LCA 200

Text Display

Find out what's going on virtually free off charge

A text display system which saves more than it costs
The universally applicable text display LCA 200 shows what your machines and control can do. If you wish, it can do this 1024 times in different languages.
You make a precise display or message out of everything you have. All you need are simple contacts or PLC outputs.
The small and compact LCA 200 with its enormous performance capabilities, easily blends in with your machine design, whether it be once, twice or, to put it a nutshell, as often as you want, as often as you have something to display.
And why not in any case if you can have two text displays for the price of one.
Programming the LCA 200 with any PC is such a dream that you could fall into the temptation of not wanting to do anything else.
It only remains to be said: just simply try out this universally applicable LCA 200 text display!

Reg 10470/1002

CiS-Nr.: 360.000.0400

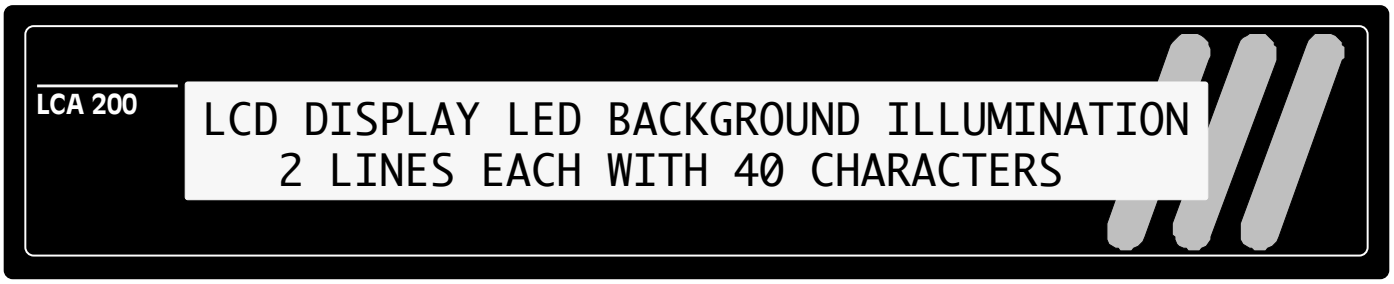
Version 2/06.94

UP TO 1024 MESSAGES
6 VARIABLE FORMATS, 4 OPERATING MODES

The LCA 200 text display can be easily incorporated into your automation concept. The drive and message text call which can be selected by means of individual contacts (connectors) or any PLC system is extremely simple. The same applies for the programming and parameterization of the LCA 200 with the LCA*PRO* planning software.

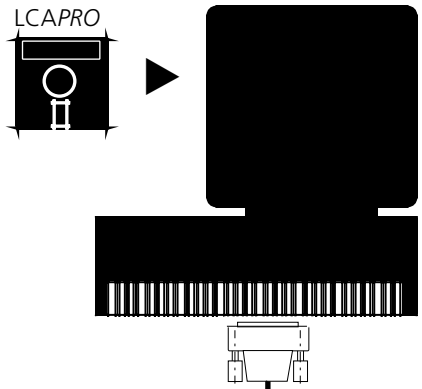
Here is an outline of the most important performance capabilities of the LCA 200

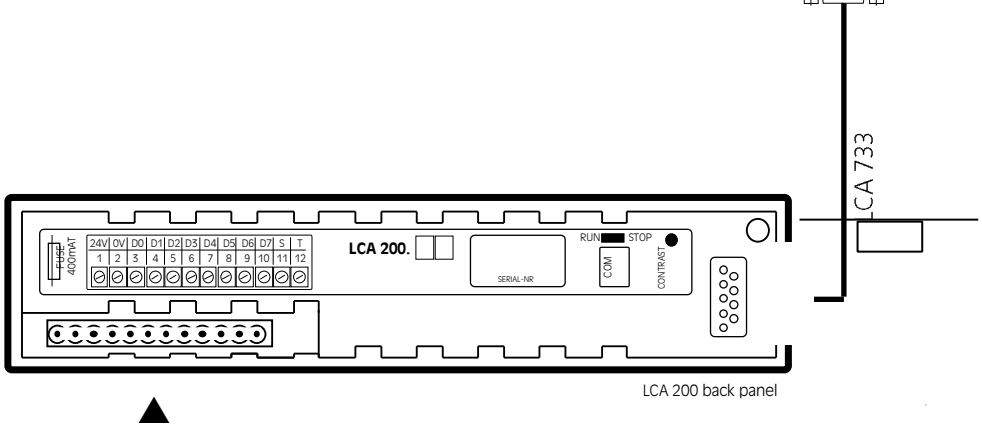
- **LCD-Display 2 x 40 characters**
  with LED background illumination
- **Integrated EEPROM**
  for firmware, texts and variable definitions
- **10 Inputs**
  for a comprehensive text display drive
- **RS 232 Serial Interface**
  for programming with the software LCA*PRO*
- **Up to 1024 Message Texts**
  with 2 main lines and 30 additional lines, every text is combinable with variables. Each message text can be formulated as info or fault.
- **Up to 16 Help Texts**
  with 2 main lines and 30 additional lines
- **Up to 4 Default Texts**
  with 2 main lines and 30 additional lines
- **4 Ways of Operating (Modes)**
  Direct drive, binary drive, cyclical transfer, selective transfer
- **3 Message Formats**
  Last message, initial message, cyclical display
- **6 Variable Formats**
  BIT, STRING, BCD, BIN, VBIN and ASCII variables
- **16 Function bits** (external)
  - Help text call
  - Quitting (flashing called message text is made static with Q-key)
  - Forward/back paging in the message memory
  - Call additional lines
  - Call main lines
  - Supression of infos and faults
  - Selection of message formats
  - Selection of default text/help text number



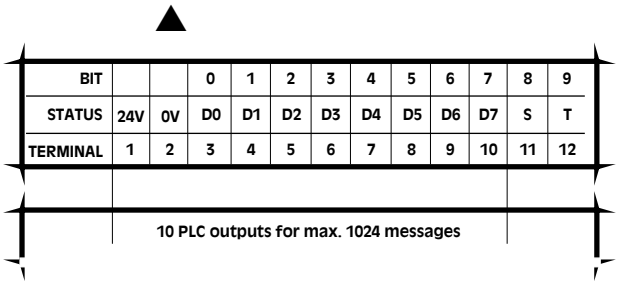
Programming the LCA 200 text display is done with a PC (MSDOS). We supply the LCA*PRO* planning software for this. The individual project data and the firmware are loaded per down load into the EEPROM.

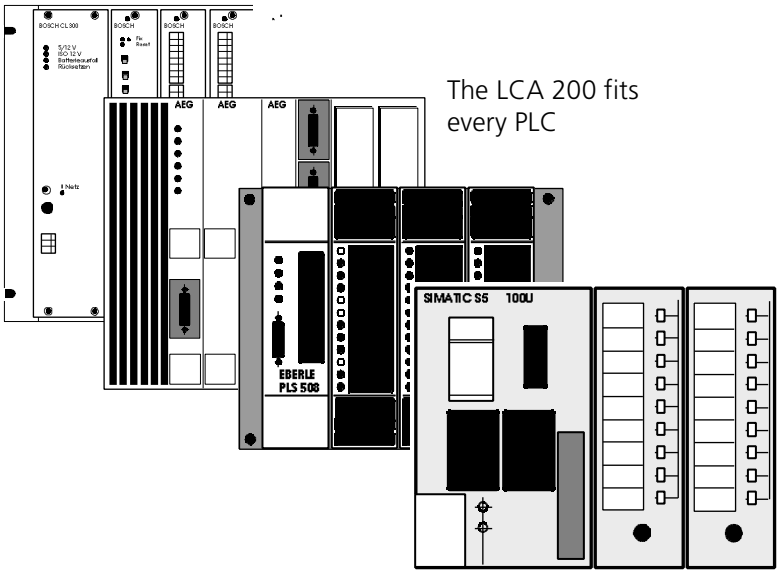
The connection from the PC (COM1 or COM2) to the LCA 200 is done with the LCA 733 cable





LCA 200 back panel





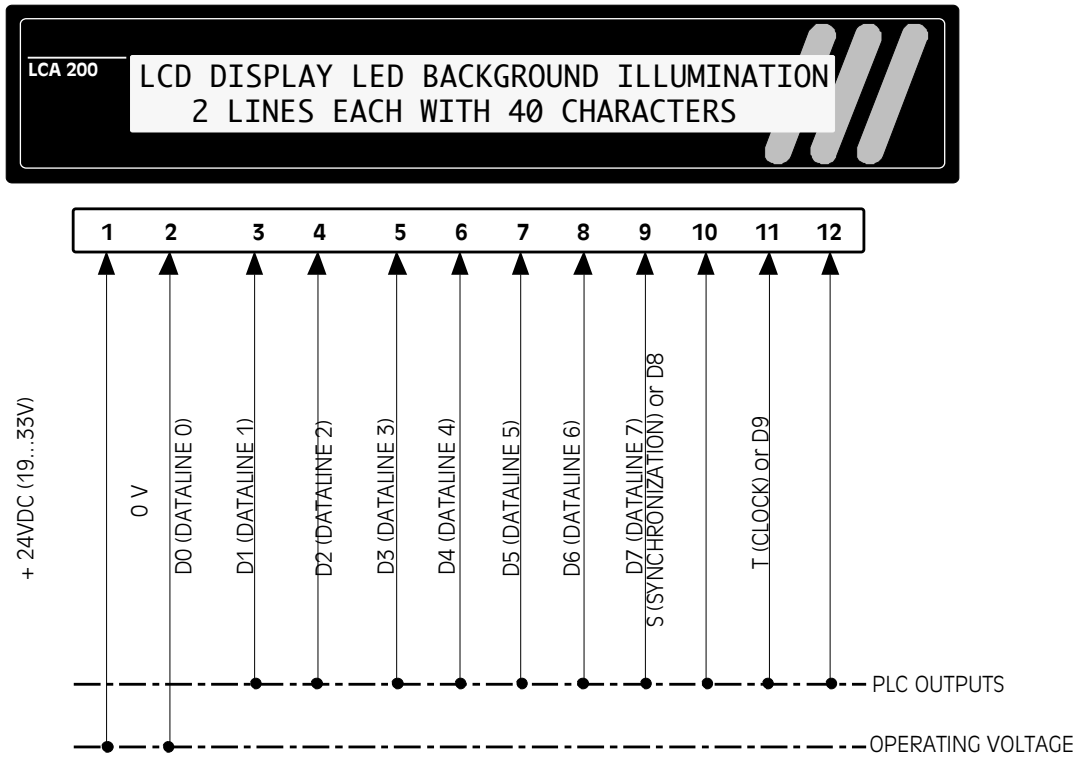
The LCA 200 fits every PLC

CONTENTS OF THE LCA 200 MANUAL

The Text Display Connections

The connection between the PLC and the LCA 200 is achieved by means of the 12pin terminal connector. Every function is brought into play by means of this interface:

