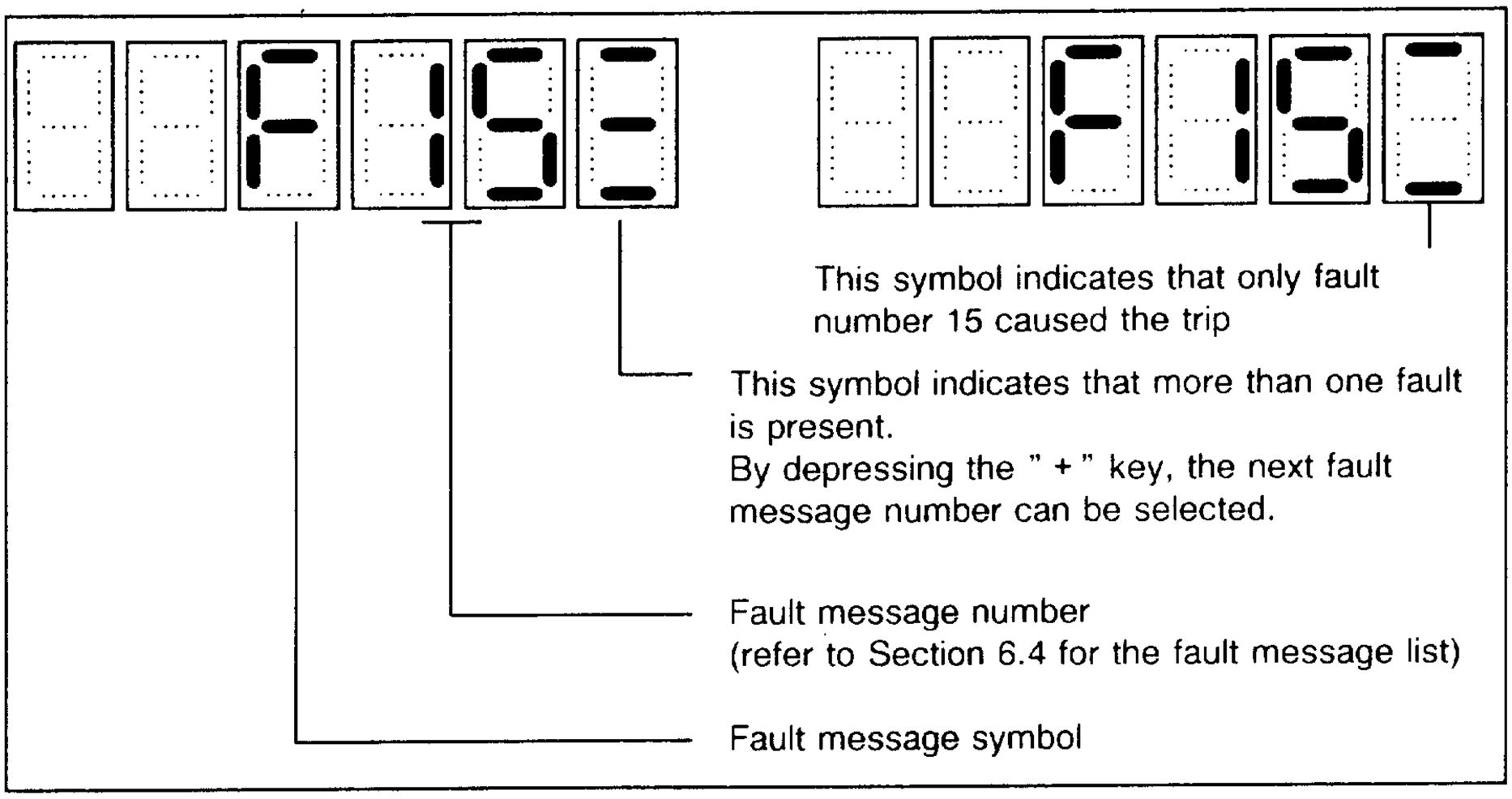
6 Faults and diagnostic aids

6.1 Fault display

When a fault occurs, it is evaluated by software and displayed. This is accomplished by the following flashing symbols:



6.2 Faults after power-up

The following faults may be present when the operating display LEDs are not lit after power-up:

- Circuit-breaker not switched-in
- At least two phases missing (U1, V1, W1)
- At least two input fuses have blown (F1, F2, F3)
- Central board G1 defective
- Connection between display board H1 and control board N1 defective
- Control board defective (red LED time-out error lit)
- Central board G1 overloaded as a result of a defective board (N1, N2, A1, S1)

The following faults may be present if all display LEDs (8.8.8.8.8.8.) are lit after power-up:

- Control board N1 defective
- Software board D1 or EPROMs defective

6.3 Faults after controller enable

If the motor rotates at a maximum of 10 RPM with a setpoint input n_{set} > 10 RPM, or if the motor oscillates (assuming that oscillation is not selected) at n_{set} < 10 RPM, the motor phase sequence is incorrect (interchange 2 phase connections).

