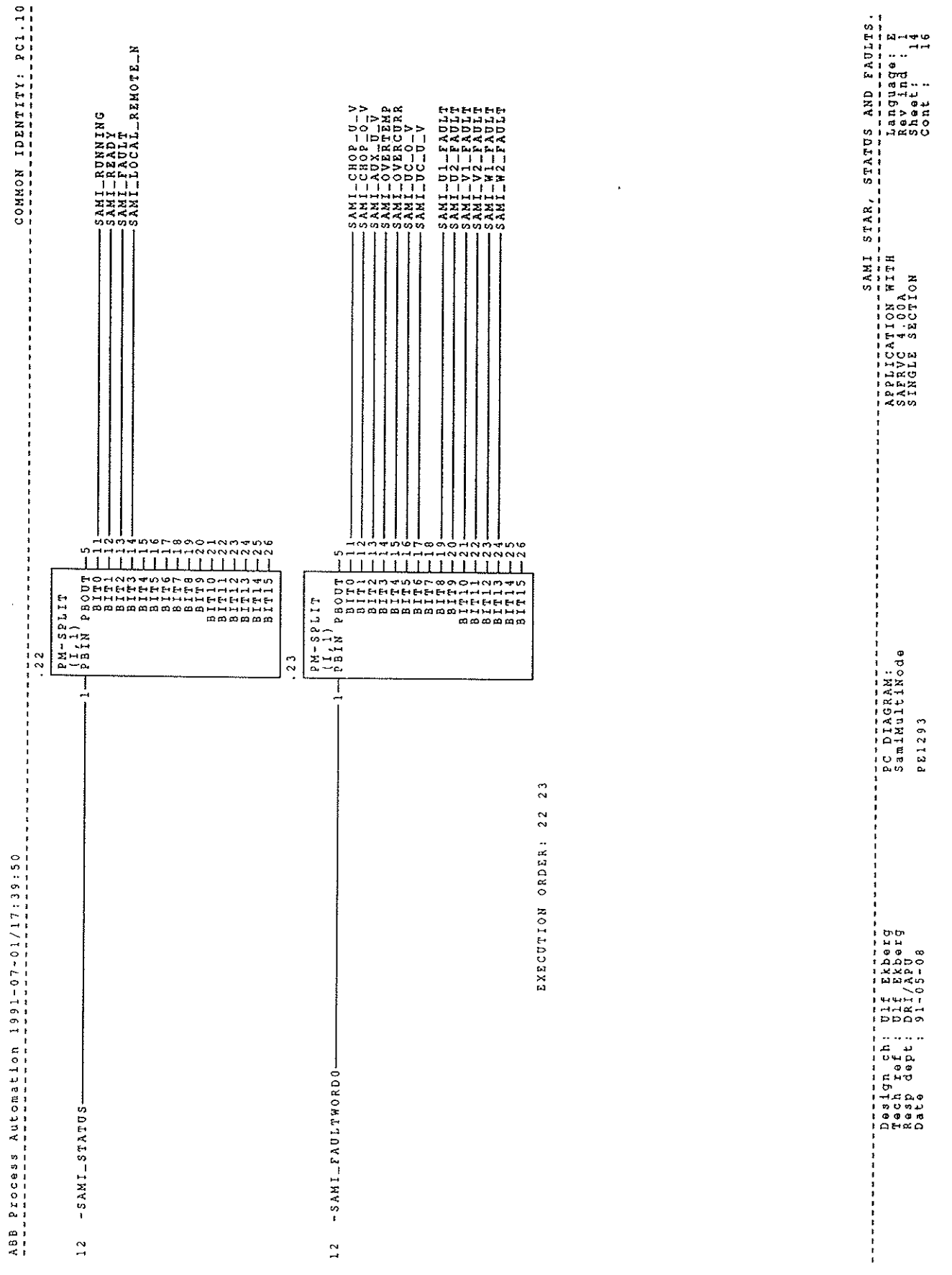
ABB Process Automation 1991-07-01/17:39:50

