Contents

ENGLISH

The FIPIO communication option is designed to be used with Altivar 16 speed controllers.
The FIPIO bus is the fieldbus for TSX Series 7 PLCs and APRIL 5000. It enables PLC I/O and industrial peripheral equipment to be remotely located as close as possible to the plant.

Data exchanges are used to access all the functions of the Altivar 16 :

- Function configuration
- Remote loading of adjustment parameters
- Control – supervision.

The communication kit which uses the FIPIO fieldbus comprises :

- Two diskettes (product reference TST L FPV16V5) for integrating the Altivar 16 under XTEL-CONF, one entitled "Altivar 16-50" for a speed controller configured at 50 Hz, the other entitled "Altivar 16-60" for a 60 Hz configuration.

- An installation manual for the Altivar 16 with the FIPIO fieldbus.

- A TSX FPP 01 FIPIO communication card (PCMCIA type 3 format), with a 1 meter long connection cable, fitted with a SUB-D connector.

Items to be ordered separately :

- a TSX FP ACC4 terminal box

- a cable for connecting a PCMCIA card/TSX FP CG 0.0 terminal box (. : 1 for a 1 m length or 3 for a 3 m length)

On the FIPIO fieldbus, periodic variables are used to update the state of the input and output registers at the same rate as the PLC cycle.
Aperiodic variables are used for speed controller configuration, adjustment and monitoring.

In order to develop an application using the FIPIO fieldbus, the user only needs to declare the speed controllers connected to the fieldbus :
- the XTEL-CONF software tool for TSX Series 7 PLCs,
- the ORPHEE configuration editor for the APRIL 5000,

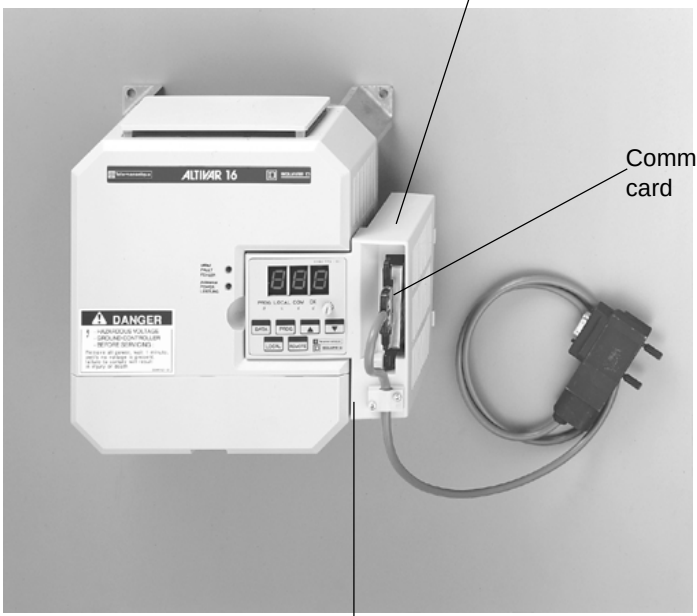
This tool automatically generates the network operating parameters which are then loaded into the PLC.

In addition, a sequence of screens guides the operator through the functions for configuring and adjusting the speed controllers connected to the fieldbus.

2.1 Installing the card

Before performing any operation on the speed controller switch it off and wait for the capacitors to discharge (approximately 1 min after switching off).

- Install the communication interface (VW3-A16303) on the speed controller (see user's guide).
- Insert the TSX FPP 01 communication card in the guide so that the connection cable, which is one meter long, falls towards the base of the product.
- Run the connection cable through the cable clamp below the communication card slot.



2.2 Connection to the fieldbus

A number of accessories are available for connecting speed controllers together to create a FIPIO architecture :

- TSX FP CAxxx trunk cable sold in lengths of 100, 200 or 500 m
- TSX FP CCxxx tap link cable sold in lengths of 100, 200 or 500 m
- TSX FP ACC4 or TSX FP ACC10 terminal box
- TSX FP ACC7 line terminator
- TSX LES 65 or TSX LES 75 cable connector for connecting TSX 7 model 40 PLCs.
- KIT 5130 cable for connecting the APRIL 5000.

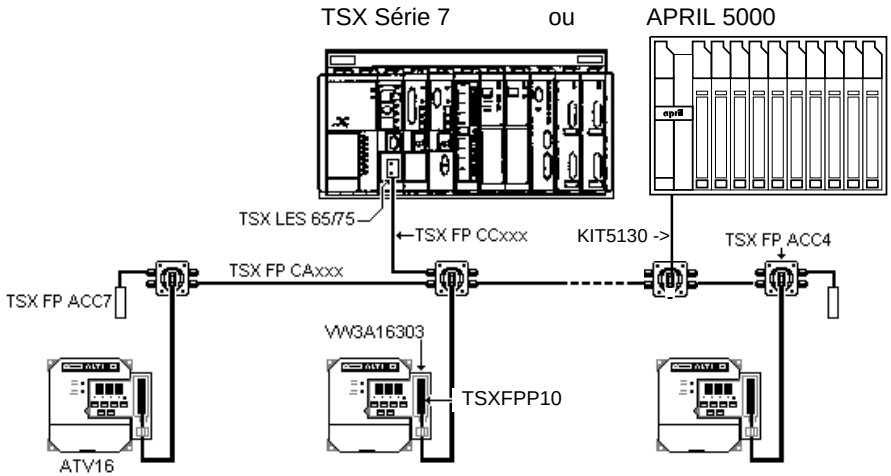
Speed controllers fitted with a communication interface are connected via a tap link to a segment of the fieldbus.
Each segment must be fitted with a TSX FP ACC7 line terminator at both ends.
The maximum length of each segment is 1000 meters (including tap links).
The maximum number of devices per segment is 32.
The number of devices can be increased up a maximum of 64 (for all segments) using TSX FP ACC6 electrical repeaters.

Wiring precautions

Keep the fieldbus and the power cables separate. The minimum recommended distance is 50 cm.
For further information on connection, refer to the FIPIO fieldbus reference manual – REF. TSX DR FPW E, ART. 82674.

Example of connection to a FIPIO fieldbus

The Altivar 16 must be switched off when it is connected to the FIPIO fieldbus.



Configuring the address on the Altivar 16

A speed controller on the FIPIO fieldbus is identified by its connection point. The connection point number represents the physical address of the speed controller on the fieldbus and takes a value between 1 and 62.

The speed controller address is configured using the VW3-A16303 communication interface by assigning a value between 1 and 62 to the ***Adr*** parameter. Selecting the address ***no*** on the speed controller inhibits communication.

Only Altivar 16s with software above version IE03 can be used.

For use with the APRIL 5000, the VW3-A1630-3 communication interface must be version 1.3, IE 04 or later (to be confirmed).

Version 1.3 IE 04 or later of the VW3-A16303 communication interface and version II 03 of the TSX FPP 10 card are both required for the "hot start" function on the Altivar 16 connected to the FIPIO fieldbus.

Address ***0*** on the FIPIO fieldbus is reserved for the TSX model 40 PLC which is the fieldbus manager, and address ***63*** is reserved for the FTX programming terminal.

3.1 Under X-TEL

3.1-1 Presentation of the integration software

The integration software is used to install (in the XTEL environment) the files required to configure the Altivar 16 for FIPIO.

Before installing the Altivar 16 integration diskettes in the programming terminal, it is advisable to :

- Make back-up copies of the diskettes so as to avoid accidental damage to the originals.
- Check that the XTEL V5 software workshop has already been installed, (see "XTEL software workshop" manual, reference TXT DM XTEL V5E).

Installing the Altivar 16 integration software under XTEL :

- Start a full-screen 0S/2 session.
- Insert the "Altivar 16-50" diskette in the disk drive.
- Identify the drive containing the diskette (A : or B :), then press ENTER.
- After the new prompt (A : \ or B : \), enter the command **install** and press ENTER.
- Follow the instructions displayed on the screen.
- Return to the standard 0S/2 session by typing **exit** then pressing ENTER.