6.4 Fault message list

For troubleshooting, the equipment should be checked in the sequence in which it is listed.

Fault message	Fault	Cause
F-01	Supply fault	• At least 1 phase missing
F-02	Incorrect phase sequence	• Incorrect phase sequence U1, V1, W1
F-09	Fault, encoder system 1 (motor encoder)	• Motor encoder not connected • Motor encoder cable defective • Controller module defective
F-11	Speed controller is at limit, speed actual value missing Fault message can be suppressed using terminal function 26 (refer to Section 5.3.13)	• Motor encoder not connected • Motor encoder cable defective • Encoder defective • Ribbon cable between N2 I/R board ↔ gating board A1 defective or not connected • Connection cable G1/X113-A1/X11 defective or missing • Motor ground not connected • Motor encoder cable screen not connected • Motor not connected, phase missing or phase sequence incorrect • Motor rotor locked • Speed actual value sensing (N1) defective • Gating board A1 defective • DC link fusing defective
F-14	Motor overtemperature	• Motor overload, incorrect load duty cycle • Motor current too high, e.g. due to incorrect motor data in P-096 • Defective temperature sensor (motor) • Motor fan defective, rotation incorrect • Speed actual value sensing (N1) defective • Motor winding short-circuit
F-15	Converter overtemperature	• Converter overload, incorrect load duty cycle • Ambient temperature too high • Unit fan failed • Temperature sensor defective • Motor circuit-breaker tripped
F-17	$I_{Mot} > I_{rated\ power\ section}$	• Incorrect motor/converter assignment

Fault message	Fault	Cause
F-19	Temperature sensor • Interrupted • Short-circuit	• Defective temperature sensor (motor) • Sensor connection interrupted • Defective speed actual value sensing (N1)
F-26 Alarm[1)]	EEPROM write protection not cancelled	• An attempt was made to write into the EEPROM (P-052) without depressing the write-protection button on the front of the software module. This is acknowledged by depressing the write-protection button.
F-40	Internal power supply faulted	• P15, N15 faulted • G1 defective
F-41	DC link overvoltage	• DC link capacitor defective • Supply overvoltage • N2 defective • Thyristor defective • DC link fuse defective
F-42	DC link overcurrent	• Chopper transistor defective • N2 defective • Thyristor defective • Short-circuit in the DC link
F-53	DC link charge fault	• Thyristor pulses interrupted • DC link capacitor defective • N2 defective • DC link fuse defective
F-56	Supply synchronizing fault	• Significant supply frequency fluctuations • Supply synchronizing voltage missing • N2 defective
F-79	Division-Interrupt Fault message can be suppressed by setting bit 11 in P-053 (refer to Section 5.3.9)	• Incorrect motor data in P-159...P-176
F-81	DC link overvoltage	Refer to F41 • G1 defective
FP-01	P* > encoder pulse No.	• incorrect parameterization (P-121...P-125, P-131)
FP-02	P_{act} > encoder pulse No.	• Zero mark signal from the encoder or Bero® interrupted

1) no pulse cancellation

6.5 Fault acknowledgement

Faults can be acknowledged as follows:

- Parameter key
  By depressing the parameter key with controller inhibit. A return jump is made to the operator control program after acknowledgement if no other faults are present.
- Remote acknowledgement
  With controller inhibit and by energizing terminal "R" (freely-programmable terminal function)
- Power-off
  Switch the unit off and on again
- Automatic acknowledgement of supply faults (refer to P-053)

6.6 Changing over to the operator control interface

If a fault is present, by depressing the "–" key, the operator control program can be selected for approx. 1 minute, without the fault being acknowledged.