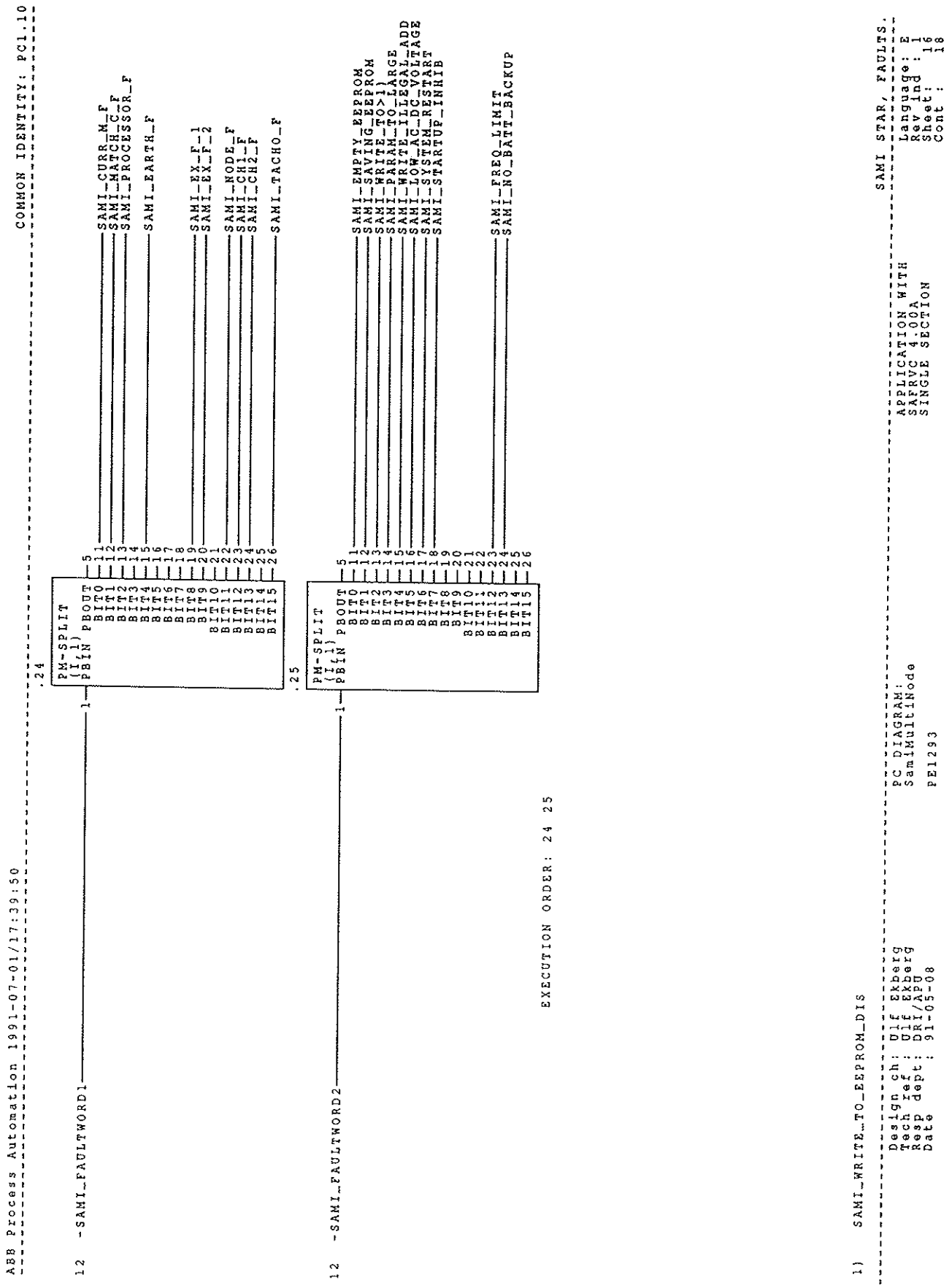
COMMON IDENTITY: PC1.10



SAMI STAR, INPUT FROM SAMI STAR.

Design ch: Ulf Ekberg Tech ref : Ulf Ekberg Resp dept: DRI/APU Date : 91-05-08	PC DIAGRAM: SamiMultiNode PE1293	APPLICATION WITH SAFRVC 4.00A SINGLE SECTION	Language: E Rev ind : 1 Sheet: 12 Cont : 14


COMMON IDENTITY: PC1.10
ABB Process Automation 1991-07-01/17:39:50
.22
PM-SPLIT
(I,1)
PBIN PBOUT
BIT0
BIT1
BIT2
BIT3
BIT4
BIT5
BIT6
BIT7
BIT8
BIT9
BIT10
BIT11
BIT12
BIT13
BIT14
BIT15
12 -SAMI_STATUS
SAMI_RUNNING
SAMI_READY
SAMI_FAULT
SAMI_LOCAL_REMOTE_N
.23
PM-SPLIT
(I,1)
PBIN PBOUT
12 -SAMI_FAULTWORD0
SAMI_CHOP_U_V
SAMI_CHOP_O_V
SAMI_AUX_U_V
SAMI_OVERTEMP
SAMI_OVERCURR
SAMI_UC_O_V
SAMI_UC_U_V
SAMI_U1_FAULT
SAMI_U2_FAULT
SAMI_V1_FAULT
SAMI_V2_FAULT
SAMI_W1_FAULT
SAMI_W2_FAULT
EXECUTION ORDER: 22 23
SAMI STAR, STATUS AND FAULTS.
APPLICATION WITH
SAFRVC 4.00A
SINGLE SECTION
Language: E
Revind : 1
Sheet: 14
Cont : 16
PC DIAGRAM:
SamiMultiNode
PE1293
Design ch: Ulf Ekberg
Tech ref : Ulf Ekberg
Resp dept: DRI/APU
Date : 91-05-08