Repeat this procedure for installing the "Altivar 16-60" diskette.

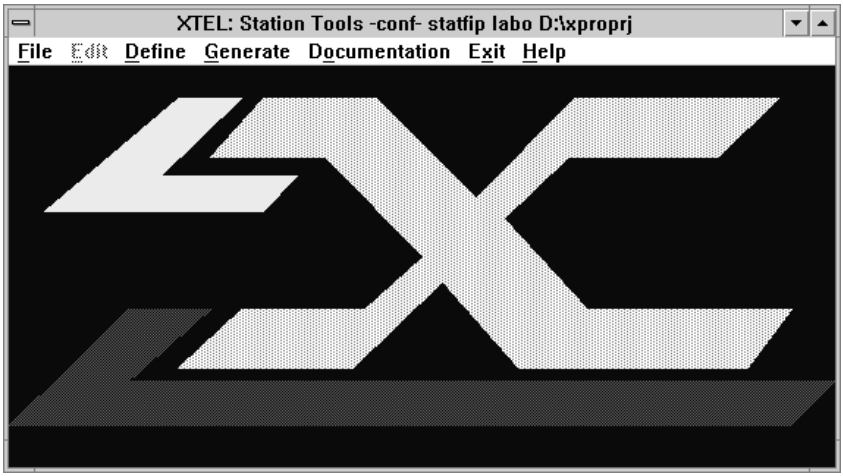
The Altivar 16 factory settings for a 50 Hz or 60 Hz configuration are now saved and can be accessed via XTEL-CONF.

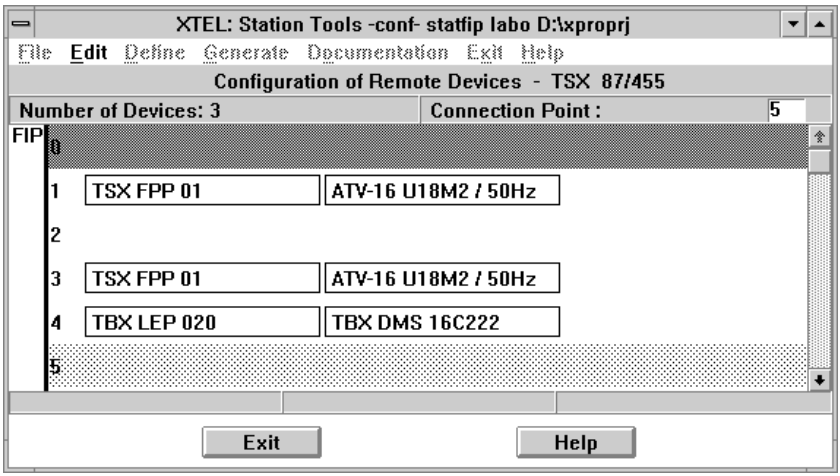
3.1-2 Selecting the Altivar 16

Once the Altivar 16 integration software has been installed, the XTEL-CONF station tool is used to configure and define the parameters of the new speed controllers connected to the FIPIO fieldbus or to redefine the parameters of a speed controller already configured under XTEL-CONF.

The configuration procedure is performed without starting the speed controller.

In the **Station Tools** window, click on the **Conf** tool to bring up the **Station Tools-conf** window.
In the **Define** menu, select **Remote I/O Config.** to bring up the **Configuration of Remote Devices** screen, which is used to select each connection point.





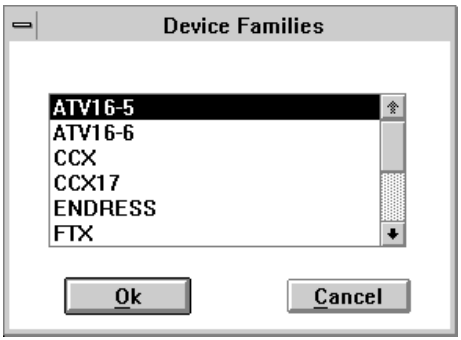
• Connection point

The connection point number defined under XTEL must be the same as the Altivar 16 address given by the ***Adr*** parameter.

The connection point is selected using the arrow keys or the mouse. The connection point number is then highlighted. The FIPIO configuration can be accessed by pressing ENTER or by double clicking on the highlighted line.

• Device Families

There are two possible Altivar 16 configurations :
– ATV16-5
– ATV16-6

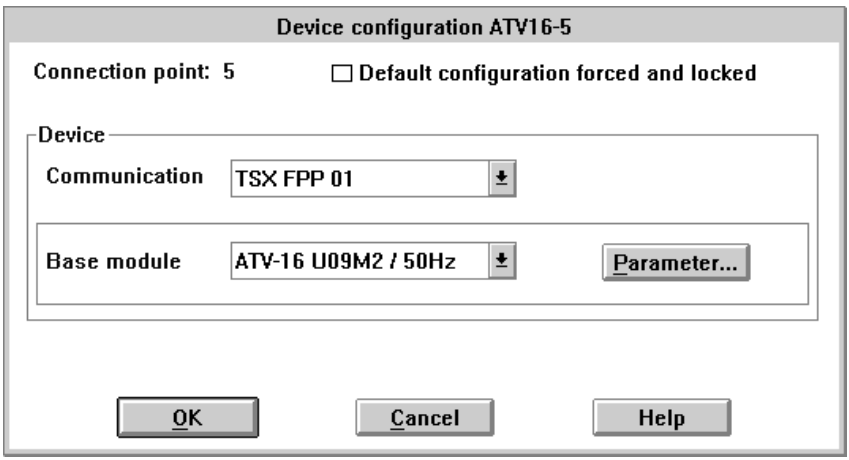


If switch 1 on the ATV16 control card is set to OFF (50Hz), select ATV16-5. If it is set to ON (60Hz), select ATV16-6.

This screen does not appear when setting the parameters of a speed controller which has already been configured under XTEL-CONF.

• Device configuration ATV16…

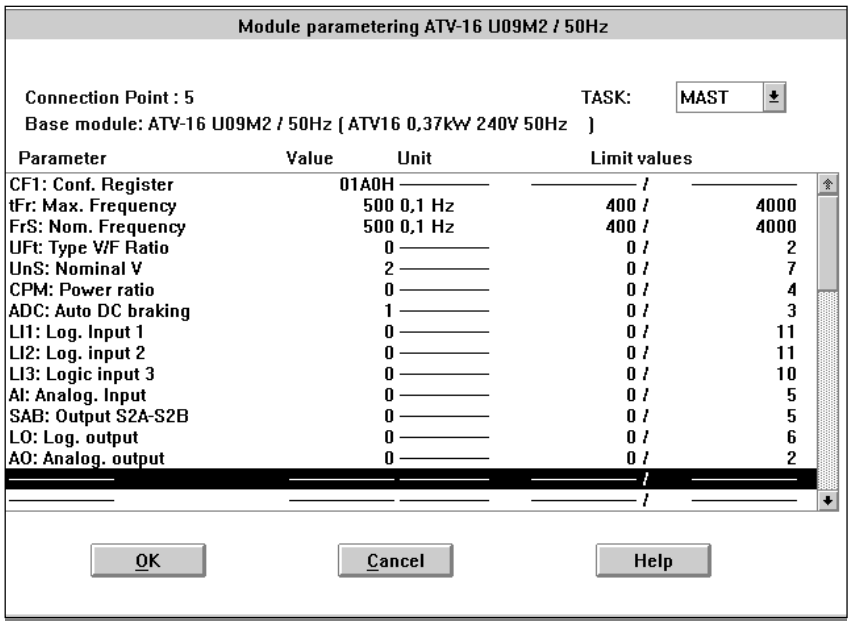
- **Default configuration forced and locked**: This box can be used to force the speed controller to its factory configuration and to lock against any modification using the XTEL-CONF tool.
- **Communicatio**n: Select reference TSX FPP 01 which corresponds to the FIPIO PCMCIA communication card.



