SIEMENS

SIMADYN D

Brief Description

T400 Technology Module



Edition 09.99

Brief Description T400 Technology Module

Edition		Edition version
1	T400 Technology Module	09.98
2	T400 Technology Module	04.00

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Disclaimer of liability

We have checked the contents of this Manual to ensure that they coincide with the described hardware and software. However, deviations cannot be completely ruled-out, so we cannot guarantee complete conformance. However, the information in this document is regularly checked and the necessary corrections included in subsequent editions. We are thankful for any recommendations or suggestions.

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Technical data subject to change

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Definitions

NOTE

The information in this Manual does not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.
Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, please contact your local Siemens office.
Further, the contents of this Manual shall not become a part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties nor modify the existing warranty.

Qualified personnel

For the purpose of this Manual and product labels, a „Qualified person" is someone who is familiar with the installation, mounting, start-up and operation of the equipment and the hazards involved. He or she must have the following qualifications, for example:

1. Trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
2. Trained in the proper care and use of protective equipment in accordance with established safety procedures.
3. Trained in rendering first aid

Danger and warning information



DANGER For the purpose of this Manual and product labels, „Danger" indicates death, severe personal injury and/or substantial property damage will result if proper precautions are not taken.



WARNING For the purpose of this Manual and product labels, „Warning" indicates death, severe personal injury or property damage can result if proper precautions are not taken.



CAUTION For the purpose of this Manual and product labels, „Caution" indicates that minor personal injury or material damage can result if proper precautions are not taken.

NOTE For the purpose of this Manual, „Note" indicates information about the product or the respective part of the Instruction Manual which is essential to highlight.





CAUTION This board contains components which can be destroyed by electrostatic discharge. Prior to touching any electronics board, your body must be electrically discharged. This can be simply done by touching a conductive, grounded object immediately beforehand (e.g. bare metal cabinet components, socket protective conductor contact).



WARNING Hazardous voltages are present in this electrical equipment during operation. Non-observance of the safety instructions can result in severe personal injury or property damage.
It is especially important that the warning information in all of the relevant Operating Instructions/Instruction Manuals are strictly observed.

1. Product description

Order No. 6DD1606-0AD0

Applications

The T400 is a technology module. It can be used to complement drives with sophisticated, high-dynamic performance open-loop and closed-loop control functions at a favorable price. Sampling times down to 100 µs are possible.

Applications include higher-level closed-loop controls for:

- closed-loop tension control
- closed-loop position control
- winder and coiler
- (angular) synchronous control
- positioning
- cross cutter and flying saws
- drive-related open-loop control functions

The T400 can be inserted in the electronics box of

- SIMOVERT MASTERDRIVES VC, MC Compact 6SE70/71 AC drive converters (not in MC Compact PLUS!)
- SIMOREG DC-MASTER 6RA70.

Further, the T400 can also be used in the SRT400 SIMADYN D subrack. Two T400 can be inserted in the SRT400.

The T400 is always used in the drives and in the SRT400, together with the MASTERDRIVES or DC MASTER communications module, for example, CB1, SCB as well as the ADB carrier module with the communications modules inserted in it, for example, CBP2 (PROFIBUS-DP), CBC (CAN), CBD (DeviceNet).

2. Installation

2.1. Installing the module

2.1.1. SRT400

If only one T400 is used, then this is inserted in the lefthand slot. The optional 2nd module (second T400 or communications module) is inserted at the right. The modules are retained using screws above and below the handles which are used to insert/withdraw the modules.

2.1.2. Electronics box in the MASTERDRIVE / DC MASTER

Slot in the electronics box			Modules
Left	Slot 1 (CUx)	(left)	CU2 / CU3 / CUDC / CUVC / CUMC / ...
Center	Slot 3 (options)	(center)	CB1 / CB2 / CBP / CBP2 / SCB1 / SCB2 / ADB / ... / empty
Right	Slot 2	(right)	**T400**

Note:
The T400 must always be inserted at slot 2 (right!!!), if it is used in a MASTERDRIVE or DC MASTER.
It is not permissible to use a TSY or the terminal expansion modules EBx (on the ADB) in conjunction with the T400.

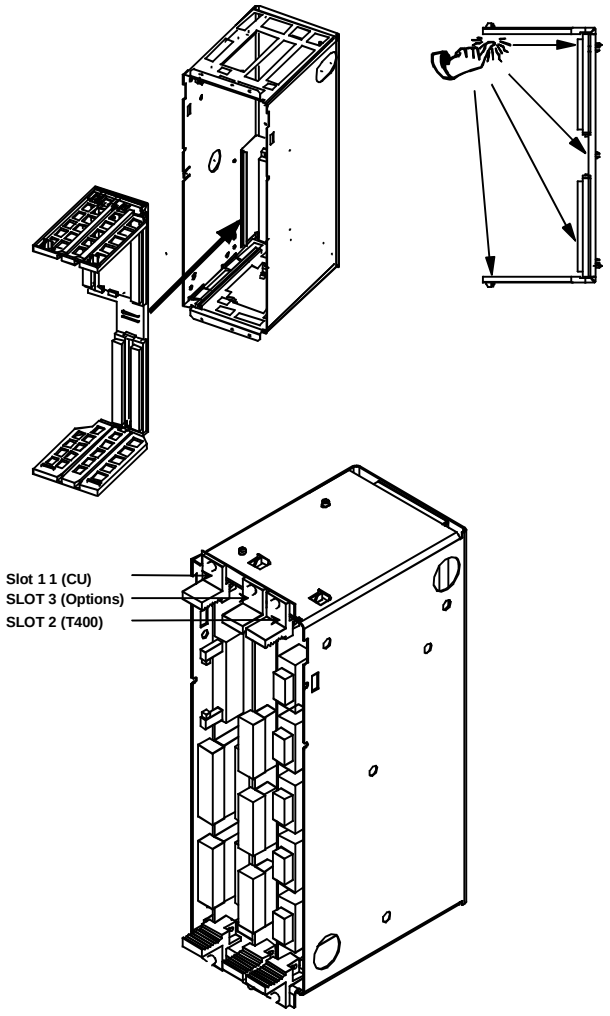
In order to be able to insert the option modules in the electronics box, the LBA (Local Bus Adapter) must be installed in the electronics box.