6.7 Diagnostic aids

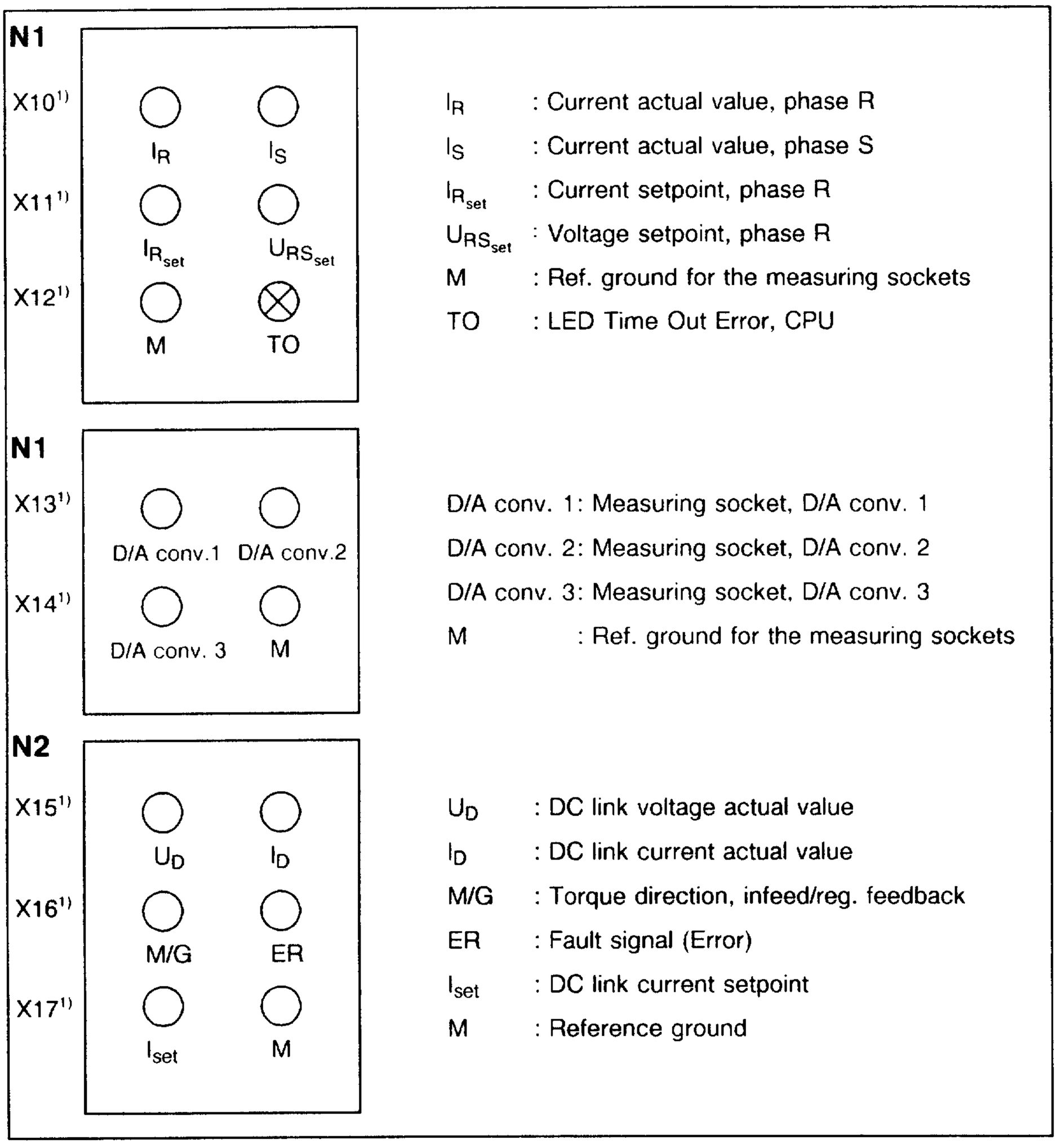
6.7.1 Measuring sockets

In addition to displays, measuring sockets on the front of the module are available as diagnostic aids.

Use of the D/A converter test sockets is described in Section 5.3.12.