3.1-3 Setting the Altivar 16 parameters

- **Base module**: Select the reference for the speed controller at the connection point shown.
  For example : ATV16U09M2/50Hz
- **Parameter : Selecting** the **Parameter…** button accesses the **ATV-16… Module Parameters** screen.
  The function configuration parameters, I/O assignments and adjustment parameters are available on this screen.
  The connection point, the Altivar 16 product reference and the PL7-3 application task in which the device is configured are also shown on this screen.

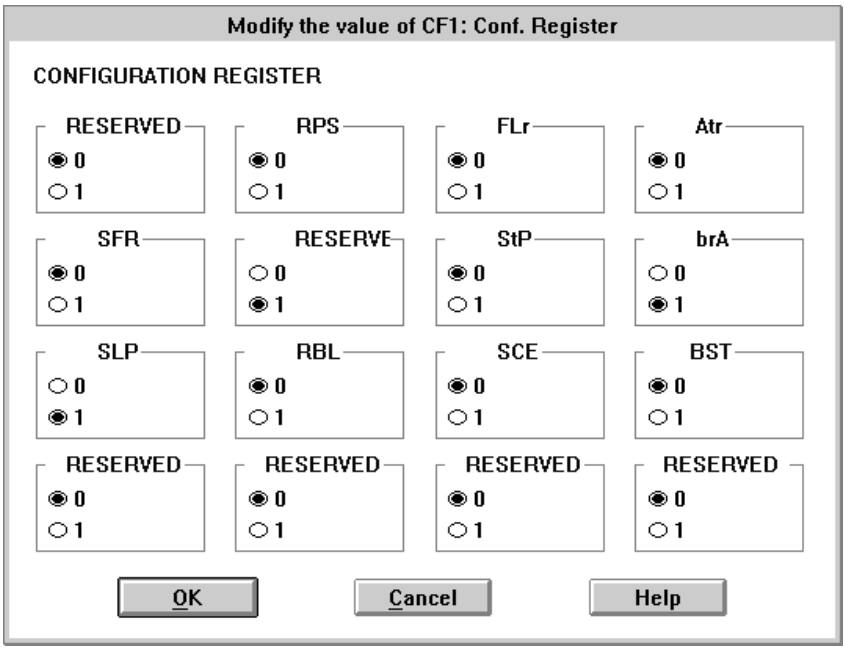
If the application does not require any modification to the factory settings listed on the **Module parametering ATV-16…** screen, select **OK**.



Three types of menu are available depending on the register to be modified:
- Logic (bit by bit entry).
- Semi-logic (select from several preset values).
- Numerical.

• Examples of register modification menus.

- Logic-type register



(state 1: Function activated).

Description of variables:

RPS : S ramp
FLr : Flying restart
Atr : Automatic restart
SFR : Switching frequency at 10 KHz
StP : Controlled stop on loss of AC supply
brA : Adaptation of the deceleration ramp
SLP : Slip compensation
RBL : Activation of the +/- setpoint memory
SCE : +/- setpoint memory in EEPROM
BST : Inhibit BOOST
HST : Hot start

The HST function is used for the fast connection of the Altivar 16 to the FIPIO fieldbus on power-up. The Altivar 16 restants by applying the configuration and adjustment parameters which were valid prior to the power down. The Altivar 16 also applies the outputs before the PLC has checked the configuration.

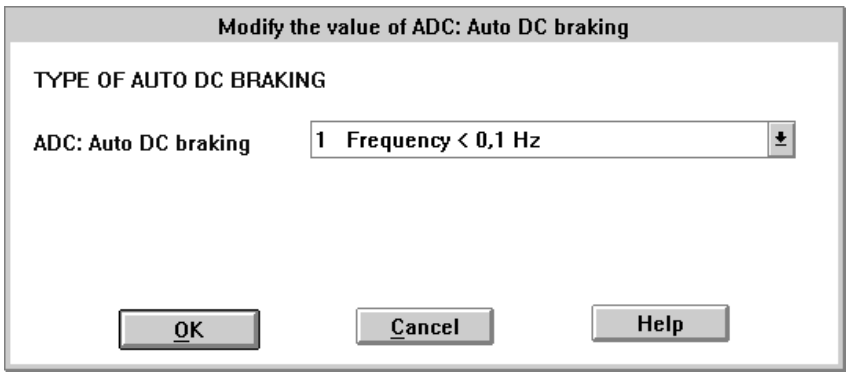
Warning

This function must not be active during installation and certain precautions must be taken during maintenance. The following operations must be carried out when replacing the Àltivar 16 :

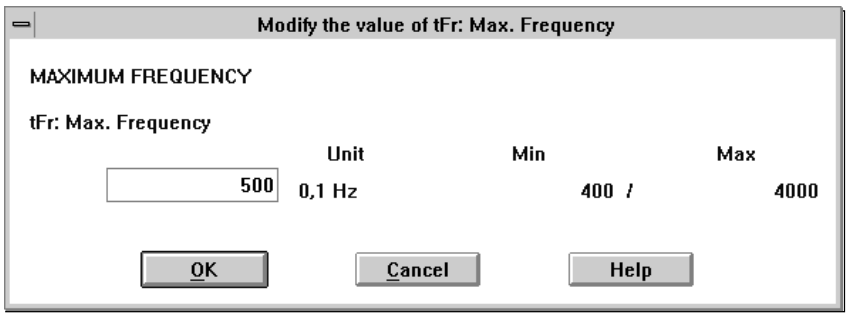
1. Power up the Altivar 16/communication interface/TSX FPP 10 assembly when it is not connected to the FIPIO fieldbus,
2. Power down the assembly,
3. Connect the assembly to the FIPIO fieldbus,
4. Power up the assembly.

The HST function can only be used with version 1.3 IE 04 of the VW3-A16303 interface and version II 03 of the TSX FPP 10 card.

- Semi-logic type register



- Numerical type register



- Adjustment range

The minimum and maximum values for each parameter are shown on the screen. Any attempt to write a value outside these limits is rejected by XTEL-CONF. The software does not take any account of inter-parameter coherence or of the availability of any functions linked to a dedicated card installed in the product.

An adjustment value or function accepted by XTEL-CONF may be rejected by the speed controller (once the configuration has been sent by the PLC) if it is not compatible with the physical configuration of the speed controller. An I/O error is then displayed by the PLC (I/O indicator lamp).

Example:
- If the LSP value is greater than the HSP value, an I/O error is indicated by the PLC.
- If the analog value AI is assigned to the speed feedback PI for an Altivar 16 fitted with a general usage dedicated card, an I/O error is indicated by the PLC.

All the adjustment ranges can be found in the Altivar 16 user guides.

Once all the parameters have been confirmed, return to the **Connection point** screen by pressing **OK**. Then click on **Exit** to display the main screen.

3.2 Under ORPHEE

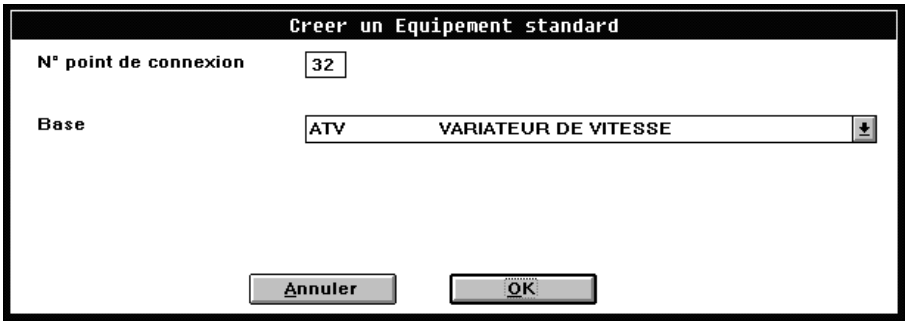
3.2.1 Presentation

The ORPHEE configuration editor can be used to connect and configure devices on the FIPIO fieldbus. With ORPHEE ≥V6.2 onwards, the ATV 16 can also be connected.
The rest of this section describes the correct operating mode when using the Altivar 16 on the FIPIO fieldbus controlled by the APRIL 5000.
For more details on the principles of connection and configuration of devices on the FIPIO fieldbus, refer to the manual entitled "ORPHEE/ORPHEE-DIAG option for use of the FIPIO fieldbus on APRIL 5000" ref. TEM10000/10800GB.