Installing the bus expansion LBA:

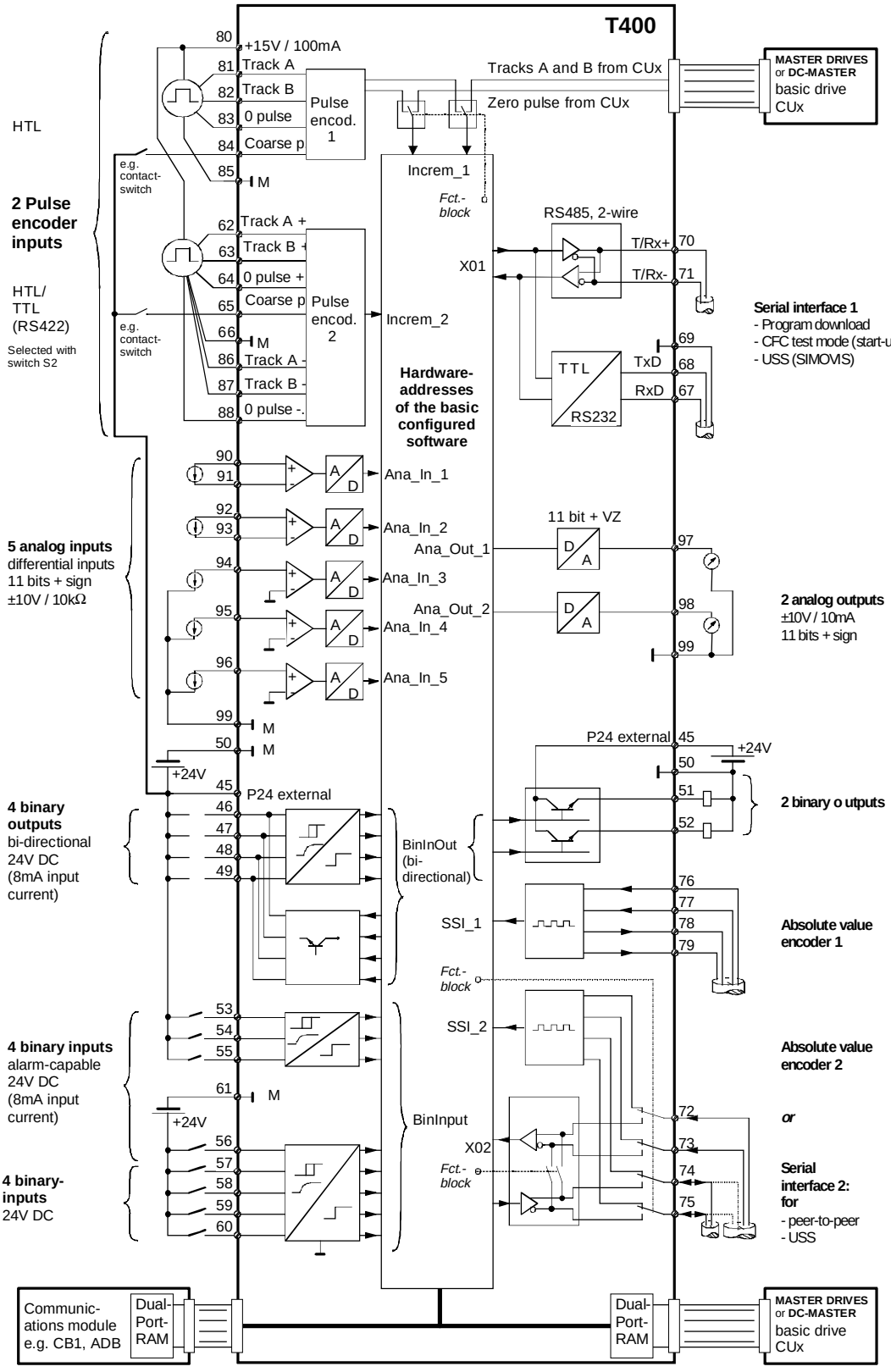
- Remove the CUx module (lefthand slot in the electronics box) after releasing the connecting cable to the PMU and the two retaining screws. Use the handles to remove the module.
- Insert the bus expansion LBA into the electronics box (position, refer to the diagram) until it snaps into place.
- Insert the CUx module back into the lefthand slot, screw in the retaining screws at the handles, insert the connecting cable to the PMU.
- Insert the T400 in **slot 2 (<u>right</u>)** and, if required the option module in slot 3 (center) of the electronics box, and screw into place.

Replacing modules in the electronics box

- Release the screws retaining the modules above and below the handles.
- Carefully remove the module from the electronics box using the handles, and take care that the module does not catch on any adjacent components and parts.
- Carefully locate the new module onto the guide rails and insert it fully into the electronics box.
- Tighten the module retaining screws above and below the handles.



2.2. **Connections**



Datei: T400-io.dsf

Note: All of the grounds are connected with one another and the electronics ground.

2.2.1. Analog inputs/outputs

T400 terminal assignment		Connector	Connector pin	Terminal
Ground, analog inputs/outputs		X9	1	89
Analog input 1	Analog input 1+		2	90
	Analog input 1-		3	91
Analog input 2	Analog input 2+		4	92
	Analog input 2-		5	93
Analog input 3			6	94
Analog input 4			7	95
Analog input 5			8	96
Analog output 1			9	97
Analog output 2			10	98
Ground, analog inputs/outputs			11	99

If inputs 1 and 2 are not used as differential inputs, terminals 89, 91 and 93 must be connected with one another. This means that measurements made at terminals 90 and 92 are with respect to ground.