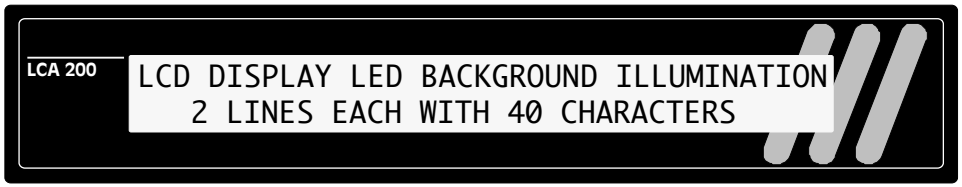
- **Call help texts**
- **Call message texts**
- **Supply variables**
- **Operation of the text display**

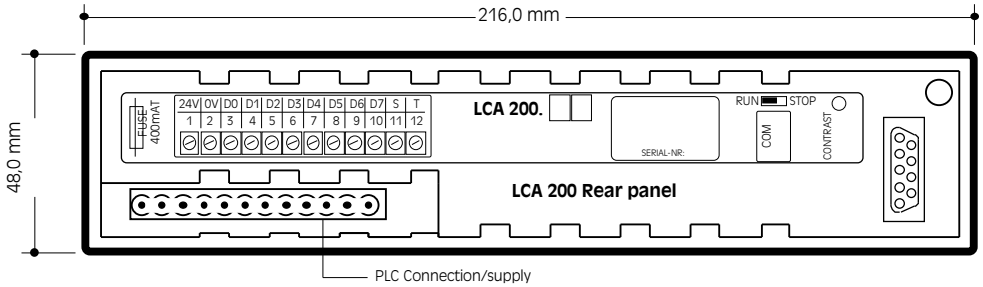


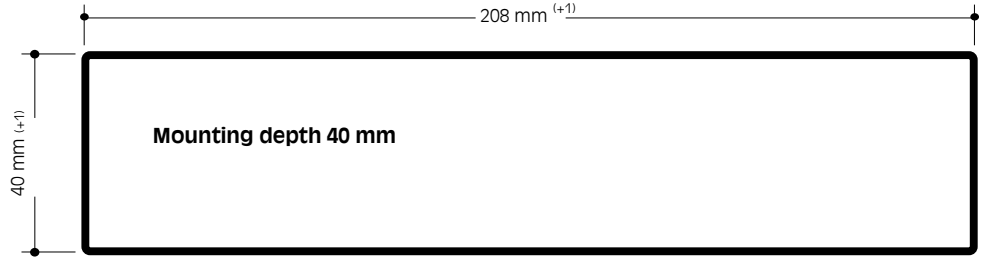
Technical Details

Operating voltage		**+19 ... 33V= (DC)**
Signal voltage		**+19 ... 33V= (DC)**
Power dissipation		**6 W**
Connections		**12pin strip connection, plug**
Safeguard		**Front panel: IP 65** **Back panel: IP 20 (as IEC 529)**
Dimensions (without plug)		**216 x 48 x 40 mm**
Weight		**ca. 275 g**
Humidity	no rear panel condensation	**max. 95%**
Input resistance		**ca. 5.8 KOhm**
Input level		**LOW: < 9 V (typ. 10,5 V)** **HIGH: > 16 V (typ. 14,5 V)**
Resistance to interference	per IEC 801-1	**Operating voltage**
	per IEC 801-1	**discharging on rear panel**
Temperature	Storage	**-25...+70° C**
	Operating	**0...+50° C**
Fuse		**Glass fuse 400 mAT**
Display		**LCD (LED background illumination)**
Reading angle		**(60° above/below) 120°**
Lines		**2**
Characters per line		**40**
Height of character, pixel matrix		**5 mm, 5 x 7 dots**
Character set		**ASCII (8 free definable characters)**
Message call		**direct, binary or in multiplex procedure**
Message pages		**maximum 1024**
Idle, message, help texts		**2 main lines, 30 additional lines per page**
Memory (for firmware and texts)		**EEPROM 32 kB** **for texts ca. 22 kB available**
Variable formats		**BIT, STRING, BCD, BIN, VBIN, ASCII**

Dimensions and Front Cross-section





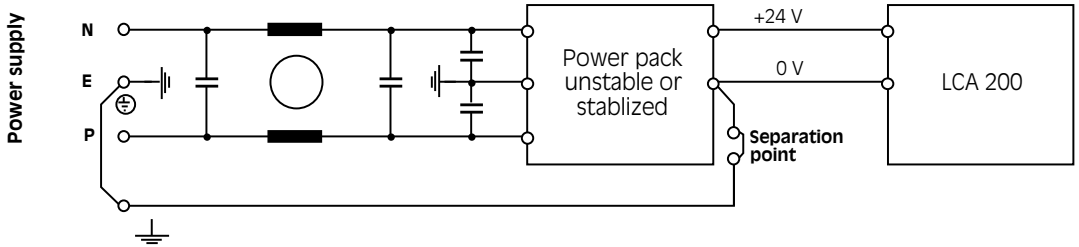


Character Table

The character table shows all the ASCII and special characters with the corresponding decimal coding that can be displayed on the LCA 200.

You can create your own special characters with the 8 definable characters.

Example of a suppressor with filter switch for large interference levels

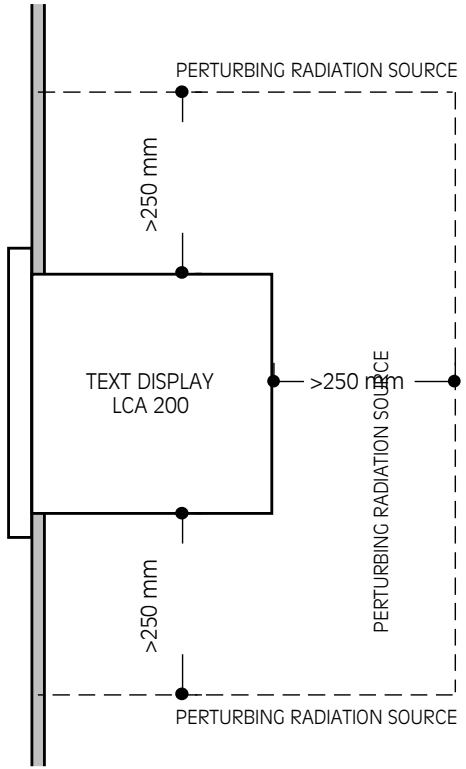


According to the VDE 0113, it must be possible to measure the current to earth at the separation point.

General Interference Protection Measures

Even the best electronic can only guarantee a secure function up to a certain interference level. In order to avoid unnecessary breakdowns of apparatus, the following information should be born in mind when planning:

1. If possible put the supply and signal wires of the LCA device in separate cable channels.
2. The safety distance to the source of interference should be at least 250 mm.
3. The built-in safety and relais coil inductances in the same switch cabinet must be switched on with the corresponding recovery diodes, resprectively R-C-erasure parts.
4. Do not use fluorescent lamps for illumination of the control cabinet.
5. Fix a central earthing point with a large enough cross section to connect the PE earth wire.
6. If there's great field strength as with a large transformer, we recommend the installation of a separate insulating plate.
7. Frequency converters and other devices can only be suppressed with shielded filter switches.
8. The best drainage of high frequency interferences is achieved with shielded signal wires, whereby the protection should be earthed both sides. However steps to incorporate an equipotential bonding conductor $\geq 10\ mm^2$ must be made (refer to VDE 0100. Part 547).
9. Ready made filters inserted before the supply circuit, have proven themselves to be effective in the case of large interferences.

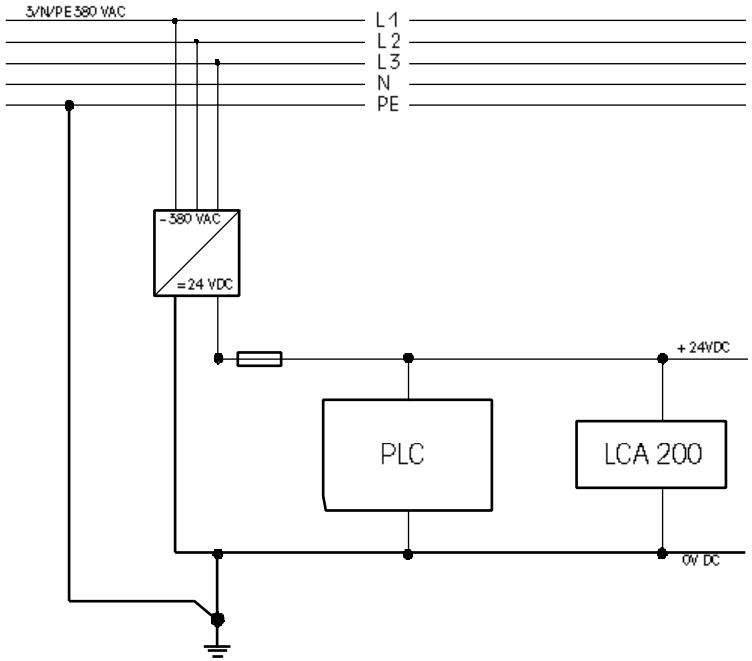


Installation Instructions

To maintain a stable operation of the text display, all the perturbing radiation sources should be at least 250 mm distance from the LCA 200. This also applies to the data and supply lines of the LCA 200.

With cable lengths > 5 m, we recommend protected lines earthed on both sides. Please note that in this case, an equipotential bonding conductor with a minimum diameter of 10 times cable sheathing will be necessary. The reason being the **compensating current!**

Feed lines to the LCA 200 should not be lead in along with high tension or high frequency cables.



Operating current per DIN 19240	U_B	: 24 VDC ≤ (5% residual ripples)
	U_{Bmax}	: 33 VDC
	U_{Bmin}	: 19 VDC
Current consumption		: ~200 mA (to +24VDC)

Current Supply

To maintain stable operation of the LCA 200 text display, the following information appertaining to current supply should be taken into consideration:

Only run the LCA 200 within the specified range of operating voltage.