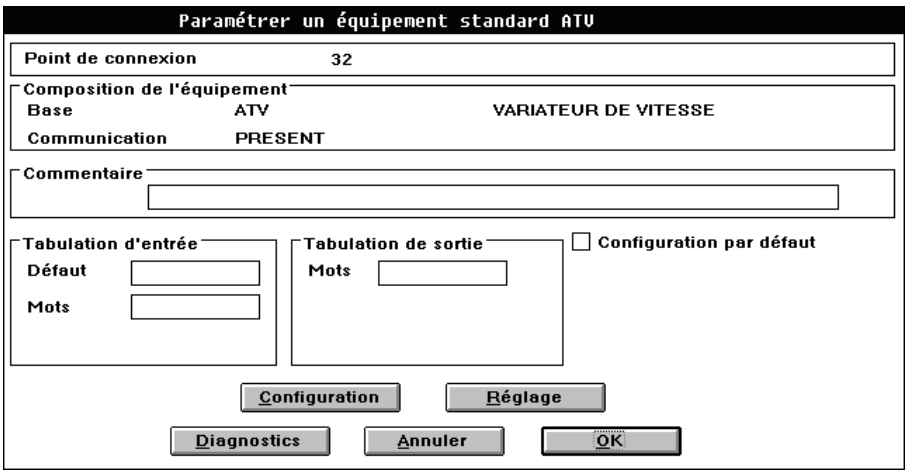
3.2.2 Selecting the Altivar 16

The ATV 16 can be accessed in the STD P family within the FIPIO fieldbus configuration screen.
To connect an ATV 16 on this fieldbus, click on the STD P button, enter the connection point number and select ATV.

The connection point number defined under XTEL should be identical to the address of the Altivar 16 found in the value of the ***Adr*** parameter.



The ATV then appears in the list of connected devices. Select it and choose "Access to parameters" from the "Parameters" menu, or double-click to display the following parametering screen :



"Comment" field : Comment line which is displayed in real time and forms part of the application dossier.

"Input tabulation" zone "Error" field : Word representing the validity of information. Possible values are given in section 5.2.2.
"Input tabulation" zone "Word" field : Information exchanged with the PLC on each ATV cycle, keeping the PLC informed of the status of the ATV. The variable entered must be a table of 8 %MW. The significance of each of these words is given in section 5.2.2.
"Output tabulation" zone "Words" field : Information exchanged with the PLC on each ATV cycle, so that the ATV can be controlled by the PLC. The variable entered must be a table of 8 %MW. The significance of each of these words is given in section 5.2.3.
"Default configuration" field : If this box has a cross in it, the PLC does not send any parameters to the ATV, which therefore retains its default configuration. If not, the parameter values entered in the screens accessed via the configuration and adjustment buttons are sent to the ATV during the transition from STOP to RUN or on power-up.
In all cases, the adjustment parameters can be read and modified once the PLC is running, via the READ_PRM and WRIT_PRM CFB(s).

The next sub-section describes the significance of the configuration and adjustment parameters entered in the screens accessed via the configuration and adjustment buttons.

Note that ORPHEE does not perform any check on the parameter values entered :
If an incorrect value is entered, this may be refused by the ATV 16, if possible, or result in a parametering error (DL2) in the speed controller.

3.2.3 Setting the Altivar 16 parameters

Configuration parameters				
WORD	**NAME**	**VALUES**	**UNIT**	**DESCRIPTION**
CNF0	CF1	0 to 65536		Configuration register
Bit0				Reserved
Bit1	RPS	0 / 1		S ramps
Bit2	FLR	0 / 1		Flying restart
Bit3	ATR	0 / 1		Automatic restart
Bit4	SFR	0 / 1		Switching frequency at 10kHz
Bit5				Reserved
Bit6	STP	0 / 1		Controlled stop on loss of AC supply
Bit7	BRA	0 / 1		Adaptation of the deceleration ramp
Bit8	SLP	0 / 1		Slip compensation
Bit9	RBL	0 / 1		Activation of the +/- setpoint memory
Bit10	SCE	0 / 1		+/- setpoint memory in EEPROM
Bit11	BST	0 / 1		Inhibit BOOST
Bit12	HST			Hot start
Bit13				Reserved
Bit14				Reserved
Bit15				Reserved

Note

The HST function is used for the fast connection of the Altivar 16 to the FIPIO fieldbus on power-up. The Altivar 16 restants by applying the configuration and adjustment parameters which were valid prior to the power down. The Altivar 16 also applies the outputs before the PLC has checked the configuration.

Warning

This function must not be active during installation and certain precautions must be taken during maintenance. The following operations must be carried out when replacing the Àltivar 16 :

1. Power up the Altivar 16/communication interface/TSX FPP 10 assembly when it is not connected to the FIPIO fieldbus,
2. Power down the assembly,
3. Connect the assembly to the FIPIO fieldbus,
4. Power up the assembly.

The HST function can only be used with version 1.3 IE 04 of the VW3-A16303 interface and version II 03 of the TSX FPP 10 card.

Configuration parameters

WORD	NAME	VALUES	UNIT	DESCRIPTION
CNF1	TFR	400 to 2000	0.1Hz	Maximum frequency
CNF2	FRS	400 to 2000	0.1Hz	Nominal frequency
CNF3	UFT	0 : N ratio 1 : P ratio 2 : L ratio		Type of U/F ratio
CNF4	UNS	0 : 208 V 1 : 220 V 2 : 230 V 3 : 240 V 4 : 380 V 5 : 400 V 6 : 415 V 7 : 460 V		Nominal voltage
CNF5	CPM	0 : 1/1 ratio 1 : 1/2 ratio 2 : 1/3 ratio 3 : 1/4 ratio 4 : 1/5 ratio		Motor power ratio
CNF6	TIC	0 : none 1 : motor frequency < 0.1 Hz 2 : motor frequency < LSP 3 : motor frequency < SRF		Type of DC injection

Configuration parameters				
WORD	**NAME**	**VALUES**	**UNIT**	**DESCRIPTION**
CNF7	LI1	0 : not assigned 1 : run / stop 2 : fast stop 3 : fault reset 4 : + speed 5 : freewheel stop 6 : ramp switching 7 : reduce current limit 8 : jog 9 : change motor power 10 : local forcing		Assignment of logic input LI1
CNF8	LI2	0 : not assigned 1 : 3rd speed 2 : fast stop 3 : fault reset 4 : - speed 5 : freewheel stop 6 : manual reference input 7 : ramp switching 8 : reduce current limit 9 : jog 10 : change motor power 11 : local forcing		Assignment of logic input LI2
CNF9	LI3	0 : not assigned 1 : 4th speed 2 : fast stop 3 : DC injection 4 : fault reset 5 : freewheel stop 6 : ramp switching 7 : reduce current limit 8 : jog 9 : change motor power 10 : local forcing		Assignment of logic input LI3

Configuration parameters				
WORD	**NAME**	**VALUES**	**UNIT**	**DESCRIPTION**
CNF10	AI1	0 : not assigned 1 : speed feedback 2 : speed feedback + drift monitoring 3 : summing reference input 4 : P.I. feedback 5 : manual reference input		Assignment of analog input AI
CNF11	SAB	0 : not assigned 1 : 100 % thermal state reached 2 : frequency reference reached 3 : HSP reached 4 : brake control		Assignment of relay output S2A - S2B
CNF12	LO1	0 : not assigned 1 : 100 % thermal state reached 2 : frequency reference reached 3 : current limit reached 4 : LSP reached 5 : HSP reached 6 : 1.1 x ITH overload reached		Assignment of logic output LO
CNF13	AO1	0 : not assigned 1 : motor frequency 2 : motor current		Assignment of analog output AO
CNF14		not assigned		
CNF15		not assigned		