2.2.2. Binary inputs/outputs

T400 terminal assignment	Connector	Connector pin	Terminal
+ 24 V external (for binary inputs and outputs)	X5	1	45
Bi-directional binary input and output 1		2	46
Bi-directional binary input and output 2		3	47
Bi-directional binary input and output 3		4	48
Bi-directional binary input and output 4		5	49
Ground, binary inputs and outputs		6	50
Binary output 1		7	51
Binary output 2		8	52
Binary input 1 (alarm-capable)		9	53
Binary input 2 (alarm-capable)		10	54
Binary input 3 (alarm-capable)		11	55
Binary input 4 (alarm-capable)	X6	1	56
Binary input 5		2	57
Binary input 6		3	58
Binary input 7		4	59
Binary input 8		5	60
Ground, binary inputs and outputs		6	61

2.2.3. Absolute value encoder

T400 terminal assignment			Connector	Connector pin	Terminal
Absolute encoder 2:	data+	Serial interface 2: Rx-RS485+	X7	6	72
Absolute encoder 2:	data-	Serial interface 2: Rx-RS485-		7	73
Absolute encoder 2:	clock+	Serial interface 2: Tx (Rx)-RS485+		8	74
Absolute encoder 2:	clock-	Serial interface 2: Tx (Rx)-RS485-		9	75
Absolute encoder 1:	data+			10	76
Absolute encoder 1:	data-			11	77
Absolute encoder 1:	clock+		X8	1	78
Absolute encoder 1:	clock-			2	79

Either absolute encoder 2 or serial interface 2 can be used. The selection is made when configuring the software using CFC.

2.2.4. Incremental encoder

T400 terminal assignment				Connector	Connector pin	Terminal
Increm. encod. 2:	Track A (HTL)	Increm. encod. 2:	Track A+ (RS422)	X6	7	62
Increm. encod. 2:	Track B (HTL)	Increm. encod. 2:	Track B+ (RS422)		8	63
Increm. encod. 2:	Zero pulse (HTL)	Increm. encod. 2:	Zero pulse+ (RS422)		9	64
Increm. encod. 2: Coarse pulse					10	65
Ground, incremental encoder 2					11	66
+ 15 V encoder power supply (max. 100 mA)				X8	3	80
Increm. encod. 1:	Track A				4	81
Increm. encod. 1:	Track B				5	82
Increm. encod. 1:	Zero pulse				6	83
Increm. encod. 1:	Coarse pulse				7	84
Ground, incremental encoder 1					8	85
Increm. encod. 2:	Track A-	(for RS422)			9	86
Increm. encod. 2:	Track B-	(for RS422)			10	87
Increm. encod. 2:	Zero pulse-	(for RS422)			11	88

If no push-pull signals are used for encoder 2, terminals 85, 86,87 and 88 must be connected with one another.

2.2.5. Serial interfaces

T400 terminal assignment			Connector	Connector pin	Terminal
Ser. interface 1: Rx-RS232			X7	1	67
Ser. interface 1: Tx-RS232				2	68
Ground, serial interface				3	69
Ser. interface 1: Tx/Rx-RS485+				4	70
Ser. interface 1: Tx/Rx-RS485-				5	71
Ser. interface 2: Rx-RS485+	4 wire	Absolute encoder 2: data+		6	72
Ser. interface 2: Rx-RS485-	4 wire	Absolute encoder 2: data-		7	73
Ser. interface 2: Tx (Rx)-RS485+	2 or 4 wire	Absolute encoder 2: clock+		8	74
Ser. interface 2: Tx (Rx)-RS485-	2 or 4 wire	Absolute encoder 2: clock-		9	75

Either absolute value encoder 2 or serial interface 2 can be used. The selection is made when configuring the software using CFC.

3. Technical data

3.1. Overview

Inputs/outputs

- 2 analog outputs
- 5 analog inputs
- 2 binary outputs
- 8 binary inputs
  of which 4 binary inputs can be used to call interrupt tasks (50 µs response time)
- 4 bi-directional binary inputs or outputs
- 2 incremental encoder inputs with zero pulse
  - encoder 1 for HTL (15V) encoder
    Encoder pulses of an encoder connected to a SIMOVERT MASTERDRIVES SC/VC which are fed via the backplane bus to the T400 can also be evaluated. This means it is also possible to use a TTL/RS422 encoder. The pulse encoder simulation via the backplane bus of the SIMOVERT MASTERDRIVES MC can also be used.
  - encoder 2 for HTL (15V)- or TTL/RS422 encoder (5V)
- For each incremental encoder, a coarse pulse input to suppress the zero pulse, the coarse pulse input (simultaneously) can also be used as binary input.
- The inputs/outputs are not electrically isolated
- 2 absolute value encoders with SSI- or EnDat protocol (RS485) for positioning applications
  Note: When using absolute value encoder 2, serial interface 2 (peer, USS) cannot be used, as the same terminals are used for the two applications!

Serial interface 1 with RS232 or RS485 data transfer format;
The protocol can be selected using a switch on the module:

- **Service protocol DUST1**
  for start-up (CFC test mode, service IBS (start-up), TELEMASTER) and downloading programs with a 19.2 kbit/s baud rate at the RS232 interface
- **USS protocol,**
  2 wire, with selectable RS232 or RS485 data transfer format;
  max. baud rates, 38.4 kbit/s;
  can be configured as slave for parameterization with OP1S (from OP1S, version V2.2),
  or as master for the OP2 operator panel connection

Serial interface 2
with RS485 data transfer format, selectable baud rates of: 9.6; 19.2; 38.4; 93.75 and 187.5 kbit/s;
the required protocol is selected by appropriately configuring the function block:

- **Peer-to-peer**
  for fast process coupling, 4 wire
- **USS protocol** (USS bus),
  can be configured as slave for parameterization with SIMOVIS (2- or 4 wire),
  as master for OP2 operator panel connection (2 wire) or to control drive converters;
  max. baud rates, 38.4 kbit/s;

Low deadtimes can be achieved as a result of **synchronization**:

- Synchronization of the T400 on the basic drive converter modules (CUx) or second T400
- T400 supplies synchronizing signals for other modules (CUx, CBx or second T400)

Other features

- Lowest sampling time is 0.1 ms, 0.8 ms is the typical sampling time for a control loop
- As a result of the floating point arithmetic, not only is a high accuracy achieved, but configuring is also simplified as normalization and value range limits are eliminated
- Operation without fan
- 3 LEDs for operating status displays
- Hardlock-PAL: Plug-in socket for 28-pin EPLD device for copy protection of the user program
- Soldered-in flash memory (2 Mbyte) for the program code (compressed), which is downloaded from the PC via the serial interface; no plug-in memory module is used!
- 4 Mbyte DRAM as working memory for programs and data,
- 32 Kbyte permanent change memory
- NOVRAM for data save at voltage-off for up to 10 configurable values (real type)
- Cache memory: 4 Kbyte program, 4 Kbyte data
- Clock cycle (external/internal): 32/32 MHz

3.2. General data

Grounding/ground

The grounds of the following terminals

- interfaces 1 and 2
- analog inputs/outputs
- binary inputs/outputs
- incremental encoders 1 and 2

are connected with the T400 electronics ground.