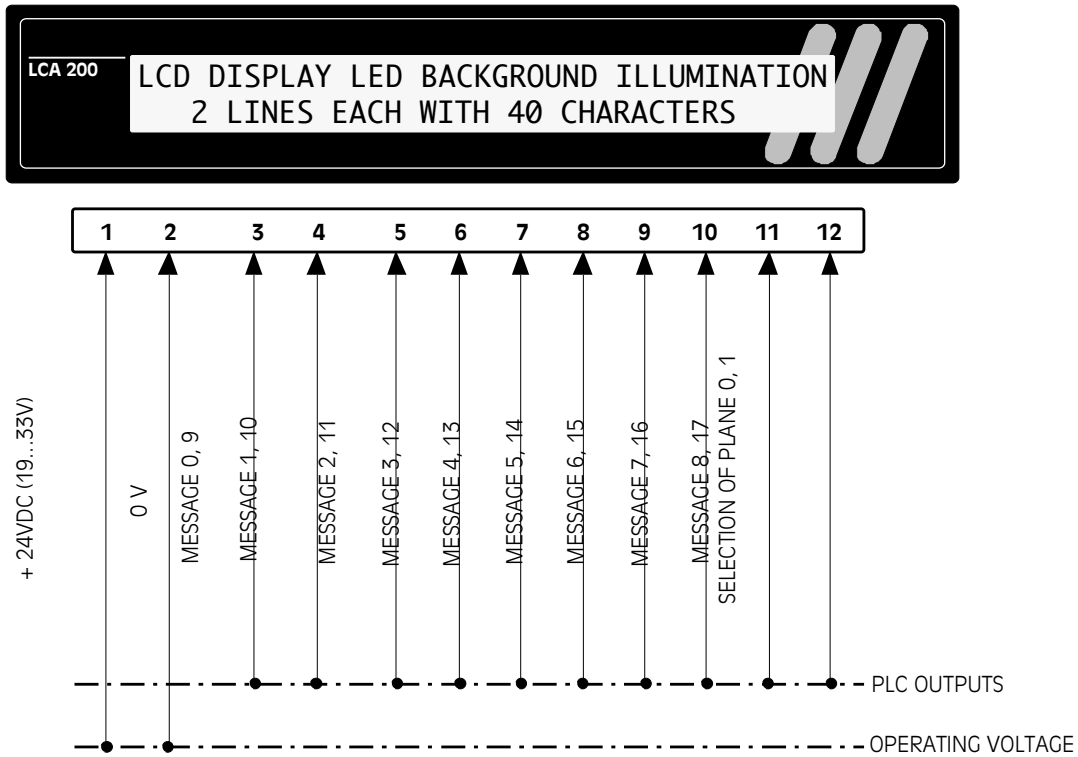
Short term voltage interruptions of ≤ 4 ms are permissible.

An operating voltage U_B of 35 V is permissible for the duration of ≤ 100 ms (repeating frequency ca. 1 Hz).

The LCA devices may only be run with the safety »low voltage« as of VDE 100. The control transformer must confirm to the VDE 0551. Thereupon according to the VDE a single pin earthing of the operating current is possible. We recommend this earthing when running our devices.

Without single pin earthing of the operating voltage, you require your own control transformer to operate the LCA 200.

If switching on is done with the operating/signal voltage safeguards or relais, they must be equipped with recovery diodes and/or interference protection switches.



Mode 1: Direct drive

The Communication Concept

The LCA 200 text display possesses 10 digital inputs for driving. For example, 10 digital PLC outputs can be used to call and update texts and variables.

The functionality of the 10 inputs is determined with the LCA*PRO* planning software.

After a data record has been created which contains text and variable definitions it is transfered into the text display together with the firmware for the selected mode through the serial RS 232 interface of a PC. This data finally ends up non-volatile in the integrated EEPROM of the LCA 200 text display.

At the moment, 4 drive modes are available. There is a diagnostic module for every mode which can be activated with the LCA*PRO* planning software. This diagnostic module provides a means of assistance in facilitating the primary commissioning and in the search for faults in the drive software.

Mode 1: Direct Drive (without Clock and Synchronization)

This mode presents the simplest type of drive. Filing log 1 (24V) permits double line message texts to be activated with the terminals 3...11 (Do...D7,S) 9.

If all the inputs are log 0, a double line idle text appears.

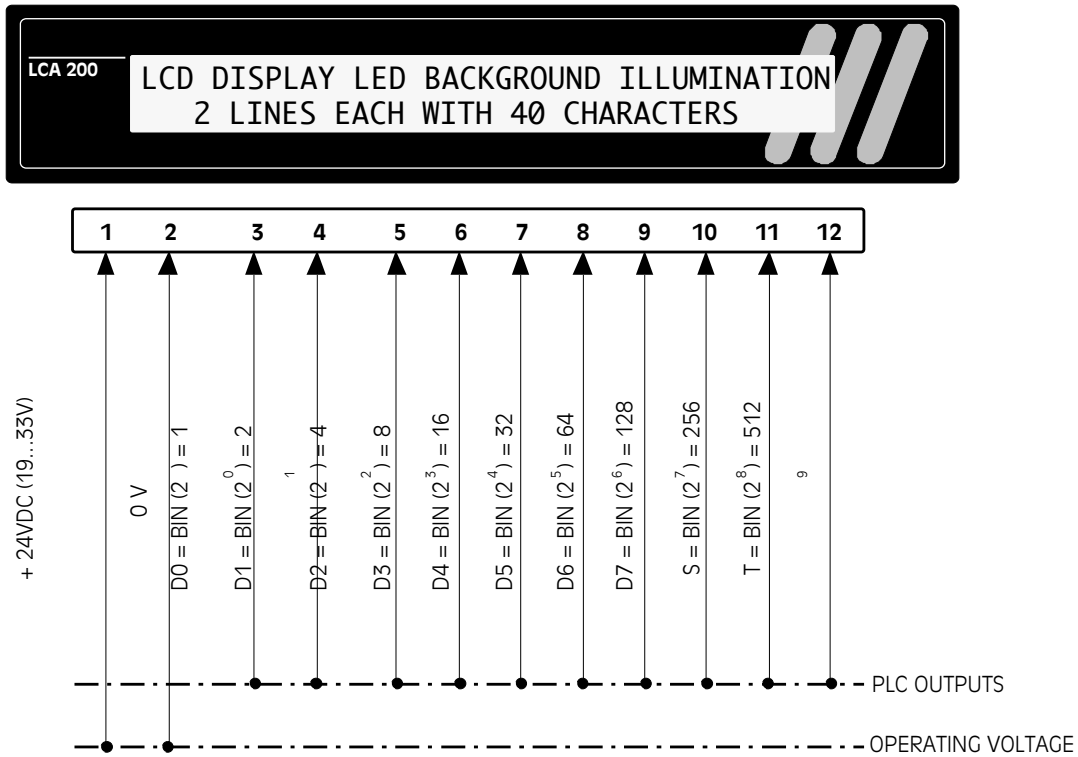
With log 1 at the terminals 12 (T), a second plane can be activated (e.g. for language selection). Whereby there are 2 idle and 18 message texts available.

If several inputs are log 1, the texts roll through in a time cycle preset by the planning software.

With the text groups "idle texts" and "message texts", so called default texts or category texts can be defined.

If a text is lined up but not projected, an empty display appears.

The internal variable "text number" can be applied in the filed texts.



Mode 2: Binary drive

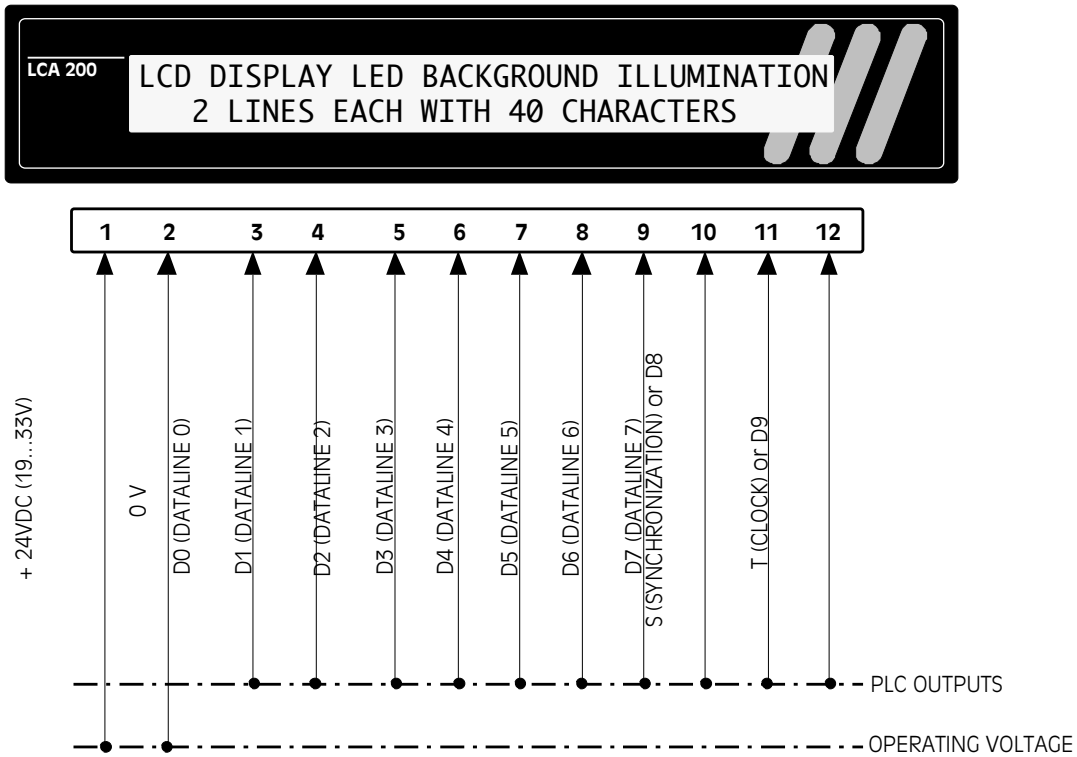
Mode 2: Binary drive (without Clock and Synchronization)

On apply a binary value (10 bit) with this mode, it is possible to activate a maximum of 1024 double line messages (0...1023).

The binary values are filed with the terminals 3...12 (Do...D7, S, T). The most significant bit (MSB) is terminal 12 (T), the lowest significant (LSB) is terminal 3 (D0).

A default message text can be defined for non-planned message texts. It is advisable to integrate the variable "text number" here.