Addresses of variables for diagnostics

Variable	Address High	Address Low	Value	Corres-ponds to
Speed setpoint	0C02H	0C00H	10 0000H	n_{rated}
Speed actual value	0C06H	0C04H	10 0000H	n_{rated}
Abs. speed actual value (1 ms)	–	1402H	1000H	n_{rated}
Speed setpoint - actual value difference	0C0AH	0C08H	10 0000H	n_{rated}
Torque setpoint from speed controller	–	0C66H	Adr. 0F52H	M_{drated}
Torque setpoint for K/P converter	–	0C6CH	Adr. 0F52H	M_{drated}
Actual M_{dset} for M_d operation	–	0C6EH	Adr. 0F52H	M_{drated}
Ramp-function generator input	0E00H	0E02H	10 0000H	n_{rated}
Ramp-function generator output	0E04H	0E06H	10 0000H	n_{rated}
Magnetizing current setpoint	–	0F5CH	2000H	I_{rated}
Active current setpoint	–	0F5EH	2000H	I_{rated}
Slip frequency setpoint	–	0F7CH	2000H	f_{rated}
Stator temperature	–	0FC2H	H	in °C
Digital filter input	–	1B08H	Adr. 0F52H	M_{drated}
Digital filter output	–	1B0AH	Adr. 0F52H	M_{drated}



Overview of the measuring sockets on boards N1 and N2.

Unit	I_D, I_{set}	U_D	I_R, I_S, $I_{R_{set}}$	$U_{RS_{set}}$
6SC6608	10 V ≙ 167 A	10 V ≙ 600 V	10 V ≙ 208 A	5 V ≙ 360 V
6SC6612	10 V ≙ 298 A	10 V ≙ 600 V	10 V ≙ 368 A	5 V ≙ 360 V
6SC6620	10 V ≙ 580 A	10 V ≙ 600 V	10 V ≙ 606 A	5 V ≙ 360 V

1) Connector designation refers to the measuring sockets on the board (= also circuit diagram info)

6.7.2 Speed actual value - fault counter

(P-020) Diagnostic parameter dn/dt

Parameter P-020 is used to monitor the speed sensing. To realize this, in softwre release V1.0, after initialization, parameter P-045 should be increased by one increment, and then reset to the old value. The constant, calculated for the speed actual value fault counter, must be saved using "write into EEPROM".

The contents of P-020 are increased by 1 if an excessive speed difference is identified within the sampling time (dn/dt).

Sporadic response by just a few increments is insignificant, as the speed controller is not influenced.

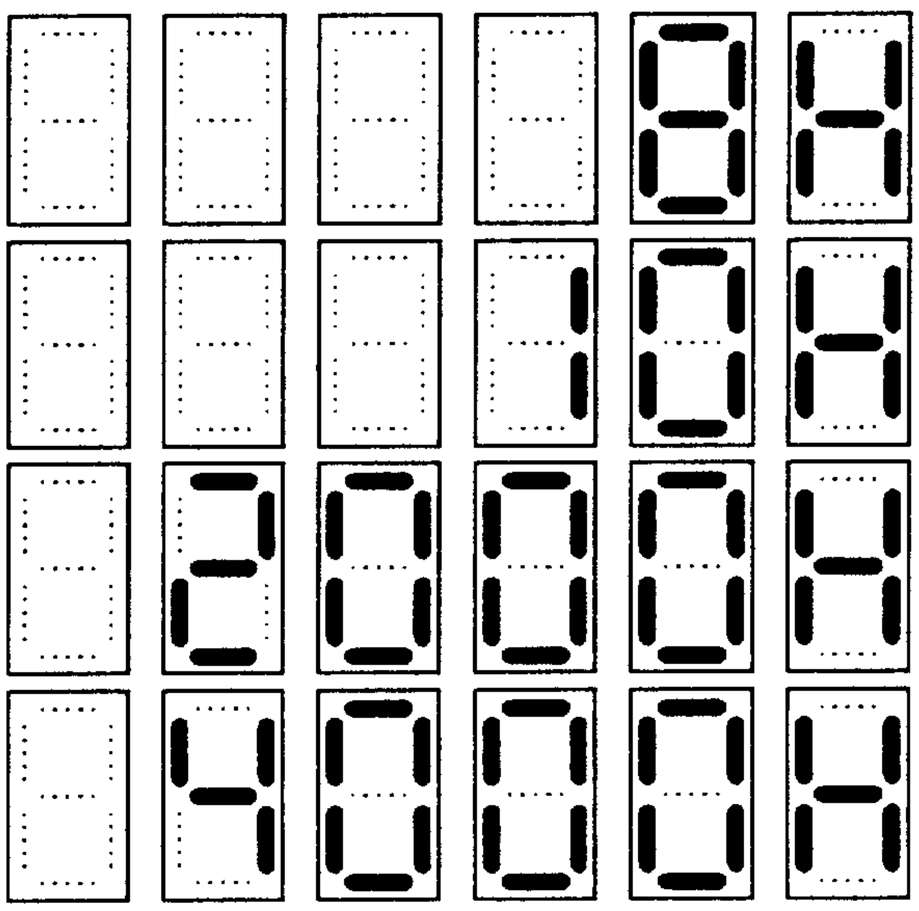
An increased signal noise level is present if the contents of P-020 are continuously increased by several increments.