Adjustment parameters				
WORD	**NAME**	**RANGE**	**UNIT**	**DESCRIPTION**
PRM0	HSP	LSP...TFR	0.1 Hz	High speed
PRM1	LSP	0...HSP	0.1 Hz	Low speed
PRM2	SP3	LSP...HSP	0.1 Hz	3rd speed
PRM3	SP4	LSP...HSP	0.1 HZ	4th speed
PRM4	SMF	0...LSP	0.1 Hz	Brake application frequency level
PRM5	SRF	0...LSP	0.1 Hz	Brake release frequency level
PRM6	JF1	0...TFR	0.1 Hz	Skip frequency 1
PRM7	JF2	0...TFR	0.1 Hz	Skip frequency 2
PRM8	JOG	1...100	0.1 Hz	JOG frequency
PRM9	CGL	0...50	0.1 Hz	Slip compensation
PRM10	RGP	0...10000	0.01	Proportional gain KP (PI function)
PRM11	RGI	0...10000	0.01	Integral gain KI (PI function)
PRM12	FLG	0...100	1 %	Frequency loop gain
PRM13	UFr	0...100	1	Set U / F ratio
PRM14	Acc	1...6000	0.1s	Acceleration
PRM15	dEc	1...6000	0.1s	Deceleration
PRM16	Ac2	1...6000	0.1s	2nd acceleration ramp
PRM17	dE2	1...6000	0.1s	2nd deceleration ramp
PRM18	tdc	0...51	0.1s	DC injection time
PRM19	TMF	0...50	0.1s	Brake application time
PRM20	ItH	0.5 Inm...1.15 Inm	0.1A	Motor thermal protection
PRM21	Idc	0.5 ItH...1.5 ItH	0.1A	DC injection amplitude
PRM22	Ibr	0...1.15 Inm	0.1A	Brake application current level
PRM23	LtI	0.5 Inm...1.21 Inm	0.1A	Current limit

Words PRM24 to PRM31 are not used

4.1 Summary

All Altivar 16 devices connected to the FIPIO fieldbus must have been previously declared in the XTEL-CONF (with TSX Series 7 PLCs) or ORPHEE (with APRIL 5000 PLCs) software workshop.

Depending on the application, it is possible to modify the factory settings for an Altivar 16, which may or may not have already been configured, using XTEL-CONF software or ORPHEE (with APRIL 5000 PLCs).

For short-term use, the Altivar 16 parameter settings can be modified in local mode using the interface for the VW3-A16303 PCMCIA communication card (refer to the relevant user guide).
Caution : Any parameters modified in local mode are not saved in the PLC. Restarting the speed controller or the PLC, changing from local to remote forcing, or a new connection, all cause the Altivar 16 configuration, which was initially stored in the PLC using XTEL-CONF or ORPHEE (except when **default configuration** has been selected if ORPHEE is being used), to be downloaded automatically.

For long-term use, any Altivar 16 parameters modified in local mode must be written using XTEL-CONF or ORPHEE (if using the APRIL 5000).

The following table shows all the functions of the Altivar 16 with its various dedicated cards.

Application	ATV16	General usage	Materials handling	Variable torque	High speed
Drive functions					
Maximum frequency	▲ 40 ... 200Hz	▲40 ... 200Hz	▲40 ... 200 Hz	▲40 ... 70/80Hz	▲40 ... 400Hz
Voltage/frequency ratio selection (1)	■ n-P-L	■ n-L	■ n-L	● P	■ n-L
Slip compensation	■ yes/no	■ yes/no	■ yes/no	no	no
Switching frequency	■ 5/10kHz	■ 5/10kHz	● 5kHz	■ 5/10kHz	● 5kHz
Current limit	●1.5 In	▲0.5 to 1.5 In	●1.5 In	●1.2 In	●1.2 In
Braking to a standstill by DC injection (f<0.1 Hz)	■ yes/no	■ yes/no	no	no	■ yes/no
Specific functions in the dedicated cards					
• ± 10 V analog input					
Summing		■	■	■	■
Speed regulation		■	■		
PI controller				■	
• Logic inputs					
2nd ramps		■	■	■	■
Preset speeds		■	■		■
Current limit		■			
+/- speed			■		
Step by step operation (JOG)		■			■
Fast stop			■		
Freewheel stop		■		■	■
DC injection				■	
Automatic/manual				■	
Start/stop		■	■		
Reset after fault		■	■		
Change motor power			■		
Speed controller forced in local mode (3)		■	■	■	■
• Logic outputs					
Brake control sequence			▲		
Speed reference reached		■		■	■
Low speed reached		■	■		
High speed reached		■		■	
Current limit reached		■	■		
1.1 In overload reached		■	■		■
100% thermal state reached		■			
• Analog output					
Motor frequency		■	■	■	■
Motor current		■	■		■
Preprogrammed and programmable characteristics					
– S ramps	■	■	■		
– Skip frequencies				■	
– Controlled stop on AC supply break (2)	■	■	■	■	■
– Automatic catching a spinning load	■	■		■	■
– Automatic restart	■	■		■	

(1) n : constant torque (normal applications), P : variable torque,
L : constant torque (heavily-loaded machines).
(2) ATV16 U..N4 speed controller only.
(3) Only the Altivar 16 with software version IE07.
● - fixed, programmed function
■ - programmable function
▲ - function with adjustable value

4.2 Speed controller parameters

TSX Series 7 PLCs

The Altivar 16 factory configuration initially stored in the PLC corresponds to the standard product (without a dedicated card). When a speed controller is used with a dedicated card, the user must use XTEL-CONF to modify the factory configuration assigned to the selected dedicated card.

APRIL 5000 PLCs

When using an ATV16 without a dedicated card, the user can select the **Default configuration** box. The adopted configuration is then the factory configuration as shown in the table below. When using an ATV16 with a dedicated card, the user must deselect the **Default configuration** and enter the configuration and adjustment parameters explicitly.

The following tables only show the differences between the factory configurations of an Altivar 16, both with and without a dedicated card.

Tables of variables : Speed controller parameters

Speed controller parameter	ATV16 no dedicated card	ATV16 general usage	ATV16 materials handling
UFT : Type of U/F ratio		N	L
TIC : Auto DC inject.	F<0.1 Hz		no
LI1 : Logic input 1	not assigned	fault reset	fault reset
LI2 : Logic input 2	not assigned	freewheel stop	3rd speed (5 Hz)
LI3 : Logic input 3	not assigned	JOG	4th speed (25 Hz)
AI : Analog input	not assigned	reference input 2 summed with AIV	reference input 2 summed with AIV
SAB : Relay output	not assigned	frequency reference reached	brake control
LO : Logic output	not assigned	100 % thermal state reached	current limit reached
AO : Analog output	not assigned	motor frequency	motor frequency

Speed controller parameter	ATV16 no dedicated card	ATV16 variable torque	ATV16 high speed
UFT : Type of U/F ratio	N	P	L
TIC : Auto DC inject.	F<0.1 Hz	no	
LI1 : Logic input 1	not assigned	freewheel stop	JOG
LI2 : Logic input 2	not assigned	manual reference input	switching to ramp 2
LI3 : Logic input 3	not assigned	DC current injection	freewheel stop
AI : Analog input	not assigned	manual reference input	reference input 2 summed with AIV
SAB : Relay output	not assigned	HSP reached	frequency reference reached
LO : Logic output	not assigned	frequency reference reached	1.1 Ith overload reached
AO : Analog output	not assigned	motor frequency	motor frequency

4.3 Configuration register CF1

The following table shows the differences between the factory set configuration register (CF1) of an Altivar 16, both with and without a dedicated card.