If a text is lined up but hasn't been planned, an empty display appears.



Mode 3: Cyclical transfer

Mode 3: Cyclical Transfer (Multiplex with Clock and Synchronization)

A maximum of 256 bytes (terminals 3...10 = D0...7 = data bit 0...7) are cyclically transfered with the terminals 11 (S= synchronbit) and 12 (T=Clock).

The text display absorbs the applied bytes (data bits D0...7) with every positive as well as negative edge of the clock bit.

The first byte is marked with the terminal 11 (S) = log 1. All the following bytes are transfered with the reset synchronous input terminals 11 (S) = log 0.

It is absolutely essential as the distance between two clock edges amounts to at least a millisecond.

As the outputs of the various PLC and componentry manufacturers have differing switching delays for log 0/log 1 - and log 1/log 0 transfers, a "clock delay time" can be set with the planning software. It can be set within the range 250 µs and 10ms.

The cyclical transfer is to be recommended if the PLC cycle time is short (< 10ms) or the PLC has a timer interrupter facility <10ms with fast periphery access. All the data bits of the address area are transfered into the LCA 200 cyclically.

Advantage: minimum programming and execution time. The PLC only has to present the information for the respective addresses that follow and to invert the clock bit. 256 PLC cycles are necessary for the maximum number of 256 addresses. In order to increase the speed for updating the data, the number of maximum addresses must be reduced to the highest number of applied addresses if they are less than 256.

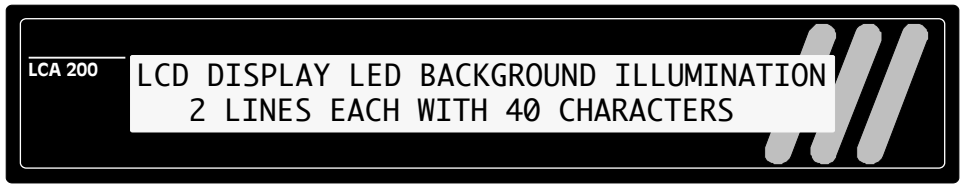
The synchronising S log 1 and the clock flank puts the address pointer onto the address 00. Every positive (0 -> 1) or negative (1 -> 0) flank of the clock T increases the address pointer (+1). The LCA reads the data bits of this allocated address and calls functions, messages and/or variables. The clock bit is inverted with every writing of the PLC output byte.

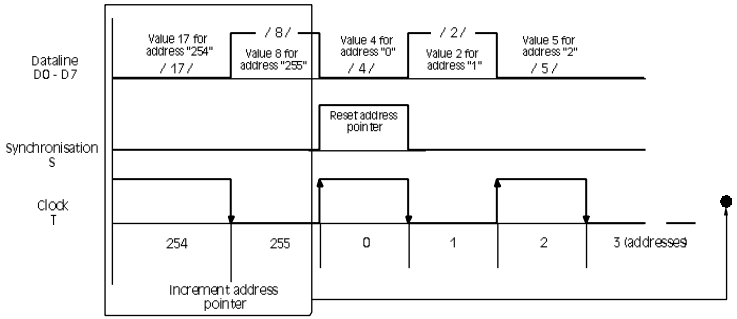
If the address pointer reaches the address 255, it must be reset again to address 00 with the synchronization S (log 1). If the address pointer is not reset, it remains on address 255.

With every address, the address pointer can be reset to address 0 with the synchronization (log 1).

Data bits of the respective address must always be filed on the dataline D0...D7.

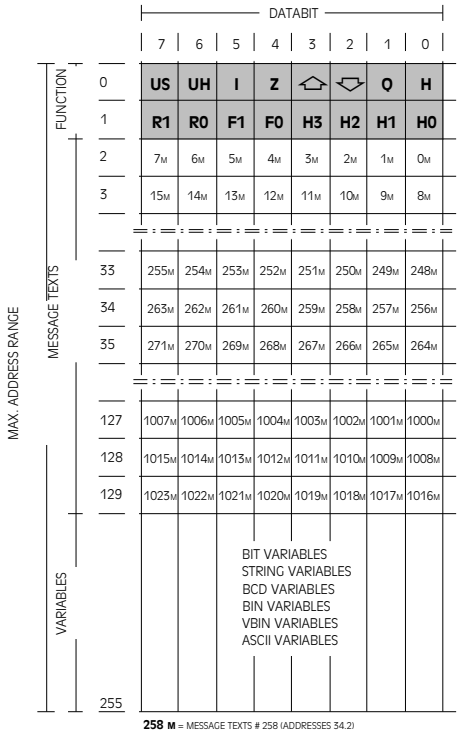
You can glean the driving concept from the following flow diagram. Whereby the creation of a PLC program will be made easier.



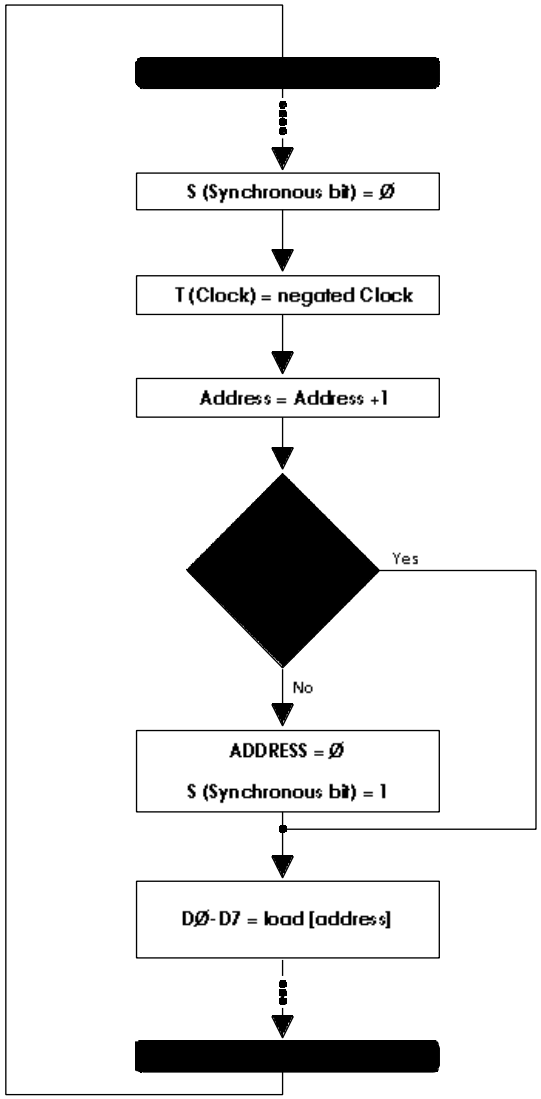


Example:

Cyclical Transfer of addresses 0 to 255



Flow diagram in Mode 3



;PLC operated inputs/outputs

;Synchronous bit preferably previously occupied with 0 (reset)

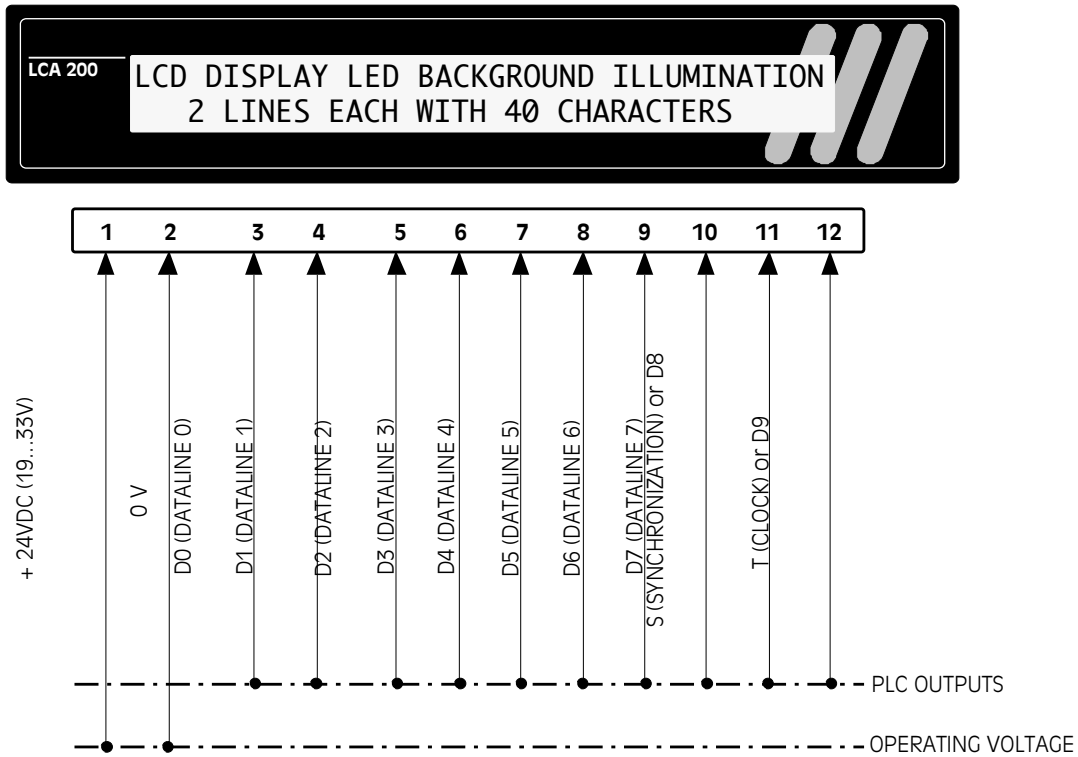
;Invert clock bit
(Clock exchange 0/1 -> 1/0 -> 0/1)

;Address +1

;In our example the end address is the same as the maximum address 255 => query on end address + 1.
If there are less addresses, the end address must be correspondingly reduced.
With a PLC fresh run, the address counter is to be initialized with the end address +1 so that in the 1st PLC cycle, the address 0 will be transfered with synchronization.

;Reset the address
;Zero run synchronization
S = set log 1

;Load 8 databits corresponding to the selected addresses from the data array, e.g. by indirect addressing.



Mode 4: Selective transfer

Mode 4: Selective Transfer (Multiplex with Clock and Synchronization)

Up to 256 selective bytes (terminals 3...10 = D0...7 = data bit 0...7) are transfered through the terminals 11 (S = synchronous bit) and 12 (T = Clock). Selective means that only data which has been changed will be transfered from the PLC.

The text display incorporates the applied bytes (data bits D0...7) for every positive as well as every negative edge of the clock bit (T).