Slot assignment	1
Dimensions W x H x D [mm]	14 x 267 x 140
Weight	Approx. 0.3 kg
Degree of protection	IP00
Terminals	MINI-COMBICON, Phönix company
Humidity class	F according to DIN 40040
Ambient temperature	From 0°C , up to 55°C (without fan)
Storage temperature	From -25°C to 75°C

3.3. Power supply

The T400 requires the following voltages at the backplane bus connector X1:

Rated voltage	Minimum	Maximum	Typical current drain
+5 V	+4.75 V	+5.25 V	1100 mA
+15 V	+14.4 V	+15.6 V	140 mA + encoder load (terminal 66) (max. 100 mA, electronic. limited)
-15 V	-14.55 V	-15.45 V	140 mA
24 V (external)	20 V	30 V	150 mA + binary output currents

3.4. Inputs/outputs

Analog outputs

No.	2, non-floating
Output voltage range	+/-10 V
Output current	Max. +/- 10 mA
Resolution	12 bit (4.88mV)
Linearity error	< 1 bit
Absolute accuracy	+/- 3 bit
Short-circuit protection to ground	Yes
Voltage rate-of-rise of the output	Approx. 4.2 V/µs
Delay time	3.5 µs

Analog inputs

No.	5
Version	2 differential inputs, 3 unipolar; all non-floating
Input voltage range	+/- 10 V
Input resistance	20 kohm
Input filter	3 dB transition freq. 25 kHz
Resolution	12 bit (4.88mV)
Measuring principle	Sampling
Absolute accuracy	+/- 3 bit
Linearity	< 1 bit
Offset error	+/- 3 bit
Conversion time	12 µs
Differential input resistance	$\geq$ 20 kohm
Hardware smoothing	4.7 µs

Binary outputs

No.		2 + max. 4 bidirectional; all non-floating
Power supply		External
	Nominal value	24 V DC
	Permiss. range	+15 V to 33 V including ripple
	Briefly	+35 V, max. 0.5 s
	Current drain	20 mA + output currents
Output current for 1 signal		Max. 50 mA / output
Short-circuit protection		Electronically and thermally, continuous short-circuit protection, limited to 220 mA
Inductive switch-off voltage limiting		Power supply voltage + 1 V
Switching frequency		5 kHz for ohmic loads
Signal level		
	for 0 signal	Max. 0.1 V
	for 1 signal	Power supply voltage - 0.3 V
Switching delay (0V to 24V)		Max. 70 µs

Binary inputs

No.		8 + max. 4 bidirectional + 2 coarse pulse signals all non-floating
Input voltage		24 V DC rated voltage
	for 0 signal	-1 V to +6 V or open-circuit inputs
	for 1 signal	+13 V to +33 V
Input current		
	for 0-Signal	0 mA
	for 1-Signal	typ. 3 mA, max. 5 mA
Delay time		150 µs

3.5. Incremental encoder with coarse- and fine pulse evaluation

No. of encoders	Total, max. 2	
Version	Encoder 1	HTL
	Encoder 2	either HTL,TTL or RS422

3.5.1. Pulse encoder 1

Input voltage range		HTL, 30 V
Input voltage		
	for 0 signal	< 4 V
	for 1 signal	> 8 V
Input current		Approx. 8 mA
Pulse frequency		Max. 400 kHz (track frequency)
Phase difference of the track signals		Independent of the pulse frequency, min. 200 ns
Input filter		Via software (function block NAV) can be configured

Note:

The pulses for encoder 1 (tracks A, B, zero pulse) can also be retrieved from the basic drive, via the **backplane bus,** if another module supplies these (e.g. incremental encoder simulation of the CUMC; as TTL signal level). The pulse source selection is configured at the speed actual value block NAV.

Zero pulse evaluation

The zero pulse evaluation can be parameterized and is dependent on the direction of rotation, i.e. the same encoder position is identified independent of the actual direction of rotation.

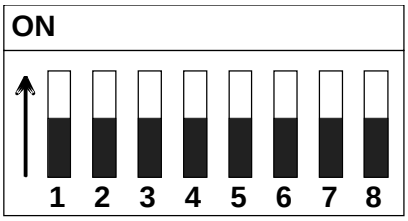
3.5.2. Pulse encoder 2

2 pulse encoders with different signal levels can be connected at encoder input 2.

- RS422
- HTL, bipolar
- HTL, unipolar
- TTL

3.5.2.1. Pulse encoder type selection switches S2/1 - S2/8

The encoder type is selected using DIL switch S2/1 - S2/8



The signal levels of track signals A and B are set according to the following table:

Significance	Switch S2		
	1	2	3
TTL RS422	ON	ON	ON
HTL, bipolar	OFF	OFF	ON
HTL, unipolar	OFF	OFF	OFF
TTL	ON	ON	OFF

The signal level of the zero pulse can be set independently of track A and B:

Significance	Switch S2	
	4	5
TTL RS422	ON	ON
HTL, bipolar	OFF	ON
HTL, unipolar	OFF	OFF
TTL	ON	OFF

Bus terminating resistors can be switched-in for RS422 using switches S2/6 to S2/8. This is always required, if the T400 is connected at one end of an RS422 cable. If it is located in the center, then it is not permissible that the terminating resistors are switched-in.

Significance	Switch S2
Track A	6
Track B	7
Zero pulse	8

The terminating resistors are switched-out in the OFF position; they are switched-in in the ON position.
The switch settings can only be changed when the module is withdrawn. They are not accessible when the module is inserted.

3.5.2.2. useable pulse encoder types

The following properties are valid for the settings for an HTL encoder with push-pull signals:

Input voltage range		HTL, differential voltage +/-30 V
Input voltage		
	for 0 signal	- 3V
	for 1 signal	+3 V
Input current		Approx. 2 mA
Pulse frequency		Max. 1.5 MHz (track frequency)
Input filter		Can be configured per software (function block)

The following properties are valid for settings for an HTL encoder without push-pull signals:

Input voltage range		HTL, 30 V, unipolar
Input voltage		
	for 0 signal	< 4 V
	for 1 signal	> 8 V
Input current		Approx. 2 mA
Pulse frequency		Max. 1.5 MHz (track frequency)
Input filter		Can be configured per software (function block)

If no push-pull signals are used for encoder 2, terminals
85, 86, 87 and 88 must be connected with one another.