Conf. register CF1	ATV 16 no dedicated card	ATV 16 general usage	ATV 16 material handling	ATV 16 variable torque	ATV 16 high speed
RPS : S ramps	0	1			
FLr : flying restart	0		1	1	
Atr : automatic restart	0		1		
SFR : switching frequency at 10 kHz	0		1		
StP : controlled stop on AC supply break	0				
brA : adaptation of the deceleration ramp	1	0			
SLP : slip compensation	1		0	0	
RBL : activation of the +/- speed reference	0				
SCE : +/- speed reference in EEPROM memory	0				
BST : inhibit BOOST	0				

ENGLISH

5.1 Under X-TEL

5.1-1 Programming objects

The user can access the speed controller commands, its signalling and settings via the various registers which can be used directly in the PLC program.
The table below gives the mnemonic symbols of the objects available to the user.

Object	Description	Access	Format
RIW	**R**emote **I**nput **W**ord – input register (signalling)	R	16 bit word
ROW	**R**emote **O**utput **W**ord – output register (control)	R / W	16 bit word
PRMA	**P**ara**m**eter – group **A** adjustment parameter	R / W	16 bit word
PRMB	**P**ara**m**eter – group **B** adjustment parameter	R / W	16 bit word
SENDPRM	**SEND p**ara**m**eters – controls sending of the adjustment parameters	R / W	one bit
READPRM	**READ p**ara**m**eters – controls reading of the adjustment parameters.	R / W	one bit
STATUSA ERROR	Standard FIPIO status register Fault identification bit	R R	16 bit word one bit
SW118 to SW 121	Status of all the devices connected remotely on the FIPIO fieldbus	R	16 bit word

R : Read, – W : Write.

The syntax for all the registers in PL7-3 language refers to the number of the Altivar connection point, the module number (always zero for Altivar) and the register number.

Example : RIW10,0,2 designates input register 2, for the Altivar at connection point 10.

RIW: contains all the useful data (being used in the PLC program) relating to the speed controller operating status.

ROW: contains all the necessary commands for controlling the speed controller from the PLC program.

PRMA, PRMB, SENDPRM, READPRM: are objects used to read or write the speed controller adjustment parameters to the user program.

ERROR: this bit detects whether a fault is present.

STATUSA: diagnoses the origin of the fault (PLC or speed controller).

SW118 to SW121: identifies the faulty device on the FIPIO fieldbus.

5.1-2 Periodic input variables

			Input registers RIW (Signalling)
WORD	**NAME**	**UNIT**	**DESCRIPTION**
RIWx,0,0	ETA	- - -	**Speed controller status register** bit 0 All commands assigned in LOCAL mode - 1 Speed controller ready (RDY or SLC) - 2 Faulty - 3 Reset authorized (following correctable fault) - 4 Reserved - 5 Speed controller forced to LOCAL mode (if function configured) - 6 Communication check inhibited (NTO) **(see note 2 on next page)** - 7 Correctable fault - 8 Motor running - 9 Direction of rotation (0 = forward / 1 = reverse) - A DC injection braking - B Steady state (reference reached) - C Motor thermal overload alarm (thermal state ≥ 100%) - D Overbraking alarm (precedes an "ObF." fault) - E Current limit - F Reserved
RIWx,0,1	FRR	0.1 Hz	**Rotation frequency (signed value)**
RIWx,0,2	LCR	0.1 A	**Motor current**
RIWx,0,3	IOL	---	**Speed controller logic I/O status register** bit 0 Forward input : FW - 1 Reverse input : RV - 2 Logic input 1 : LI1 - 3 Logic input 2 : LI2 - 4 Logic input 3 : LI3 - 5 Relay output - 6 Logic output, LO 7 to F Reserved
RIWx,0,4	AIV	1	**Speed controller analog input value AIC/AIV (0...10000)**
RIWx,0,5	AI1	1	**Speed controller analog input value AI (–10000...+10000)**
RIWx,0,6	FRH	0.1 HZ	**Effective frequency reference (signed value)**
RIWx,0,7	DEF	---	**Speed controller fault register** bit 0 Internal speed controller fault (InF) - 1 Communication fault (SLF) - 2 Storage fault in EEPROM (EEF) - 3 External fault (generated by an EFL command) - 4 Mains supply undervoltage (USF) - 5 Mains supply overvoltage (OSF) - 6 Supply phase(s) failure (PhF) - 7 Reserved - 8 Speed regulation fault / Tachogenerator absent - 9 Overcurrent (drF) - A Overvoltage caused by overbraking (ObF) - B Overcurrent caused by overbraking (ObF.) - C Motor overload (OLF) - D Reserved - E Reserved - F Capacitor charging relay fault (CrF)

RIWx,0,y

RIW number : 0…7
module number : always 0 for the Altivar
connection point address on the FIPIO fieldbus : 1 to 62 in decimal
indicates the input register (periodic signalling variable)

The PLC updates all the RIWs automatically at the beginning of the program task.

5.1-3 Periodic output variables

Output registers ROW (Command)				
WORD	**NAME**	**RANGE**	**UNIT**	**DESCRIPTION**
ROWx,0,0	COM	---	---	**Command register** bit 0 Reset speed controller - 1 Assign logic commands on LINE (DLI) **Note 1** - 2 Assign frequency reference on LINE (FLI) **Note 1** - 3 Reserved - 4 Communication check inhibited (NTO) **Note 2** - 5 Start / stop command **1=start** - 6 DC injection braking command - 7 Reserved - 8 Select freewheel stop - 9 Select fast stop - A Reserved - B Reserved - C Reserved - D Reserved - E External fault command (EFL) - F Reserved
ROWx,0,1	FRL	LSP...HSP	0.1Hz	**Line frequency reference (signed value)** **Note 3**
ROWx,0,2	LOL	---	---	**Write logic outputs on line** bit 0 Value applied at SAB - 1 Value applied at LO 2 to F Reserved
ROWx,0,3	AOL	0...255	1	**Write analog output AO on line**

The bits are active at state 1

ROWx,0,y

ROW number : 0…3
module number : always 0 for the Altivar
connection point address on the FIPIO fieldbus : 1 to 62 in decimal
indicates the output register (periodic command variables)

The PLC updates all the ROWs automatically at the end of program task execution.

Example : command to start the speed controller at connection point 28 at a frequency of 25 Hz.
H'0026'→ROW28,0,0
250→ROW28,0,1
The first instruction validates the on-line logic command (bit 1), the on-line frequency reference (bit 2) and the start command (bit 5).
The second instruction assigns a frequency reference of 25 Hz to the speed controller.

Note 1: Bits DLI and FLI in the command register can be used to partially assign commands which can be executed from the fieldbus. It is important to set them correctly each time the COM register is written.
In an application where the Altivar is totally controlled via a communication link, they should always be at state 1.

Note 2: Setting bit NTO to 1 in the command register inhibits the communication fault check (Altivar 16 "SLF" fault).
For safety reasons, this command should be used with care.

Note 3: The direction of rotation can be reversed by changing the sign of the frequency reference.

5.1-4 Aperiodic adjustment variables

The 24 words for setting parameters are divided into 2 groups, PRMA and PRMB :

PRMAx,0,y
PRMBx,0,y

- adjustment parameter number : 0..15 for PRMA, 0..7 for PRMB
- module number : 0 for the Altivar
- connection point address on the FIPIO fieldbus : 1 to 62 in decimal indicates the adjustment parameter register

Example : PRMA5,0,14 gives the value of the speed controller acceleration ramp declared at connection point 5.
PRMB5,0,4 gives the value of the motor thermal protection.

Writing parameters to the Altivar 16:

To modify the Altivar adjustment parameters from the PLC program, the values in PRMA and / or PRMB must be changed and then sent to the Altivar at connection point x, and bit **SENDPRMx,0,0** must be set to 1.