Using the terminal 11 (S) = log 1, the address pointer which shows to the transfer block of 256 bytes size, can be positioned. If the terminal 11 (S) = log 0, data will be transfered to the previous set address.

If several bytes are to be transfered to the consecutive unbroken chain of addresses, it is only necessary to position the address pointer at the beginning. All the subsequent bytes can be transfered directly one after another, as the text display automatically increments the address pointer after every clock.

It is essential that there is a minimum interval of a millisecond between two clock flanks.

As the outputs of the various PLC manufacturers and componentry have differing switching delays for log 0/log 1 - and log 1/log 0 transfers, a "clock delay time" can be set with the planning software. It can be set within the range 250 µs and 10ms.

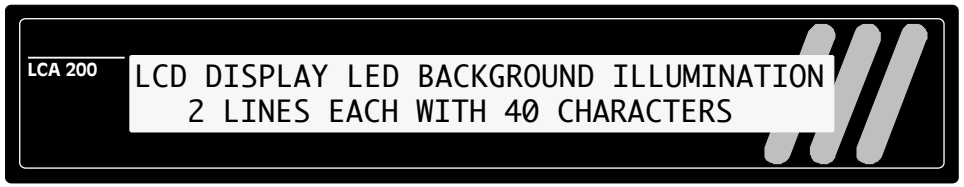
Selective transfer is to be recommended if the PLC cycle time is long. Only addresses in which the data bits are altered, are transfered into the LCA 200.

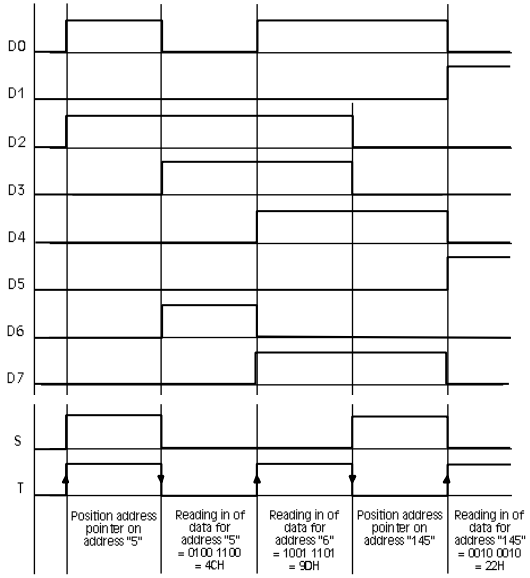
Advantage: Fast reaction. However the PLC program is more complicated and requires more execution time than the cyclical transfer.

As long as the synchronous input S is log 1, the binary coded address lies with the datalines D0...D7. If the synchronous input S changes to log 0, the data bits for functions, messages and/or variables lie with the datalines D0...D7.

If the synchronous input S remains log 0, the address pointer (+1) is increased with every clock flank. The transfer then corresponds to the cyclical transfer. Thereupon there is a saving of a clock cycle for a renewed address pointer positioning.

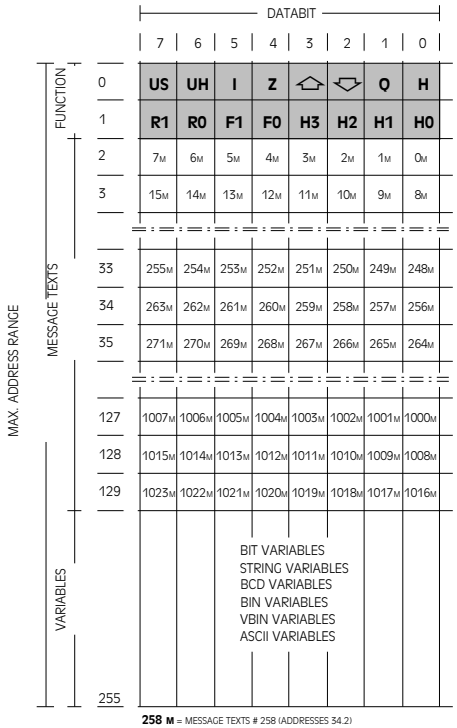
You can glean the drive principle from the following flow diagram. Whereby the creation of a PLC program is made easier.



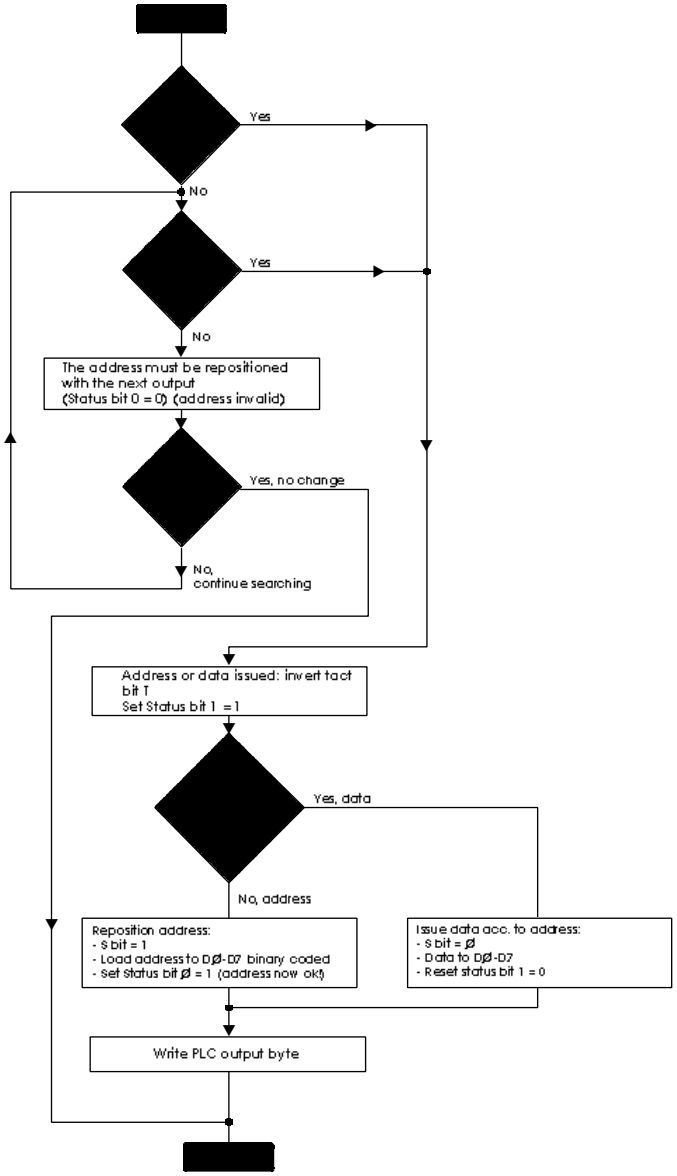


Example:
Transfer of addresses
5, 6 and 145

Contents of address 5 = 0100 1100
Contents of address 6 = 1001 1101
Contents of address 145 = 0010 0010



Flow diagram in Mode 4



Status bit 0: log 1 = address pointer is positioned correctly

Status bit 1: log 1 = actual data has still to be issued

ADDRESS 00

BIT 0 **Call Help Texts H**

The help text, having been preselected with the bits H0...H3 is called with log 1.

BIT 1 **Quit Flashing Texts Q**

The flashing message text currently being presented is quitted with the positive edge (0/1) and thereafter displayed as an established text. If there is a fresh call for the message text, it will be necessary to have renewed quitting.

BIT 2 **Leaf Forwards in the Message Memory ▼**

Leafing forward is done from the older to the next latest message in the active display memory (information or fault) with the positive edge (0/1).

BIT 3 **Leaf Backwards in the Message Memory ▲**

Leafing backwards is done from the latest to the next older message in the active display memory (information or fault) with the positive edge (0/1).

BIT 4 **Call Additional Information Z**

Always the next 2 text lines of the actual text are called with the positive edge (0/1). This function applies for the text groups: message, help and idle text.

BIT 5 **Call Main Information i**

The first two lines of the actual text are called with the positive edge (0/1). This function applies for the text groups: message, help and idle text.

BIT 6 **Suppress Information UH**

Active information are suppressed with log 1 (messages).

BIT 7 **Suppress Faults US**

Active faults are suppressed with log 1 (messages).

ADDRESS 01

BIT 0...3 **Call Help Texts H0...H3**

A help text is binary coded selected out of 16 possible ones using this 4 bit. The call of the address takes place in bit 0 (address 00).

BIT 4 + 5 **Message Format F0 + F1**

The message format for the maximum 128 registered messages in the message memory*) is determined with these 2 bits. The following combinations are possible:

F1	F0	
0	0	Last value message
0	1	First value message
1	0	Cyclical display
1	1	Reserve function

BIT 6 + 7 **Call idle texts R0...R1**

A binary coded idle text is selected from a selection of 4 with these 2 bits. The text is called if there isn't a higher priority (message or help text) active.

*) When there over 128 active messages, the latest messages can only be considered, if older messages are cleared. It is not then possible to achieve the time sequence.

Operation of the LCA 200 (Modes 3, 4)

The Function Range of the LCA 200

Operation of the LCA 200 is done with the first 16 function bits. They determine the respective function of the text display.