The causes could be:

- Encoder screen not grounded
- Defective encoder
- Defective grounding of the electronics ground of the SIMODRIVE 660
- Motor ground not connected at SIMODRIVE 660
- Entered motor moment of inertia is too low (P-159)

6.7.3 Fault flags

(P-028) Fault signals are stored in parameter P-028, which do not result in shutdown (pulse inhibit).



Temperature sensor
- Interrupted
- Short-circuit

Pre-alarm, pulse cancellation after approx. 4 min.

Motor limit exceeded

$n_{act} > n_{max.\ Mot}$

Division interrupt
- Error in the arithmetic routines
- Incorrect data entry

Transistor monitoring has responded → (P-070)

6.7.4 Transistor diagnostics

(P-070) The transistor diagnostics parameter P-070 is provided for transistor monitoring. Parameter contents which are not equal to 0H can be caused by one of the following:

- Defective gating board (A1)
- Defective transistor in the power section
- Defective control board (N1)
- Defective infeed/regenerative feedback board (N2)

If a transistor monitoring function has responded, the parameter contents change from 0H to the appropriate transistor value:

Phase U2	1H	transistor V2 (+ V22)[1)]
	2H	transistor V6 (+ V66)[1)]
Phase V2	4H	transistor V3 (+ V33)[1)]
	8H	transistor V7 (+ V77)[1)]
Phase W2	10H	transistor V4 (+ V44)[1)]
	20H	transistor V8 (+ V88)[1)]
Chopper	40H	transistor V1 (+ V11)[1)]
	80H	transistor V5 (+ V55)[1)]

If several transistor monitoring functions have responded simultaneously, other parameter contents are possible.

P-075 If parameter P-075 is set to 1H, the contents of P-070 are set to 0H, and set again when the transistor monitoring responds.

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1) only valid for 6SC6620

6.7.5 Minimum and maximum value memory

Parameters P-179 and P-181 to P-183 are available to monitor individual variables (RAM data locations).

P-179 The minimum and maximum value memory function is started by setting this parameter to 1H or 2H.
1H: Absolute value evaluated
2H: Bipolar value evaluated

P-181 Address of variables to be monitored. The parameter contents can be stored in the EEPROM.

(P-182) Minimum value display

(P-183) Maximum value display

The memory function is re-started by changing parameter P-179.

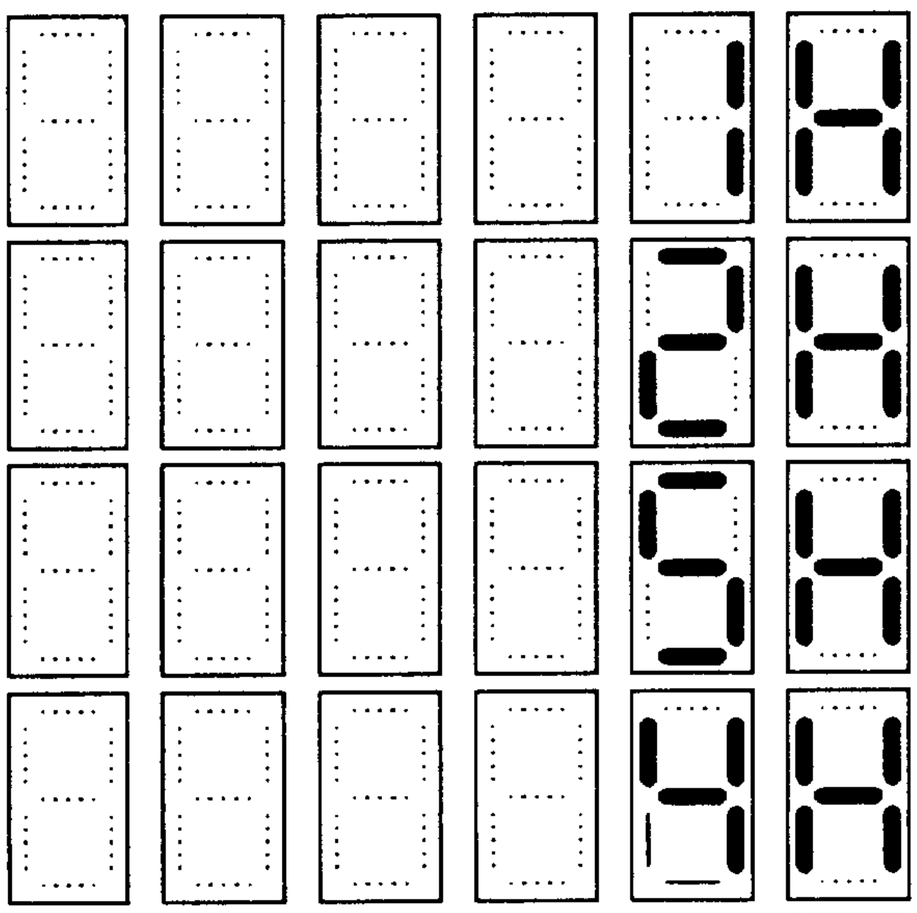
The memory function is stopped if 0H is written into parameter P-179.