The following properties are valid for the setting for a TTL encoder:

Input voltage range		TTL, 5 V
Input voltage		
	for 0 signal	< 0.8 V
	for 1 signal	> 2.3 V
Input current		Approx. 2 mA
Pulse frequency		Max. 1.5 MHz (track frequency)
Input filter		Can be configured per software (function block)

The following properties are valid for the RS422 setting:

Input voltage range		RS422, 5V
Input voltage		
	for 0 signal	< -0.2 V
	for 1 signal	> 0.2 V
Input current		Approx. 2 mA
Pulse frequency		Max. 1.5 MHz (track frequency)
Input filter		Can be configured per software (function block)

3.6. Absolute value encoder

The T400 has up to 2 synchronous serial interfaces for absolute value encoders:

Input voltage range	RS422, 5V
Encoders which can be connected	Single- or multi-turn encoders
Protocols	SSI (synchronous-serial)
	EnDat (accord. to the Heidenhain company)
Data transfer rate	100kHz to 2 MHz
Data representation type	Dual code
	Grey code
	Grey excess code

It is possible to simultaneously use the 2 serial interfaces and absolute value encoder 1 (terminals 76-79).

3.7. Serial interfaces

The T400 has 2 serial interfaces:

3.7.1. Service interface 1

Interface 1 has the two physical versions (they can only be used one at a time!):

- RS 232 for PC coupling (download, service, via the Dust1 protocol with 19.2 kbaud)
- RS 485 (2 wire) for USS to connect
  - SIMADYN D OP2 operator panels
  - MASTER DRIVES OP1 operator panels
  - SIMOVIS
  - or to the higher-level (master) / systems (e.g. SIMATIC)

The program is downloaded and service for start-up executed via interface 1. To realize this, the CFC is used in the test mode or service-IBS V5 (service start-up) (DUST1 protocol, baud rate: 19.2 kbd).

3.7.1.1. Communications switch S1/8

The physical version of serial interface 1 can be selected using S1/8. In addition to the changeover, the appropriate blocks must have been configured for the USS protocol. If the USS protocol is set, it is no longer possible to realize online visualization with CFC or service-IBS (service-start-up)!

Switch S1 / 8	
ON	RS485 (2 wire) for USS protocol (bus termination, refer to 3.7.3)
OFF	RS232 for service / start-up

3.7.1.2. Connecting cable to the PC

The connection between the T400 and the configuring-PC is via a serial link; this is established using the following cable which the user must assemble. Switch S1/8 must be in the OFF position.
The cable can be ordered as SC400 with the order number 6DD1684-HF0.

PC		T400
9-pole sub D socket		Terminal
Pin		
2	⟷	68
3	⟷	67
5	⟷	69

3.7.2. Interface 2

Interface 2 is a mixed asynchronous and synchronous **RS 485** interface:

- **Peer-to-peer** with full duplex, 4-wire connection
- **USS** protocol (master or slave) with half duplex, 2-wire connection

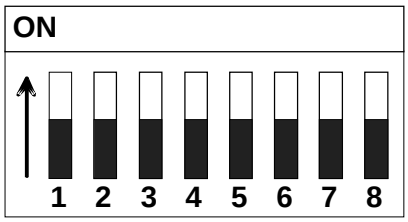
The function blocks @USS_M, @USS_S or @PEER are used to toggle between 2- and 4- wire operation. As soon as one of these blocks is configured, terminals 72 to 75 can no longer be used for an absolute value encoder.

The following baud rates can be set:
Peer to Peer: 9.6 kbd, 19.2 kbd, 38.4 kbd, 93.75 kbd, 187.5 kbd
USS: 9.6 kbd, 19.2 kbd, 38.4 kbd

3.7.3. Bus termination switches S1/1 - S1/6

The bus terminating resistors for serial interfaces 1 and 2 must be switched-in via switches S1/1 - S1/6, if the T400 is located at the beginning or end of the RS485 bus. If it located in the center, it is not permissible that the terminating resistors are switched-in.

	Terminals	Switch S1
Serial interface 1	70 / 71	1, 2
Serial interface 2 (2-wire)	74 / 75	3, 4
Serial interface 2 (4-wire)	72 / 73 / 74 / 75	3, 4, 5, 6



In the ON position, the terminating resistors are switched-in.

The switches can only be switched when the module is withdrawn. They are not accessible when the module is inserted.

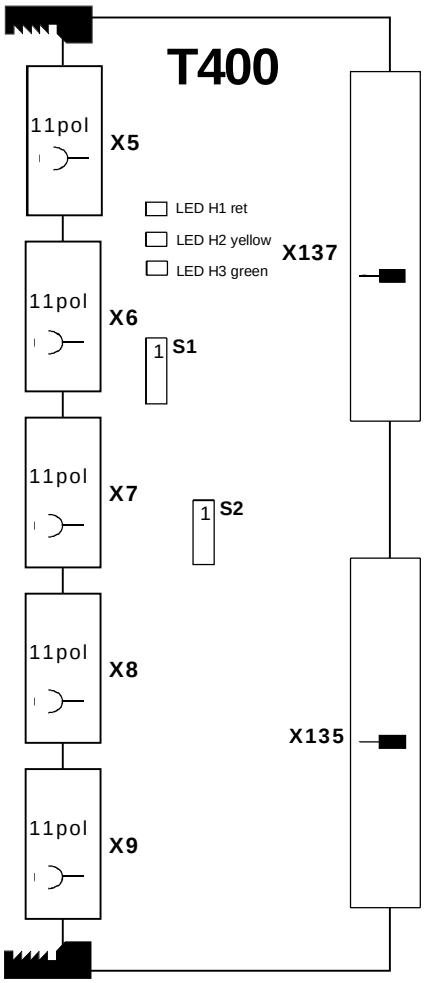
3.7.4. Download switch S1/7

Switch S1 / 7	
ON	User program inhibited, only download possible.
OFF	Standard operation

This function will only be available from D7-SYS V4.0 R07/98, and version K of the T400.