Example : 50 fi PRMA28,0,13
SET SENDPRM28,0,0 Triggers the transmission of 50 to adjust the voltage/frequency ratio of the Altivar declared at connection point 28.
Check that the exchange is performed correctly using the STATUSA register.

Reading the parameters on the Altivar 16:

To read the parameters of the Altivar at connection point x to the PLC program, set bit **READPRMx,0,0** must be set to 1

Example : SET READPRM5,0,0 Triggers the reading of all the parameters PRMA and PRMB applied to the Altivar declared at connection point 5.

The write and read operations are terminated when bits SENDPRMx,0,0 or READPRMx,0,0 return to 0.

Adjustment parameters				
WORD	**NAME**	**RANGE**	**UNIT**	**DESCRIPTION**
PRMAx,0,0	HSP	LSP...TFR	0.1Hz	High speed
PRMAx,0,1	LSP	0...HSP	0.1 Hz	Low speed
PRMAx,0,2	SP3	LSP...HSP	0.1Hz	3rd speed
PRMAx,0,3	SP4	LSP...HSP	0.1 HZ	4th speed
PRMAx,0,4	SMF	0...LSP	0.1 Hz	Brake application frequency level
PRMAx,0,5	SRF	0...LSP	0.1 Hz	Brake release frequency level
PRMAx,0,6	JF1	0...TFR	0.1 Hz	Skip frequency 1
PRMAx,0,7	JF2	0...TFR	0.1 Hz	Skip frequency 2
PRMAx,0,8	JOG	1...100	0.1 Hz	JOG frequency
PRMAx,0,9	CGL	0...50	0.1 Hz	Slip compensation
PRMAx,0,10	RGP	0...10000	0.01	Proportional gain KP (PI function)
PRMAx,0,11	RGI	0...10000	0.01	Integral gain KI (PI function)
PRMAx,0,12	FLG	0...100	1 %	Frequency loop gain
PRMAx,0,13	UFr	0...100	1	Set U / F ratio
PRMAx,0,14	Acc	1...6000	0.1s	Acceleration
PRMAx,0,15	dEc	1...6000	0.1s	Deceleration
PRMBx,0,0	Ac2	1...6000	0.1s	2nd acceleration ramp
PRMBx,0,1	dE2	1...6000	0.1s	2nd deceleration ramp
PRMBx,0,2	tdc	0...51	0.1s	DC injection time
PRMBx,0,3	TMF	0...50	0.1s	Brake application time
PRMBx,0,4	ItH	0.5 Inm...1.15 Inm	0.1A	Motor thermal protection
PRMBx,0,5	Idc	0.5 ItH...1.5 ItH	0.1A	DC injection amplitude
PRMBx,0,6	Ibr	0...1.15 Inm	0.1A	Brake application current level
PRMBx,0,7	LtI	0.5 Inm...1.21 Inm	0.1A	Current limit

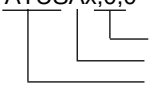
5.1-5 Periodic system status variables

STATUSA register : used to identify one or more faults at speed controller or PLC level.

DEFINITION OF STATUSA REGISTER	
Bit	**Description**
Status generated by the Altivar (8 least significant bits)	
0	Reserved
1	Reserved
2	Reserved
3	Reserved
4	Altivar fault
5	Hardware configuration fault
6	PLC-Altivar dialogue fault
7	Reserved
Status generated by the PLC (8 most significant bits)	
8	Configuration fault
9	Module missing
A	Module off
B	Module faulty
C	Internal fault, TSX hardware fault
D	Internal fault, TSX system fault
E	Dialogue fault, communication fault
F	Dialogue fault, parameter setting fault

bit=1 : fault present

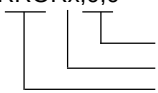
STATUSAx,0,0



always 0 for the Altivar
connection point address on the FIPIO fieldbus : 1 to 62 in decimal
standard FIPIO status register

ERROR bit : indicates that at least one bit in the STATUSAx,0,0 register is activated.

ERRORx,0,0



always 0 for the Altivar
connection point address on the FIPIO fieldbus : 1 to 62 in decimal
fault identification bit

System register SW : indicates the status of all the devices remotely installed on the FIPIO fieldbus.

Register	Description	Function
SW118 to SW121	Device fault on the the status FIPIO fieldbus device :	Each bit in this group of words signifies of a remote device. Normally at state 1, if one of these bits is at 0, this indicates the appearance of an exchange fault or an I/O fault with a • SW118,0 = 0 : fault at connection point 0, • SW118,1 = 0 : fault at connection point 1, • …… • …… • SW121,E = 0 : fault at connection point 62, • SW121,F = 0 : fault at connection point 63.

5.2 Under ORPHEE

5.2.1 Programming objects

The user can access control and signalling of the speed controller via PLC variables which are defined during configuration.

The table below gives the type of PLC variables which are defined during configuration :

Object	Description	Access	Type
Input tabulation			
Fault	fault word on the inputs	R	%MW
Words	8 input tabulation words (or periodic input variables)	R	table of 8 %MW
Output tabulation			
Words	8 output tabulation words (or periodic output variables)	R/W	table of 8 %MW

R : Read - W : Write

Details of these variables are given on the following pages.

In addition, the user can access speed controller adjustment using the READ_PRM and WRIT_PRM CFBs. To find out more about the operating principles of these CFBs, consult the manual on the ORPHEE-ORPHEE Diag option for use of the FIPIO fieldbus link on APRIL 5000 (Reference TEM10000/10800GB).
See section 3.2.3 Setting the Altivar 16 parameters for a description of the adjustment parameters handled by these CFBs.

5.2.2 Periodic input variables

Input tabulation (Table of 8%MW)			
WORD	**NAME**	**UNIT**	**DESCRIPTION**
0	ETA	- - -	**Speed controller status register**
		bit 0	All commands assigned in LOCAL mode
		- 1	Speed controller ready (RDY or SLC)
		- 2	Faulty
		- 3	Reset authorized (following correctable fault)
		- 4	Reserved
		- 5	Speed controller forced to LOCAL mode (if function configured)
		- 6	Communication check inhibited (NTO) **(see note 2 on the next page)**
		- 7	Correctable fault
		- 8	Motor running
		- 9	Direction of rotation (0 = forward/ 1 = reverse)
		- A	DC injection braking mode
		- B	Steady state (reference reached)
		- C	Motor thermal overload alarm (thermal state ≥ 100%)
		- D	Overbraking alarm (precedes an "ObF." fault)
		- E	Current limit
		- F	Reserved
1	FRR	0.1 Hz	**Frequency of rotation (signed value)**
2	LCR	0.1 A	**Motor current**
3	IOL	---	**Speed controller logic I / O status register**
		bit 0	Forward operation input : FW
		- 1	Reverse operation input : RV
		- 2	Logic input 1 : LI1
		- 3	Logic input 2 : LI2
		- 4	Logic input 3 : LI3
		- 5	Relay output : S2A - S2B
		- 6	Logic output , LO
		7 to F	Reserved
4	AIV	1	**Value of speed controller analog input AIC/AIV (0...10000)**
5	AI1	1	**Value of speed controller analog input AI (–10000...+10000)**
6	FRH	0.1 HZ	**Effective frequency reference (signed value)**
7	DEF	---	**Speed controller fault register**
		bit 0	Internal speed controller fault (InF)
		- 1	Communication fault (SLF)
		- 2	EEPROM storage fault (EEF)
		- 3	External fault (generated by an EFL command)
		- 4	Mains supply undervoltage (USF)
		- 5	Mains supply overvoltage (OSF)
		- 6	Supply phase(s) failure (PhF)
		- 7	Reserved
		- 8	Speed regulation fault / Tachogenerator absent
		- 9	Overcurrent (drF)
		- A	Overvoltage due to overbraking (ObF)
		- B	Overcurrent due to overbraking (ObF.)
		- C	Motor overload (OLF)
		- D	Reserved
		- E	Reserved
		- F	Capacitor charging relay fault (CrF)

Moreover, the fault word can take the following values :

0 : no fault

255 : ATV16 fault

The PLC automatically updates the whole table at the beginning of the PLC cycle, before executing the client program.