COMMON IDENTITY: PC1.10
ABB Process Automation 1991-07-01/17:39:50
.24
PM-SPLIT
(1,1)
PBIN PBOUT
BIT0
BIT1
BIT2
BIT3
BIT4
BIT5
BIT6
BIT7
BIT8
BIT9
BIT10
BIT11
BIT12
BIT13
BIT14
BIT15
12 -SAMI_FAULTWORD1
SAMI_CURR_M_F
SAMI_MATCH_C_F
SAMI_PROCESSOR_F
SAMI_EARTH_F
SAMI_EX_F_1
SAMI_EX_F_2
SAMI_NODE_F
SAMI_CH1_F
SAMI_CH2_F
SAMI_TACHO_F
.25
PM-SPLIT
(1,1)
PBIN PBOUT
BIT0
BIT1
BIT2
BIT3
BIT4
BIT5
BIT6
BIT7
BIT8
BIT9
BIT10
BIT11
BIT12
BIT13
BIT14
BIT15
12 -SAMI_FAULTWORD2
SAMI_EMPTY_EEPROM
SAMI_SAVING_EEPROM
SAMI_WRITE_TO>1)
SAMI_PARAM_TO_LARGE
SAMI_WRITE_ILLEGAL_ADD
SAMI_LOW_AC_DC_VOLTAGE
SAMI_SYSTEM_RESTART
SAMI_STARTUP_INHIB
SAMI_FREQ_LIMIT
SAMI_NO_BATT_BACKUP
EXECUTION ORDER: 24 25
SAMI STAR, FAULTS.
APPLICATION WITH
SAFRVC 4.00A
SINGLE SECTION
Language: E
Revind : 1
Sheet: 16
Cont : 18
1) SAMI_WRITE_TO_EEPROM_DIS
Design ch: Ulf Ekberg
Tech ref : Ulf Ekberg
Resp dept: DRI/APU
Date : 91-05-08
PC DIAGRAM:
SamiMultiNode
PE1293