3.8. Diagnostic LEDs

Three diagnostic LEDs are located on the T400.



LED H1 displays the status of the internal T400 monitoring function. Under normal operating conditions it flashes slowly, approximately every second (1.5 Hz).

If H1 starts to flash at a average rate (with 2.5 Hz) this indicates an internal fault/error. Possible faults/errors are:

- user stop
- communications error
- computation time overflow
- hardware monitoring fault

The user stop can be initiated using the CFC- or the configured software. If the T400 is inserted in an electronics box, generally, the basic drive converter module signals a fault if the T400 is in the user stop status.
If there is no user stop, the module must be accessed using the CFC in the test mode or with Service-IBS V5, to precisely determine the cause and to evaluate the internal fault fields.

If H1 flashes quickly (with 5 Hz), this indicates an initialization error. The T400 program is either erroneous, or switch S1/7 is in the ON setting.

If H1 goes into a steady light condition this indicates a system error. The user program is not processed. The T400 is either defective or has been incorrectly programmed.
The module must be accessed using the CFC in the test mode or with the service-IBS V5 to precisely determine the cause, and to evaluate the internal fault fields.

LEDs H2 and H3 indicate the coupling status to other modules. A uniform flashing indicates an error-free coupling. The flash frequency of H2 and H3 is determined by the configuring, i.e. the sampling time of function block `@DRIVE`.

T400 in the SRT400:

LED	Function	Color	SRT400	
			lefthand T400	righthand T400
H1	Internal T400 monitoring	red	flashes slowly 1.25 Hz flashes medium frq. 2.50 Hz flashes quickly 5 Hz steady light	RUN, standard operation fault/error initialization error system error
H2	Data transfer to the lefthand T400	yellow	always dark	flashes: OK dark or steady light: faulted
H3	Data transfer to the righthand T400	green	flashes: OK dark or steady light: faulted	always dark

T400 in the MASTERDRIVE or DC MASTER:

LED	Function	Color	MASTERDRIVE / DC MASTER	
H1	Internal T400 monitoring	red	flashes slowly 1.25 Hz flashes medium frq. 2.50 Hz flashes quickly 5 Hz steady light	RUN, standard operation fault/error initialization error system error
H2	Data transfer to the basic drive	yellow	flashes: OK	
H3	Data transfer to the communications module	green	dark or steady light: faulted	

4. Troubleshooting

Fault profile	Cause	Remedy
T400 is not running, MASTERDRIVES initialization stops at 0002, initialization of the DC MASTER stops at 12.2 or F80, H1 on the T400 flashes quickly	Switch S1/7 set to ON	Switch S1/7 must be set to OFF for operation
	No configured software loaded	Program the T400
	T400 defective	Replace the T400
Downloading not possible	T400 completely overloaded	S1/7 must be set to ON for downloading and then set back to OFF
	T400 defective	Replace T400
No connection can be established to the T400 using service/IBS or CFC	Switch S1/8 set to ON	Set switch S1/8 to OFF, USS operation is then disabled.
	Incorrect COM interface selected	CFC: Click on **START** in the Windows task bar, then on **SIMATIC, STEP 7 and** on **SIMADYN D online interface**. Select the interface SERVICE/IBS: Select under **Options,** the interface of the **ComPort**

4.1. Hotline

A free-of-charge Hotline is available to support users:

Phone: +49 9131 98 5000
Fax: +49 9131 98 1603
email: hotline.simadyn@erlf.siemens.de

The SIMADYN D Hotline can be accessed from 8.00 to 17.00, Monday to Friday.
Outside these times, you can use the telephone answering machine, fax or email.

5. Parameterization

All parameters, which refer to the functions and settings of the T400 technology module, are called *technological parameters.* They lie in parameter ranges between 1000 and 1999 and between 3000 and 3999 (if used).
Depending on the access type, thousands are represented directly, or as letter. In this case, there is an additional differentiation between visualization and parameters which can be changed.

The number and the function of the individual technology parameters is dependent on the configuring.

Range	Display	Example	Significance
1000 ... 1999	Hxyz	H234	Parameter No. 1234 which can be changed
1000 ... 1999	dxyz	d411	Visualization parameter No. 1411 (this cannot be changed)
3000 ... 3999	Lxyz	L234	Parameter No. 3234 which can be changed
3000 ... 3999	cxyz	c521	Visualization parameter No. 3521 (this cannot be changed)

The technological parameters can be read and changed (simultaneously) from several locations:
- PMU
- OP1, OP1S (the configured parameter names are displayed)
- CB1 (PROFIBUS)
- SCB2 with USS protocol
- Serial interfaces 1 and 2 of the CU
- PC/start-up program (SIMOVIS)

All parameter changes are stored in a EEPROM. This EEPROM allows a maximum of 100 000 write accesses. This limitation must be taken into account, if frequent write accesses, e.g. from a PLC via PROFIBUS or USS are used, e.g. with continuos commands to ‘store permanently in EEPROM’. For continuos changes the command ‘store temporary in RAM’ should be use.

6. Configuring

T400 can be configured with the graphic D7-ES configuring tools, based on Windows 95/NT. Thus, it is very easy to implement even complex customized supplementary functions in the drives. Complete standard software packages are available for functions and applications which are frequently required.

6.1. Standard software packages

The standard software packages offered, are completely generated using CFC, and can be used in SIMOVERT MASTERDRIVES and SIMOREG DC MASTER without any additional modifications. They are parameterized via the operator panel, OP1(S), SIMOVIS or via Profibus.
Please refer to the instructions of the appropriate standard application software packages for additional information.

Standard software packages are presently available for:

- angular synchronous operation
- axial winder
- cross cutter + flying saws

The software packages are available in the following forms:

- The standard software package is downloaded onto the **T400** as code which can run:
  T400 can be immediately used. When commissioning, only a few parameters have to be set for the particular application. The user does not have to configure using STEP 7/CFC.

- Standard software packages as **CFC source code** on floppy disk:
  We recommend that the source code is used if the software package has to be adapted to the particular application, which is impossible using the existing parameters, or if a standard software package is used very frequently.
  The functions of a standard T400 software package can also be implemented on the PM5, PM6 CPU modules using the source code. In this case, it is especially the closed-loop control-related core which can be used. In comparison to the configuring for the T400, when porting, only the function blocks for the input, output and communication interfaces have to be adapted to the appropriate SIMADYN D modules.