	7	6	5	4	3	2	1	0
00	US	UH	I	Z	⇧	⇩	Q	H
01	R1	R0	F1	F0	H3	H2	H1	H0

General Outline of the LCA 200 Functions:

SYMBOL		ADR/BIT	FUNCTION
H	=	00.0	Calling a help text
Q	=	00.1	Quitting a flashing text
▼	=	00.2	Leafing forwards in active message memory
▲	=	00.3	Leafing backwards in active message memory
Z	=	00.4	Call additional information (lines 3..32)
i	=	00.5	Call main information (lines 1 + 2)
UH	=	00.6	Suppression of information
US	=	00.7	Suppression of faults
H0	=	01.0	Selection of the help text bit 0
H1	=	01.1	Selection of the help text bit 1
H2	=	01.2	Selection of the help text bit 2
H3	=	01.3	Selection of the help text bit 3
F0	=	01.4	Selection of the message format bit 0
F1	=	01.5	Selection of the message format bit 1
R0	=	01.6	Selection of the idle text bit 0
R1	=	01.7	Selection of the idle text bit 1

Priorities of the LCA 200

The LCA 200 possesses 4 priority stages:

- Idle priority (priority 0 = lowest priority)
- Info priority (priority 1)
- Fault priority (priority 2)
- Help priority (priority 3 = highest priority)

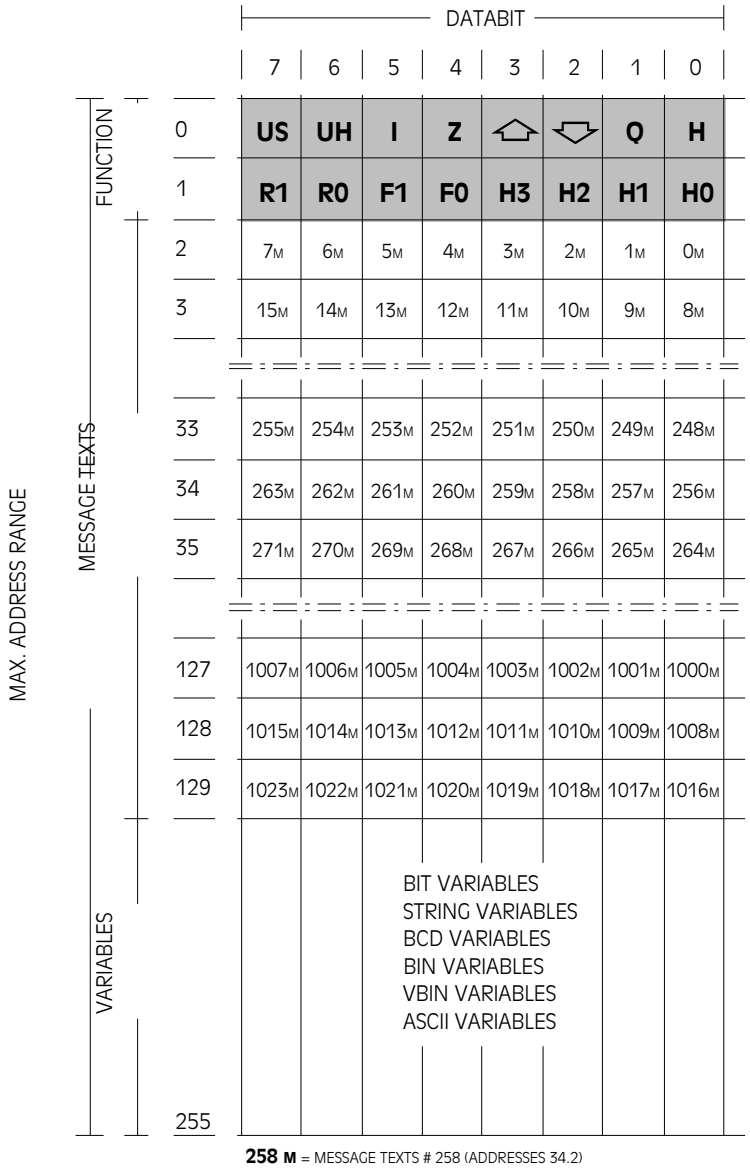
The LCA 200 puts the respectively highest (released) priority on display. By setting the bit "H" in address 0, the help priority (highest priority) can be displayed at any time. The desired help text number 0...15 is then to be filed through the bits H0...3 in address 1.

The fault priority will then be displayed if the message bit is set with parameterized message text of the priority "fault" and the bit "US" in address 0 is set on log 0. Faults can be suppressed at any time by setting the bit "US".

The info priority is displayed if a message bit with parameterized message text of the "info" priority is set and the bit "UH" in address 0 is set to log 0. Infos can be suppressed at any time by setting the bit "UH".

The idle priority (lowest priority) is displayed, if the bit "H" in address 0 is set to log 0 and no infos or faults are active.

The Data Block:



Operation of the LCA 200 (Modes 3, 4)

The Text Organization of the LCA 200

The LCA 200 can call a maximum of:

- **16 help texts**
- **1024 message texts (infos and faults)**
- **4 idle texts**

Every help, message and idle text can be 32 lines, 40 characters (double line information and 30 line additional information). The text groups are lined up in order of priority. The help text has the highest priority, the idle text has lowest priority.

Every message text is attached a message bit in the PLC. The 1024 message bits in the LCA 200 have the addresses 2.0...129.7 (messages 0...1023).

If the message bit is log 1, the message text is switched on and if it is log 0 it will be switched off. If several message bits are log 1 at the same time, then the message memory of the LCA 200 will register this. The message memory can absorb maximum 128 infos and 128 faults. These are **not** "non-volatile". If the message memory is full up and messages are selectively deleted or new messages activated, there is no longer a timed sequence. The display appears according to the selected message format (F0, F1): as either first or last message or cyclical.

As long as the function bit **H** (00.0) is log 1, a help text is displayed. Owing to the higher priority of the help text the idle or message texts are suppressed.

The LCA 200 will show the idle text if there is no active help or message text.

Calculation Formula:

Address a.b. -> Message text
((a-2) x 8) + b

Example:

34.2 -> 258

CHARACTER VARIABLES

BIT Variable
A string is allocated to each one of the 2 log states of any particular bit in the data block. The string is user-defined and may have a maximum length of 40 characters. The string itself may not have any further variable. The longest of both strings determines by the reserved space.

Example:
Bit nn = log 0 » End switch off«
Bit nn = log 1 » End switch on«

STRING Variable
A string can allocated to any binary value of any particular byte in the data block (0...255). That's a maximum of 256 strings. The strings are user-defined and may have a maximum length of 40 characters. The string itself may not have any further variable. If a value is outside the value area, an inverse field will be presented on the display.

Example:
Byte nn = 0 >> Default setting <<
Byte nn = 1 >> Hot phase <<
Byte nn = 2 >> Cool phase <<
. .
. .
. .

ASCII Variable
The corresponding character from the character table will be allocated to each binary value of a byte in the data block.

NUMERICAL VARIABLES

BIN BYTE Variable
The transfered value at any particular byte in the data block will be presented as a unsigned number. The value range can be parameterized and lies between 0...255. Pre-zeroes as well as pre-commas and post comma positions can be parameterized. If the value is outside the MIN/MAX values, an inverse field will appear.

BIN WORD Variable
The transfered value at any particular word in the data block (2 consecutive bytes) is presented as a unsigned number. The value range can be parameterized and lies between 0...65535. Pre-zeroes, as well as pre-comma and post comma positions can be parameterized.
Address nn = higher valued byte
Address nn+1 = lower valued byte
If the value is outside the MIN/MAX values, an inverse field will appear.

VBIN BYTE Variable
The transfered value at any particular byte in the data block will be presented as a fixed signed number. The value range can be parameterized and lies between -128 and +127. Pre-zeroes, as well as pre-comma and post comma positions can be parameterized. If the value is outside the MIN/MAX value, an inverse field will appear.

VBIN WORD Variable
The transfered value at any particular word in the data block (2 consecutive bytes) will be presented as a fixed signed number. The value range can be parameterized and lies between -32768 and +32767. Pre-zeroes, as well as pre-comma and post comma positions can be parameterized.
Address nn = higher valued byte
Address nn+1 = lower valued byte
If the value is outside the MIN/MAX values, an inverse field will appear.

BCD Variable
The value transfered through the 4 or 8 datalines (D0...D3 or D0...D8) is evaluated as a single or double digit BCD value and is showed in the display.
To achieve a great amount of digit number presentations, more BCD variables can be joined onto on another.
It is possible to fade in the following characters with the pseudotetrades:

$ 0B hex	corresponds to	"+"
$ 0C	corresponds to	"-"
$ 0E	corresponds to	"."
$ 0A, 0D	corresponds to	"_" (Blank)
$ 0F	corresponds to	flashing blank

Operation of the LCA 200 (Modes 3, 4)

The Variables of the LCA 200

The LCA 200 possesses character variables and numerical variables with differing formats.

With the character variables, a string is allocated to the log states of individual (bit variable) or several (STRING variable) bits.

With numerical variables it is decided upon as to whether the transfered value from the PLC is either binary or BCD coded. The LCA 200 transforms the numerical variable and presents it in decimal form.

Variables can be positioned on all addresses (0...255). The user is responsible to differentiate between function and message bit blocks.

The message bit block is automatically limited by a filed message text used bit on the block byte 2 up to the highest amount.

If, for example, the M250 (byte 33.2) is planned as the maximum message text, the addresses can be used for variables as of byte 34.

Message bit 33.5 = log 1
BIT Variable 1 160.1 =log1
BIT Variable 2 160.2 =log0
BIT Variable 3 160.3 =log0

TRANSPORT *ON*	
VENTILATION *OFF*	COOL WATER *OFF*

Message bit 33.5 = log 1
BIT Variable 1 160.1 =log0
BIT Variable 2 160.2 =log1
BIT Variable 3 160.3 =log0

TRANSPORT *OFF*	
VENTILATION *ON*	COOL WATER *OFF*

Message bit 33.5 = log 1
BIT Variable 1 160.1 =log0
BIT Variable 2 160.2 =log1
BIT Variable 3 160.3 =log 1

TRANSPORT *OFF*	
VENTILATION *ON*	COOL WATER *ON*

Message bit 33.5 = log 1
BIT Variable 1 160.1 =log1
BIT Variable 2 160.2 =log1
BIT Variable 3 160.3 =log1

TRANSPORT *ON*	
VENTILATION *ON*	COOL WATER *ON*

	7	6	5	4	3	2	1	0
33	255M	254M	**253M**	252M	251M	250M	249M	248M
34	263M	262M	261M	260M	259M	258M	257M	256M
160					BIT VAR3	BIT VAR2	BIT VAR1	
161								

❶ Name of the variable has maximum length of 16 characters
❷ 2 texts of the bit variable each one having a maximum length of 40 characters are for log 0 and log 1
❸ 8 BIT variables can be delegated to each address
❹ Reserved place for the variables in the idle, message or help text. The length of the field is determined by the length of the longest text of the variable

Example BIT Variable

Two inscriptions (strings) are aligned to the two log states of a bit.