6.7.6 Transient recorder function

A transient recorder can be set using parameters P-206 to P-218, with which two signals can be recorded over a specific time interval (640 · 1 ms = 640 ms). Start-, stop- and trigger conditions can be selected. The memory contents can be output via measuring sockets.

P-206 After the transient recorder has been parameterized (P-207 to P-218), it is activated by setting parameter P-206 to 1H.

P-207 The transient recorder mode of operation can be defined using parameter P-207. The following functions are possible.

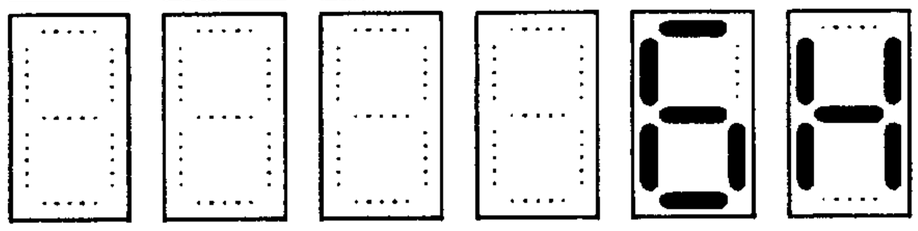


The recording can be started immediately without start or stop conditions via parameter P-206.

After parameter P-206 has been set, recording is only started when the start condition (P-208, P-209) is fulfilled. Recording is made without stop condition.

Recording is started immediately after parameter P-206 is set until the stop condition is fulfilled (P-210, P-211).

The record memory can be pre-set in this mode. The contents of parameter P-217 are written into the record memory.



In this mode, recording is with the start and stop condition.

A start condition can be parameterized using parameters P-208 and P-209.

P-208 Address of the variable, which is significant for recording start

P-209 Start condition mask, which is compared with the variable from parameter P-208.

A stop condition can be parameterized using parameters P-210 and P-211.

P-210 Address of the variable, which is significant for stopping the recording.

P-211 Stop condition mask which is compared with the variable from parameter P-210.

Two signals can be simultaneously recorded.

P-212 Address of record signal 1

P-213 Address of record signal 2

The next parameters P-214 to P-218 serve to parameterize output at the measuring socket.

P-214 Output is started by setting parameter P-214 to 1H.
Record signal 1→ D/A converter 2 (N1)
Record signal 2→ D/A converter 3 (N1)
The settings for the assignment and normalization of the D/A converters, which are used to output the recorded signals, are buffered. The D/A converters are parameterized with their original values after output.