6.2. Freely configuring the T400

In order to generate your own software packages for T400, a Windows PC (Win95 or NT) and the **D7-ES software package are required (Order No. = 6DD1801-4DA2)**. D7-ES comprises the following components:

Components	Function (for T400)
STEP 7	General project administration and hardware configuration
CFC	Graphic editor
D7-SYS	Operating system, compiler, function block library

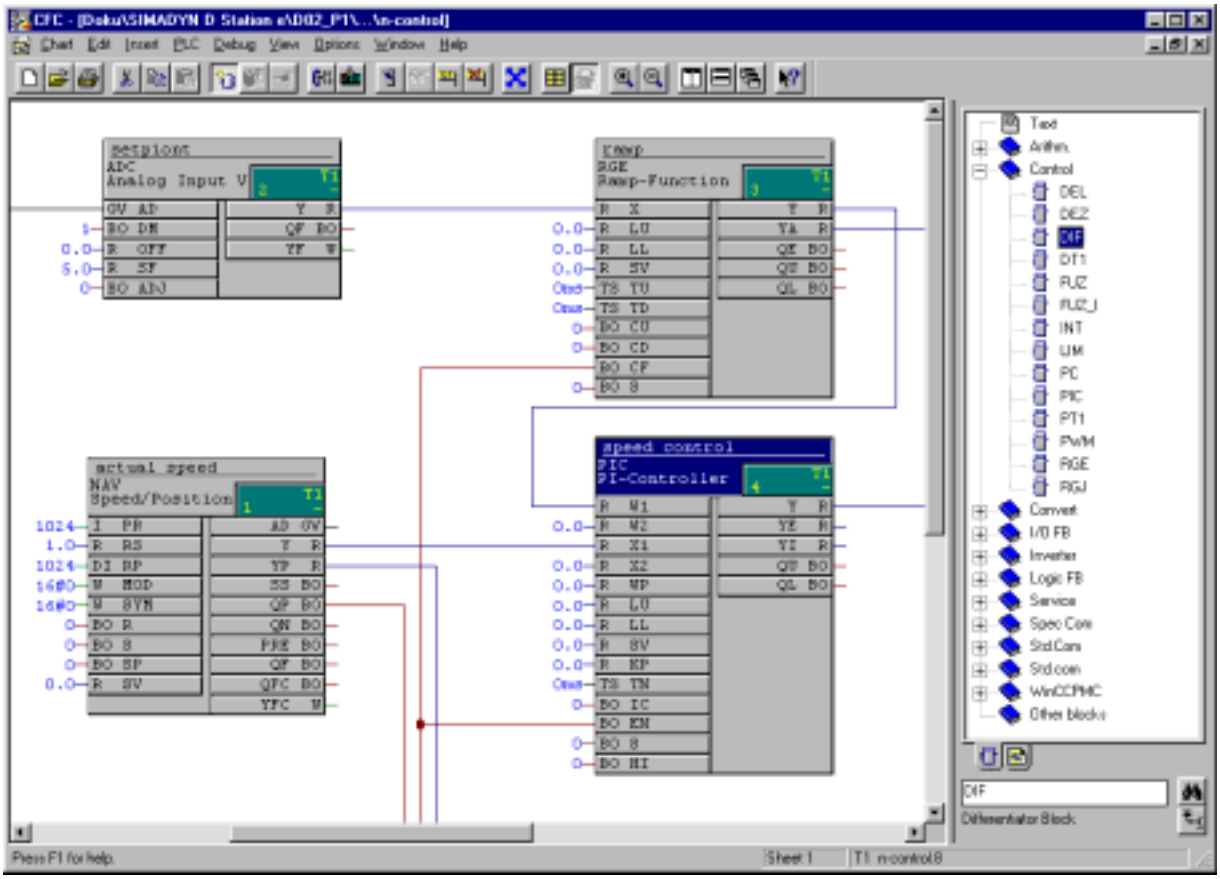
As STEP 7 and CFC are components from the SIMATIC software series, it goes without saying that SIMATIC S7 programs can also be generated. It is also possible to use SIMADYN D and SIMATIC stations in one and the same project, so that the user only requires one configuring tool.

Software configured for the T400 can easily be adapted for a CPU in the central SIMADYN D subrack. A maximum of eight CPUs can be used in multiprocessor operation in SIMADYN D subracks such as these. The standard CPU PM5 in this case corresponds to a T400.

Graphic configuring, "Configuring instead of programming"

Closed-loop control-related functions can be configured extremely simply using the CFC graphic configuring interface (Continuous Function Chart). A programming language does not have to be learned.

Function blocks are simply taken from a library, consisting of approx. 250 function blocks, and placed on a sheet, per drag & drop. The blocks in the library aren't used up, as they are prototypes, which can be called-up as often as required.
The function blocks are connected with one another by clicking on an output and an input. For inputs, which are assigned a fixed value, and are not to be connected, this value is simply specified in a parameterizing dialog box.
The configured software is then compiled by the CFC graphic configuring interface, and downloaded into the T400.



If the program is then running in the T400, the following functions can be realized directly in the graphic man machine interface using CFC

- actual values can be displayed and changed from the T400
- connections can be displayed, changed, deleted and added
- function blocks can be added or deleted.

Easy entry with basic configured software

The T400 basic configured software is a resource for users who wish to configure their own application on the T400. It allows users to generate a functioning T400 program quickly and without special SIMADYN D know-how. The basis configured software can already run and includes the following function blocks:

- coupling to basic drive- and communication modules of the drive converter with an interface for the data to be exchanged (setpoints/actual value)
- analog, binary and incremental encoder interfaces can be read-in and output
- serial T400 interfaces can be processed (USS, peer-to-peer)
- important connections are defined as parameter, which can be set and diagnosed using the configured functions (e. g. communications to the basic drive converter) via operator panels or SIMOVIS:

When the T400 (without standard software package) is supplied it is loaded with this software, and can therefore immediately run in the drive converter or in the subrack. Further, the basic configured software is also included as CFC source code in the D7-SYS software as example. Based on this project, the user can include functions he requires in a form of additional function blocks, or delete functions which he does not require. A detailed description of the basic configured software is included in D7-SYS as PDF document.