For example the message text 253 combines texts with the three bit variables:

Variable VAR1 (address 160.1)
Variable VAR2 (address 160.2)
Variable VAR3 (address 160.3)

Definition of the BIT Variable (2 texts per variable)

Name ❶ : *VAR 1*
Format : *BIT*
Text if bit log 0 ❷ : *WITHOUT*
Text if bit log 1 ❷ : *WITH*
Address ❸ : *160.1*

Definition of the BIT Variable (2 texts per variable)

Name ❶ : *VAR 2*
Format : *BIT*
Text if bit log 0 ❷ : *OFF*
Text if bit log 1 ❷ : *ON*
Address ❸ : *160.2*

Definition of the BIT Variable (2 texts per variable)

Name ❶ : *VAR 3*
Format : *BIT*
Text if bit log 0 ❷ : *OFF*
Text if bit log 1 ❷ : *ON*
Address ❸ : *160.3*

Definition of the Message Text 185

TRANSPORT □□□□ 1)*
VENTILATION ❹ □□□ 2)* *COOL WATER* □□□ 3)*

* 1) VAR1
2) VAR2
3) VAR3

The message bit 253 (address 33.5) is log 1 and the appertaining message text is presented in the text display. The texts "ON, WITH" for log 1 or "OFF, WITHOUT" for log 0 are blended in on a selection basis dependent of the log state of the databits for the variables VAR1, VAR2, VAR3 (addresses 160.1, 160.2, 160.3).

Message bit 33.2 = log 1
STRING Variable 163 =log0000 0000

PACKING MACHINE
STATUS: *SETTING UP*

Message bit 33.2 = log 1
STRING Variable 163 =log0000 0001

PACKING MACHINE
STATUS: *SINGLE TACT*

Message bit 33.2 = log 1
STRING Variable 163 =log0000 0010

PACKING MACHINE
STATUS: *SEMI-AUTOMATIC*

Message bit 33.2 = log 1
STRING Variable 163 =log0000 0011

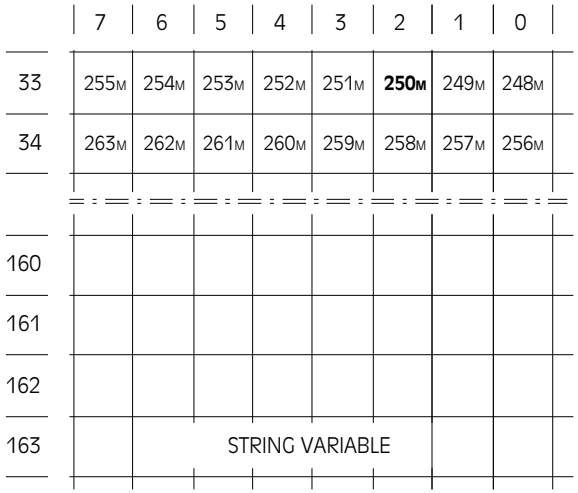
PACKING MACHINE
STATUS: *AUTOMATIC*

Message bit 33.2 = log 1
STRING Variable 163 =log0000 0100

PACKING MACHINE
STATUS: *AUTOMATIC WITH PREHEAT*

Message bit 33.2 = log 1
STRING Variable 163 =log0000 0101

PACKING MACHINE
STATUS: *AUTOMATIC WITH HEAT REGULATION*



❶ Name of the variable has maximum length of 16 characters

❷ 256 texts (maximum 40 characters long) of the STRING variables: from log 0000 0000 to log 1111 1111

❸ Reserved place for the variables in the idle, message or help text. The length of the field is determined by the length of the longest text of the variable

Example STRING Variable

The 256 states of a byte in the data block are allocated to up to 256 inscriptions (strings). Our example shows 6 inscriptions.

The message text 250 (as in the example) combines commentary texts with a STRING variable:

Variable STATUS (address 163)

Definition of a STRING Variable (max. 256 texts per variable)

Name ❶	: *STATUS*
Format	: *STRING*
Text if STRING 0000 0000 ❷	: *SETTING UP*
Text if STRING 0000 0001 ❷	: *SINGLE CLOCK*
Text if STRING 0000 0010 ❷	: *SEMI-AUTOMATIC*
Text if STRING 0000 0011 ❷	: *AUTOMATIC*
Text if STRING 0000 0100 ❷	: *AUTOMATIC WITH PREHEAT*
Text if STRING 0000 0101 ❷	: *AUTOMATIC WITH HEAT REGULATION*
Address	: *163*

Definition of a message text 250

PACKUNG MACHINE
STATUS: □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
❸

The message bit 250 (address 33.2) is log 1 and the appertaining message text is presented in the display. Texts are blended in on a selection basis

SETTING UP, SINGLE CLOCK, SEMI-AUTOMATIC, AUTOMATIC, AUTOMATIC WITH PREHEAT, AUTOMATIC WITH HEAT REGULATION

for the variable STATUS (address 163) dependent of the log state of the data bits.

Message bit 34.4 = log 1
BIN WORD Variable 160 (HIGH) =0000 1000
BIN WORD Variable 161 (LOW) =0010 0001

PACKING MACHINE
COMPLETED: *2081* PIECES

Message bit 34.4 = log 1
BIN WORD Variable 160 (HIGH) =0000 1000
BIN WORD Variable 161 (LOW) =0010 0010

PACKING MACHINE
COMPLETED: *2082* PIECES

Message bit 34.4 = log 1
BIN WORD Variable 160 (HIGH) =0000 1000
BIN WORD Variable 161 (LOW) =0010 0011

PACKING MACHINE
COMPLETED: *2083* PIECES

Message bit 33.0 = log 1
BIN BYTE Variable 163 = 0010 0100
VBIN WORD Variable 200 (HIGH) = 1111 1111
VBIN WORD Variable 201 (LOW) = 1010 1111
VBIN BYTE Variable 255 = 1110 0100

PACKING MACHINE
TEMP: - 02.8 POS: - 0.81 CYLINDER *36*

Message bit 33.0 = log 1
BIN BYTE Variable 163 = 0000 0100
VBIN WORD Variable 200 (HIGH) = 0000 0001
VBIN WORD Variable 201 (LOW) = 0100 0001
VBIN BYTE Variable 255 = 0111 1100

PACKING MACHINE
TEMP: + 12.4 POS: + 3.21 CYLINDER 4

	7	6	5	4	3	2	1	0
33	255M	254M	253M	252M	251M	250M	249M	**248M**
34	263M	262M	261M	260M	259M	258M	257M	**256M**
160	BIN WORD VARIABLE BIT 8...15							
161	BIN WORD VARIABLE BIT 0...7							
162								
163	BIN BYTE VARIABLE BIT 0...7							
200	VBIN WORD VARIABLE BIT 8...15							
201	VBIN WORD VARIABLE BIT 0...7							
255	VBIN BYTE VARIABLE BIT 0...7							

❶ Name of the variable has a maximum length of 16 characters
❷ WORD variables always require two addresses
❸ Reserved place for the variables in the idle, message and help texts

Example BINARY (BIN BYTE, BIN WORD, VBIN BYTE, VBIN WORD) Variable

Any byte or word from the data block can be presented as a decimal number, and be selected as either without sign (BIN BYTE, BIN WORD), with sign (VBIN BYTE, VBIN WORD), with or without pre-/post comma positions, with or without pre-zeroes as well as having a limit on MIN/MAX value . The message texts 248 and 256 (example) combine commentary texts with BIN and VBIN variables:

BIN WORD variable NUMBER OF PIECES (address 160 + 161)
BIN BYTE variable CYLINDER NUMBER (address 163)
VBIN WORD variable TEMPERATURE (address 200 + 201)
VBIN BYTE variable POSITION (address 255)

Definition of the BIN BYTE Variables

Name ❶	: *CYLINDER NUMBER*
Format	: *BIN-1*
Address	: *163*
Pre-comma positions	: *2*
Post comma positions	: *0*
Minimum	: *0*
Maximum	: *99*
Pre-zeroes	: *None*

Definition of the BIN WORD Variables

Name ❶	: *NUMBER OF PIECES*
Format	: *BIN-2*
Address ❷	: *160*
Pre-comma positions	: *4*
Post comma positions	: *0*
Minimum	: *0*
Maximum	: *9999*
Pre-zeroes	: *None*

Definition of the VBIN BYTE Variables

Name ❶	: *TEMPERATURE*
Format	: *VBIN BYTE*
Address ❷	: *255*
Pre-comma positions	: *2*
Post comma positions	: *1*
Minimum	: *-999*
Maximum	: *+999*
Pre-zeroes	: *Yes*

Message bit 34.4 = log 1
BIN WORD Variable 160 (HIGH) =0000 1000
BIN WORD Variable 161 (LOW) =0010 0001

PACKING MACHINE
COMPLETED: 2081 PIECES

Message bit 34.4 = log 1
BIN WORD Variable 160 (HIGH) =0000 1000
BIN WORD Variable 161 (LOW) =0010 0010

PACKING MACHINE
COMPLETED: 2082 PIECES

Message bit 34.4 = log 1
BIN WORD Variable 160 (HIGH) =0000 1000
BIN WORD Variable 161 (LOW) =0010 0011

PACKING MACHINE
COMPLETED: 2083 PIECES

Message bit 33.0 = log 1
BIN BYTE Variable 163 = 0010 0100
VBIN WORD Variable 200 (HIGH) = 1111 1111
VBIN WORD Variable 201 (LOW) = 1010 1111
VBIN BYTE Variable 255 = 1110 0100

PACKING MACHINE
TEMP: - 02.8 POS: - 0.81 CYLINDER 36

Message bit 33.0 = log 1
BIN BYTE Variable 163 = 0000 0100
VBIN WORD Variable 200 (HIGH) = 0000 0001
VBIN WORD Variable 201 (LOW) = 0100 0001
VBIN BYTE Variable 255 = 0111 1100

PACKING MACHINE
TEMP: + 12.4 POS: + 3.21 CYLINDER 4

	7	6	5	4	3	2	1	0
33	255M	254M	253M	252M	251M	250M	249M	**248M**
34	263M	262M	261M	260M	259M	258M	257M	**256M**
160	BIN WORD VARIABLE BIT 8...15							
161	BIN WORD VARIABLE BIT 0...7							
162								
163	BIN BYTE VARIABLE BIT 0...7							
200	VBIN WORD VARIABLE BIT 8...15							
201	VBIN WORD VARIABLE BIT 0...7							
255	VBIN BYTE VARIABLE BIT 0...7							

❶ Name of the variable has a maximum length of 16 characters
❷ WORD variables always require two addresses
❸ Reserved place for the variables in the idle, message and help texts

Definition of the VBIN WORD Variables

Name ❶	: *POSITION*
Format	: *VBIN WORD*
Address ❷	: *200*
Pre-comma positions	: *1*
Post comma positions	: *2*
Minimum	: *-458*
Maximum	: *+299*
Pre-zeroes	: *None*

Definition of the Message Text 248

PACKING MACHINE
COMPLETED: $\overset{1)*}{\square\square\square\square}$ *PIECES*

Definition of the Message Text 256

PACKING MACHINE
CYLINDER: $\overset{2)*}{\square\square}$
TEMPERATURE: □□□.□ °C
POSITION: □□.□□
❸

* 1) NUMBER OF PIECES
2) CYLINDER NUMBER
3) TEMPERATURE
4) POSITION

The message bit 256 (address 34.0) is log 1, and the appertaining message text is presented in the text display. The actual number of pieces is displayed dependent of the BINARY value of the variable NUMBER OF PIECES (addresses 160 + 161).