5.2.3 Periodic output variables

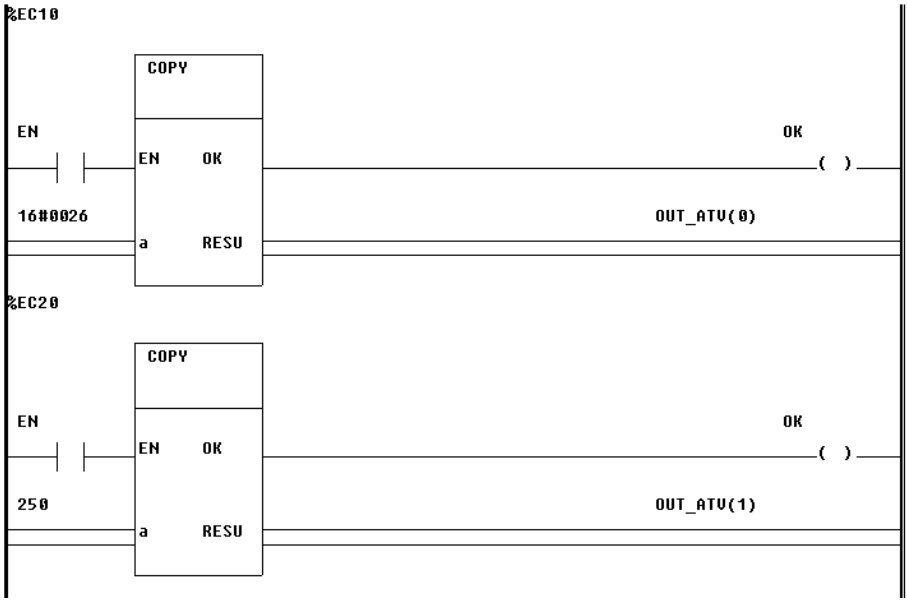
Output tabulation (Table of 8%MW)				
WORD	**NAME**	**RANGE**	**UNIT**	**DESCRIPTION**
0	COM	---	---	**Command register**
			bit 0	Reset speed controller
			- 1	Assign logic commands on LINE (DLI) **Note 1**
			- 2	Assign frequency reference on LINE (FLI) **Note 1**
			- 3	Reserved
			- 4	Communication check inhibited (NTO) **Note 2**
			- 5	Start/stop command **1=run**
			- 6	DC injection braking command
			- 7	Reserved
			- 8	Select freewheel stop
			- 9	Select fast stop
			- A	Reserved
			- B	Reserved
			- C	Reserved
			- D	Reserved
			- E	External fault command (EFL)
			- F	Reserved
1	FRL	LSP...HSP	0.1Hz	**Line frequency reference (signed value)** **Note 3**
2	LOL	---	---	**Write logic outputs on line**
			bit 0	Value applied at SAB
			- 1	Value applied at LO
			2 to F	Reserved
3	AOL	0...255	1	**Write analog output AO on line**

Bits are active in state 1

The PLC automatically updates the whole table at the end of the PLC cycle, after executing the client program. Words 4 to 7 in the table are not used. Their value does not affect the speed controller. It is nonetheless essential to enter a table of 8 %MW (and not 4 %MW), when defining the output tabulation in the configuration editor.

Example : command to start the speed controller on connection point 28 at a frequency of 25 Hz.

The first COPY CFB validates the on-line logic command (bit 1), the on-line frequency reference (bit 2) and the start command (bit 5).
The second COPY CFB assigns a frequency reference of 25 Hz to the speed controller.



Note 1 : Bits DLI and FLI in the command register can be used to partially assign commands which can be executed from the fieldbus. It is important to set them correctly each time the COM register is written. In an application where the Altivar is totally controlled via a communication link, they should always be at state 1.

Note 2 : Setting bit NTO to 1 in the command register inhibits the communication fault check ("SLF" fault on the Altivar 16). Care must be taken when using this command for reasons of safety.

Note 3 : The direction of rotation can be reversed by changing the sign of the frequency reference.

5.2.4 Periodic system status variables

The PLC sees the status of the Altivar 16 by means of Internal Faults (DI), Logic Faults (DL) and External Faults (DE).
The significance of Internal Faults and Logic Faults has been standardized for all devices on the FIPIO fieldbus.

Internal Faults

DI1 = Base module (speed controller or VW3-A16303 interface) faulty
DI2 = Communication module (TSX FPP10 card) faulty
DI3 = Extension module faulty (not relevant to the Altivar 16)
DI4 = Not used

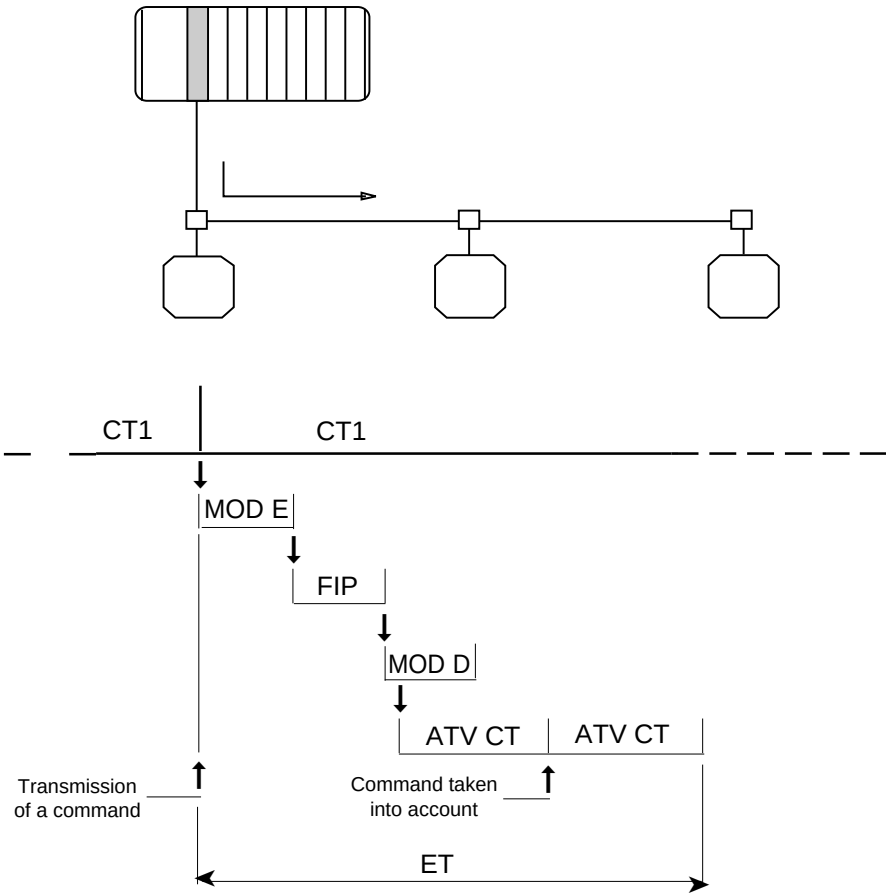
Logic Faults

DL1 = Not used
DL2 = The device parameters have not been set or are incorrect
DL3 = Not used
DL4 = Communication fault on the FIPIO fieldbus

As far as external faults are concerned, their significance for the Altivar 16 is as follows :

DE1 = Power supply fault (occurs when the ATV remains powered up by its capacitors)
DE2 = Not used
DE3 = External fault
DE4 = Not used

Programming diagnostics %TD enables the client program to be informed when faults occur.



CT1: transmitting PLC cycle time
MOD E: propagation time in the FIP transmitting module
FIP: propagation time on the FIPIO network
MOD D: propagation time in the Altivar 16 FIP module
ATV CT: Altivar 16 cycle time
ET: command execution time
typical value 40 ms.