An introduction in the configuring of the T400 is in the manual **Configuring Instructions** (Order No. = 6DD1903-0EA0). It describes the basic steps in configuring a T400.

The function blocks are described in the SIMADYN D documentation (on CD: 6DD1987-0AA2, on paper: 6DD1987-1AB2) and in the online help of D7-SYS.

7. Manufacturer's declaration

EG-Herstellererklärung

Dokument-Nr./ Monat. Jahr:	11 / 11.98
Hersteller:	Siemens AG Bereich A&D Geschäftsgebiet Drehzahlveränderbare Antriebe Geschäftszweig Regelsysteme
Anschrift:	Frauenauracher Str. 80 91056 Erlangen Bundesrepublik Deutschland
Produktbezeichnung:	Digitales Regelsystem SIMADYN D Baugruppe T400 Baugruppenträger SRT400

Das bezeichnete Produkt ist ausschließlich zum Einbau in eine andere Anlage / Einrichtung bestimmt.
Die Inbetriebnahme ist solange untersagt, bis die Konformität des Endproduktes mit den Richtlinien 89/336/EWG (EMV-Richtlinie) bzw. 73/23/EWG (Niederspannungs-Richtlinie) festgestellt ist.

Hinweis:
Angaben zur EMV-gerechten Installation für den bestimmungsgemäßen Betrieb und weitere zutreffende Hinweise in der SIMADYN D Aufbau und EMV-Richtlinie, müssen beachtet werden.

Wir bestätigen die Konformität des oben bezeichneten Produktes mit den im Anhang zu dieser Erklärung gelisteten Normen

Siemens Aktiengesellschaft

Erlangen, den 13.11.98

Selch, Leiter Geschäftszweig		Schäfer, Entwicklungsleiter	
Name, Funktion	Unterschrift	Name, Funktion	Unterschrift

Der Anhang ist Bestandteil dieser Erklärung.

Diese Erklärung beinhaltet keine Zusicherung von Eigenschaften.

Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

Anhang
zur EG-Herstellererklärung

Dokument-Nr./ 11 / 11.98
Monat. Jahr:

Produktbezeichnung: Digitales Regelsystem SIMADYN D
Baugruppe T400
Baugruppenträger SRT400

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinein überein:

89/336/EWG *Richtlinie des Rates zur Rechtsangleichung der Rechtsvorschriften der Mitgleidstaaten über die elektromagnetische Verträglichkeit geändert durch RL 91/263/EWG, 92/31/EWG und 93/68/EWG des Rates*

- ❍ Störaussendung nach EN 50 081-2
  - – Störstrahlung nach EN 50 011 (Klasse A)

- ❍ Störfestigkeit nach EN 50 082-2
  - – ESD nach EN 61 000-4-2
  - – HF-Spannung nach EN 50 141
  - – HF-Feld nach EN 50 140 / 50 204
  - – Burst nach EN 61 000-4-4

73/23/EWG *Richtlinie des Rates zur Rechtsangleichung der Rechtsvorschriften der Mitgleidstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen geändert durch RL 93/68/EWG des Rates*

Niederspannungsrichtlinie nach:

- – EN 60 204-1
- – pr EN 50 178 (DIN VDE 0160)

8. ESD guidelines

8.1. What is ESD?

Almost all of the SIMADYN D modules have highly-integrated devices. These devices are, from their very nature, extremely sensitive to overvoltage conditions, and therefore also to electrostatic discharge.

ESD

The abbreviation stands for electrostatic discharge
Modules, which use these devices have the following warning label on the component side:



Electrostatic sensitive devices can be destroyed by voltage- and energy level which lie far below the perception levels of human beings. Voltages such as these occur when personnel touch a component or a module without having first being previously electrostatically discharged. Components, which have been subject to such overvoltage conditions, can generally not be immediately identified as being faulty, as this is only manifested after a somewhat longer operating time.

8.2. Handling ESD modules

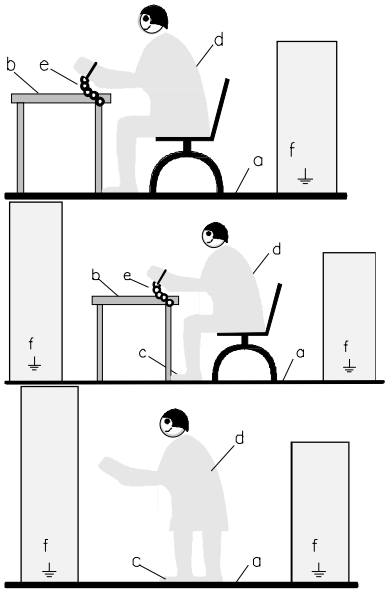
As a general rule, electronic modules should only be touched if this is absolutely necessary.
Components may only be touched if the person
is continuously grounded through an ESD bracelet, or
is wearing ESD shoes or ESD shoe grounding strips.
Before touching an electronics module, you must electrically discharge your body. This can be simply done by touching a conductive, grounded object immediately beforehand (e. g. bare metal cabinet parts, water pipe etc.)
Modules may not come into contact with highly insulating materials which can be statically charged. This includes plastic foils, insulating desktops, clothing manufactured out of man-made fibers.
Modules may only be placed down on conductive surfaces (desktop with ESD surface, conductive ESD foam rubber, ESD packing bags, ESD transport containers, cardboard- or paper surfaces).
Modules may not be brought close to data terminals, monitors or television sets.

8.3. Measuring and making changes on ESD modules

It only permissible to make measurements at the modules, if
the measuring unit is grounded (e. g. via protective conductor) or
before making measurements with an electrically-isolated measuring device, the probe is briefly discharged (for example by touching a bare metal control housing).
When carrying-out soldering work on modules, ESD soldering irons must be used or at least the soldering iron tip grounded.

8.4. Transporting modules

Modules and components may only be stored and transported in conductive packing materials (e. g. metallized plastic boxes, metal containers).
If the packaging is not conductive, then the modules must first be wrapped in conductive packaging materials. This can include, for example conductive foam rubber or normal household aluminum foil.
The necessary ESD protective measures are clearly shown in the following diagram.



a = conductive flooring surface
d = ESD coat/jacket
b = ESD desk = ESD chain
c = ESD shoes
f = grounding connection for the cabinets

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