P-215 Normalization, record signal 1 (shift number)

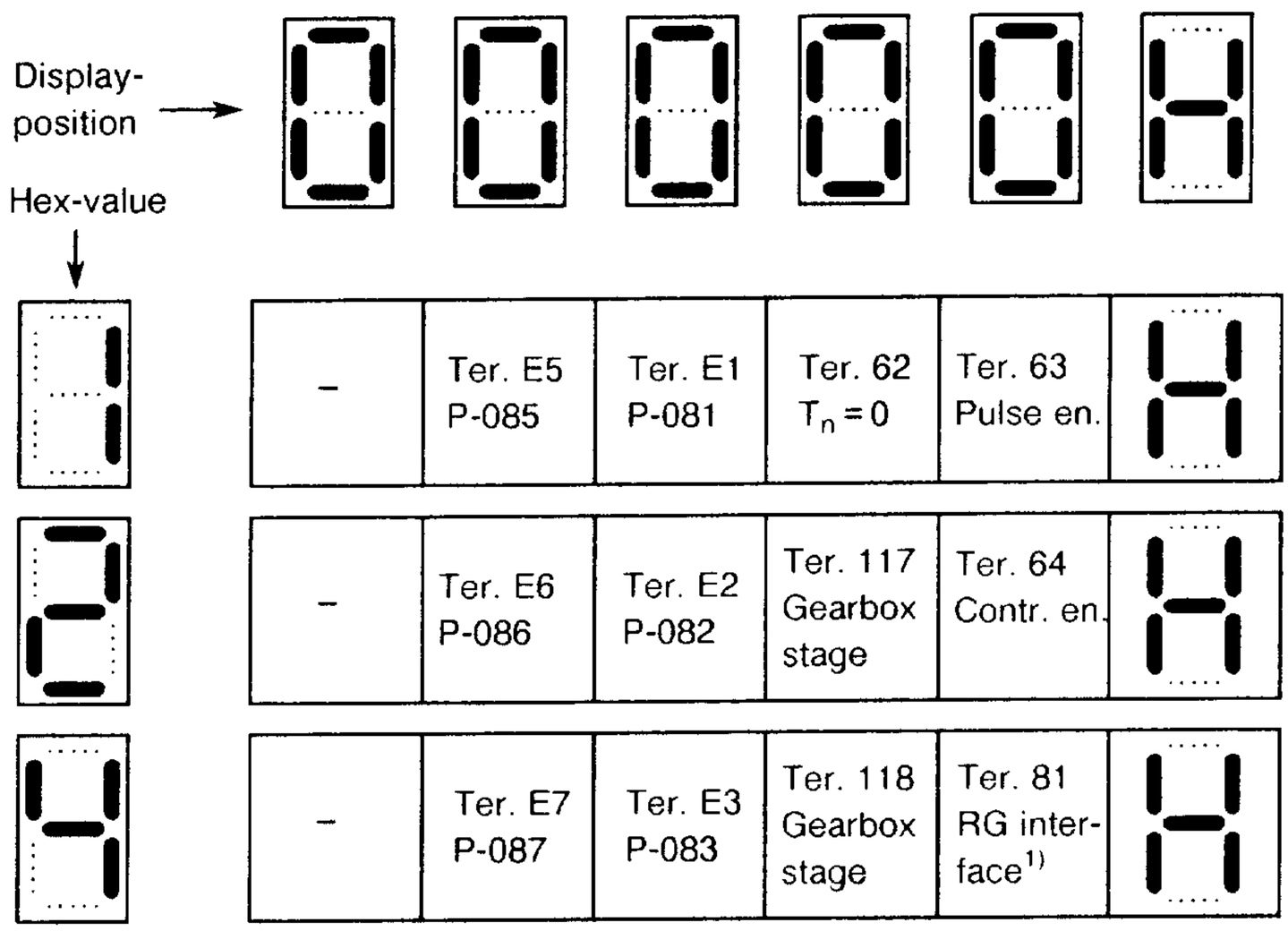
P-216 Normalization, record signal 2 (shift number)

P-217 Trigger signal amplitude "low"

P-218 Trigger signal amplitude "high"

6.7.7 Diagnostics of the input terminals

P-011 Status of the connecting terminals



1) 4 ≙ Term. 81 = Low

P-254 Display of the active terminal function

Display-position → 0 0 0 0 0 H

Hex-value ↓

1

–		Gearbox stage bit 0		2nd limit M_d	H
		Ter. 117		Ter. 111	

← Significance

← Function-number (No.) or terminal (Ter.)

2

–		Gearbox stage bit 1	M19	Oscil-lation	H
		Ter. 118	No. 6	No. 2	

4

–		Gearbox stage bit 2	$T_{accel.} = 0$	Reset fault memory	H
		Ter 119	Ter. 62	No. 3	

8

–	Setpoint enable		n-contr. integrator inhibit	M_d-mode	H
	No. 16		No. 8	No. 4	