The message bit 248 (address 33.0) is log 1 and the appertaining message text is presented in the text display. The actual number of pieces is displayed dependent of the BINARY value of the variable CYLINDER NUMBER (address 163).

The actual temperature is displayed dependently of the BINARY value of the variable TEMPERATURE (address 255).

The actual position is displayed dependently of the BINARY value of the variable POSITION (address 200 + 201).

Message bit 34.3 = log 1
BCD Variable 159 (Digit 0_1) =0001 0010
BCD Variable 160 (Digit 2_3) =0000 0000
BCD Variable 161 (Digit 4) =0000 0000

HEATING 1
BOILER PRESSURE: *120* . *00* bar

Message bit 34.3 = log 1
BCD Variable 159 (Digit 0_1) =0010 0011
BCD Variable 160 (Digit 2_3) =1001 0001
BCD Variable 161 (Digit 4) =0000 0100

HEATING 1
BOILER PRESSURE: *239* . *14* bar

Message bit 34.3 = log 1
BCD Variable 159 (Digit 0_1) =0001 0101
BCD Variable 160 (Digit 2_3) =1000 0000
BCD Variable 161 (Digit 4) =0000 1000

HEATING 1
BOILER PRESSURE: *158* . *08* bar

	7	6	5	4	3	2	1	0
33	255M	254M	253M	252M	**251M**	250M	249M	248M
34	263M	262M	261M	260M	259M	258M	257M	256M
159	BCD VARIABLE DIGIT 0_1							
160	BCD VARIABLE DIGIT 2_3							
161	BCD VARIABLE DIGIT 4							

❶ Name of the variable has a maximum length of 16 characters
❹ Reserved place for the variable in the idle, message or help text

Example BCD Variable

The contents of any particular byte of a data block can be presented either as one or two BCD numerals. The message text 259 (as in the example) combines the commentary text with the BCD variable (length 5 digits):

BCD/DIGIT 0_1 (address 159)
BCD/DIGIT 2_3 (address 160)
BCD/DIGIT 4 (address 161)

Definition of the BCD Variables

Name ❶ : *DIGIT 0_1*
Format : *BCD*
Address : *159*
Length of presentation : *2 positions*

Name ❶ : *DIGIT 2_3*
Format : *BCD*
Address : *160*
Length of presentation : *2 positions*

Name ❶ : *DIGIT 4*
Format : *BCD*
Address : *161*
Length of presentation : *1 position*

Definition of the Message Text 259

HEATING 1
BOILER PRESSURE: 1) 2) 3)* □□□ . □□ *bar*
❷

* 1) DIGIT 0_1
2) DIGIT 2_3
3) DIGIT 4

The message bit 259 (address 33.3) is log 1 and the appertaining message text is presented in the text display. The actual pressure is displayed in bar dependently of the value of the BCD variable DIGIT 0...4 (address 159...161).

If the BCD variable is only of one place, the lower valued nibble of the byte is evaluated. The higher valued nibble can, for example, be used for another variable.

Message bit 33.2 = log 1
ASCII Variable 163 =0100 1011 "K"
ASCII Variable 164 = 0100 1110 "N"
ASCII Variable 165 = 0101 0101 "U"
ASCII Variable 166 = 0101 0100 "T"

PACKING MACHINE
OPERATOR: *KNUT*

Message bit 33.2 = log 1
ASCII Variable 163 =0100 1011 "S"
ASCII Variable 164 = 0100 1110 "W"
ASCII Variable 165 = 0101 0101 "E"
ASCII Variable 166 = 0101 0100 "N"

PACKING MACHINE
OPERATOR: *SWEN*

Message bit 33.2 = log 1
ASCII Variable 163 =0100 1011 "O"
ASCII Variable 164 = 0100 1110 "T"
ASCII Variable 165 = 0101 0101 "T"
ASCII Variable 166 = 0101 0100 "O"

PACKING MACHINE
OPERATOR: *OTTO*

Message bit 33.2 = log 1
ASCII Variable 163 =0100 1011 "K"
ASCII Variable 164 = 0100 1110 "A"
ASCII Variable 165 = 0101 0101 "R"
ASCII Variable 166 = 0101 0100 "L"

PACKING MACHINE
OPERATOR: *KARL*

	7	6	5	4	3	2	1	0
32	255M	254M	253M	252M	251M	**250M**	249M	248M
33	263M	262M	261M	260M	259M	258M	257M	256M
160								
161								
162								
163				NAME 1				
164				NAME 2				
165				NAME 3				
166				NAME 4				

❶ Name of the variable has a maximum length of 16 characters
❷ Reserved place for the variable in the idle, message or help text.

Example ASCII Variable

Any particular byte of the data block can be presented as ASCII character (refer to character list).

The message text 250 (for example), combines the commentary texts with several ASCII variables:

Variable STATUS (address 163)

Definition of the ASCII Variable (64 texts per variable)

Name ❶ : *NAME 1*
Format : *ASCII*
Address : *163*

Name ❶ : *NAME 2*
Format : *ASCII*
Address : *164*

Name ❶ : *NAME 3*
Format : *ASCII*
Address : *165*

Name ❶ : *NAME 4*
Format : *ASCII*
Address : *166*

Definition of the Message Text 182

PACKING MACHINE
OPERATOR: □□□□
❷

The message bit 250 (address 32.2) is log 1 and the appertaining text is presented in the text display. The corresponding ASCII characters (refer to character list) are dependent of the contents of the ASCII variables NAME 1 - NAME 4 (address 163...166).

The Diagnostic Operation of the LCA 200

If problems should arise during the commissioning phase of the PLC and LCA 200, then first check over the parallel connection from the PLC to the LCA.

In order to check over the drive program from the PLC to the LCA, a diagnostic module is available in the LCA and it can be switched on or off through the parameterization LCA*PRO* software under the menu heading "Transfer-Diagnoses". During the initial commissioning phase it is recommended to install a time delay in the PLC program between the clock flanks, as for example, with a PLC timer.

After switching on the diagnostic operation, a definite text depending on the transfered modes, appears in the display:

Mode 1:

```
DIAGNOSTIC1              INPUTS: XXXXXXXXXX
SELECTED PLANE: X        TEXTNR.:    XX    (X)
```

In the top line, the inputs of the LCA 200 are displayed in order of sequence (T, S, D7...D0, therefore 12...3).

If the corresponding input is log 0, an 0 appears.
If the corresponding input is log 1, a 1 appears.

In the lower line you will see the currently active plane and text number. If several inputs are log 1, the text number alters with the parameterized "cycle time".

Text numbers are filed in brackets whether it concerns a idle text "R" or a message text "M".

Mode 2:

```
DIAGNOSTIC2              INPUTS: XXXXXXXXXX
                         TEXTNR.: XXXX
```

In the top line, the inputs of the LCA 200 are presented in order of sequence (T, S, D7, therefore terminals 12...3).

If the corresponding input is log 0, an 0 appears.
If the corresponding input is log 1, a 1 appears.

You'll see the currently activated text number in the bottom line.

Mode 3:

```
DIAGNOSTIC3 ADDR.: XXX  D7...D0: XXXXXXXXXX
LAST CHANGE ADDR.: XXX  D7...D0: XXXXXXXXXX
```

Every data transfer is displayed in the top line. The address and the appertaining date is displayed with each change of clock. In order that every clock edge is visibly recognized, the displayed value always moves one place to the left or one place to the right.

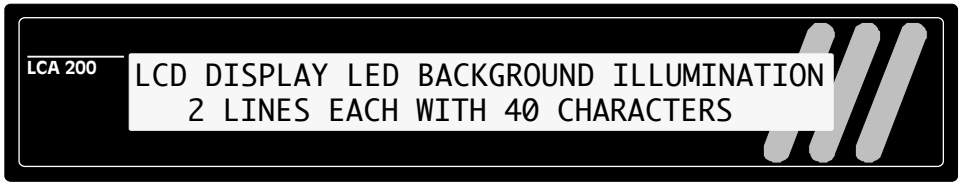
In respect of the contents of the LCA 200, the bottom line only shows amendments to data currently being transfered. Whereby it is easy to see if the drive program is working correctly.

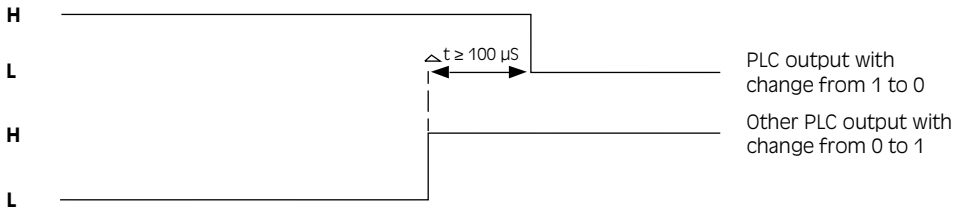
Mode 4:

```
DIAGNOSTIC4 ADDR.: XXX  D7...D0: XXXXXXXXXX
LAST CHANGE ADDR.: XXX  D7...D0: XXXXXXXXXX
```

Every data transfer is displayed in the top line. The address and the accompanying date is displayed with every change in clock. In order that the every clock edge is visibly recognized, the displayed value always moves one place to the left or one place to the right. If only one address is transfered (set synchronous bit), the character "********" appears in the field D7...D0.

With respect to the contents of the LCA 200, the bottom lines only shows ammendments to data currently being transfered. Whereby it is easy to see if the drive program is working correctly.





Switching Time Differences of the PLC Outputs

Should there be large time differences between the switching on and switching off (more than 100µs), the clock delay time in the LCA*PRO* software (menu heading "PROJECT", sub menu heading "TIMES", must be increased.

With the Siemens digital outputs, the clock delay time should be set to a value ≥ 1000 µs. The clock delay time should not be larger than $^1/_3$ of the minimum PLC cycle.

PLC Cycle Time ≤ 1 ms

If the cycle time of the PLC is ≤ 1 ms or the output switch delay ≥ the cycle time, a "delay" must be programmed. Only the drive program (inner loop) is called every n-PLC cycle.