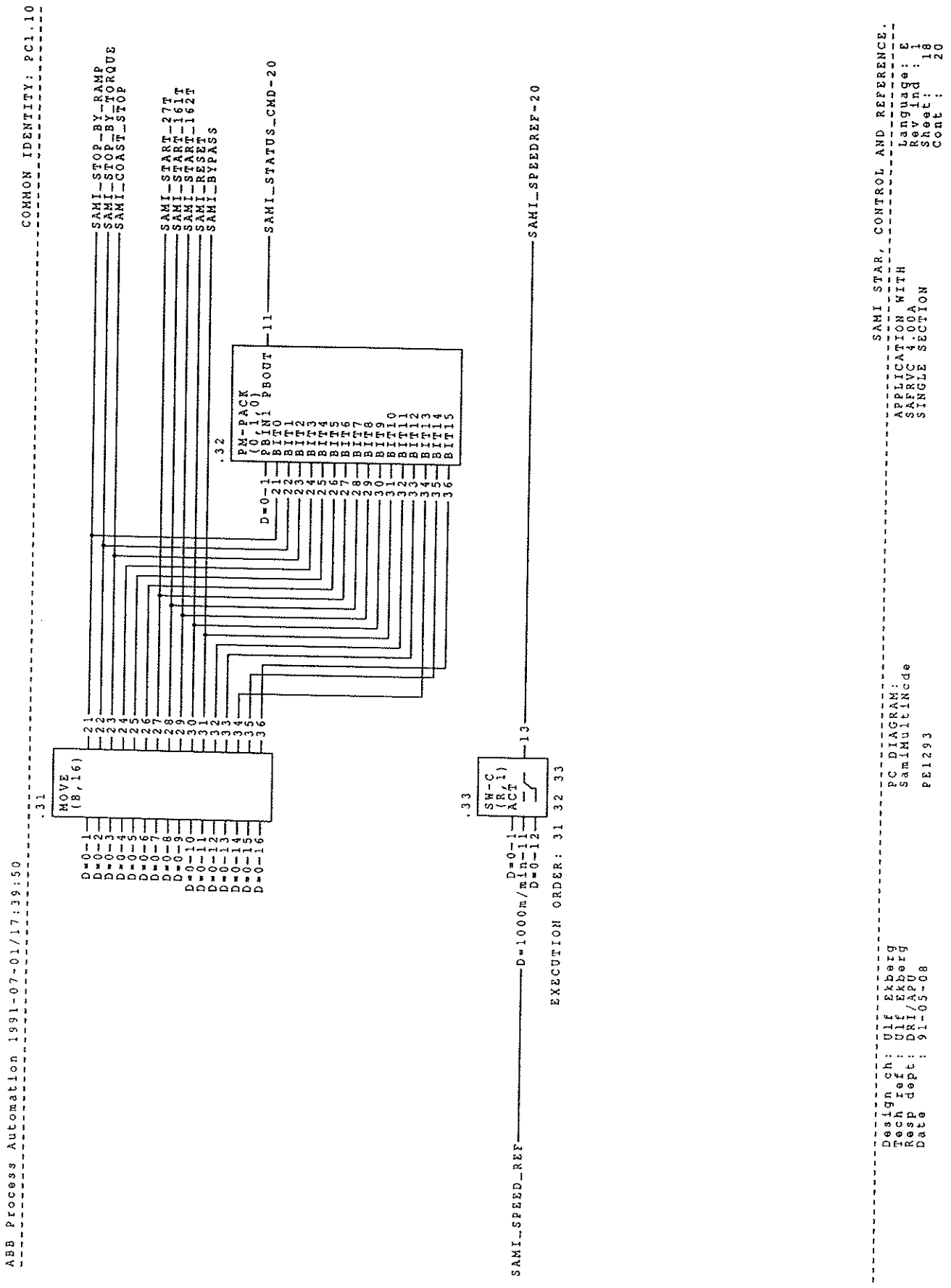
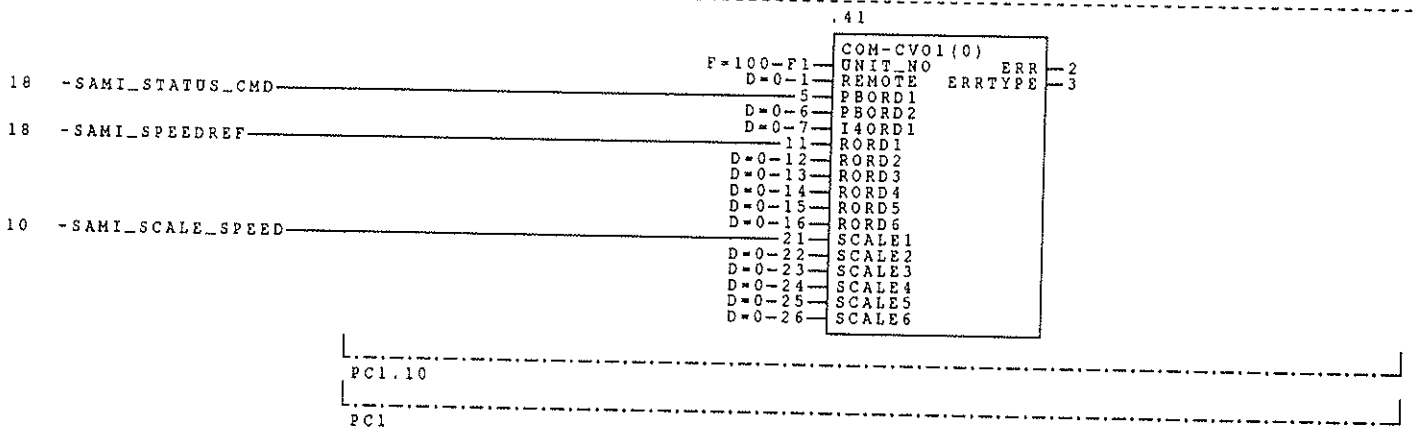

COMMON IDENTITY: PC1.10
ABB Process Automation 1991-07-01/17:39:50
SAMI_STOP_BY_RAMP
SAMI_STOP_BY_TORQUE
SAMI_COAST_STOP
SAMI_START_27T
SAMI_START_161T
SAMI_START_162T
SAMI_RESET
SAMI_BYPASS
SAMI_STATUS_CMD-20
SAMI_SPEEDREF-20
SAMI_SPEED_REF
D=1000m/min
EXECUTION ORDER: 31 32 33
SAMI STAR, CONTROL AND REFERENCE.
APPLICATION WITH
SAFRVC 4.00A
SINGLE SECTION
Language: E
Rev ind : 1
Sheet: 18
Cont : 20
PC DIAGRAM:
SamiMultiNode
PE1293
Design ch: Ulf Ekberg
Tech ref : Ulf Ekberg
Resp dept: DRI/APU
Date : 91-05-08

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

COMMON IDENTITY: PC1.10



SAMI STAR, OUTPUT TO SAMI STAR.

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

PC DIAGRAM:
SamiMultiNode

PE1293

APPLICATION WITH
SAFRVC 4.00A
SINGLE SECTION

Language: E
Rev ind : 1
Sheet: 20
Cont : -

ABB
ASEA BROWN BOVERI