Title:	LDR Commands	ID:
		0300

Date in:	Response:	Model:	Author:
2002-03-11	2002-03-11	LDR	CMa

LDR.exe

LDR I/O's

Code	Flag Number	Comment
P0	000	Carousel 0-initiator
Pn	001	Carousel n-initiator
GtClse	002	Shovel Front
GtOpen	003	Shovel Back
zInit	004	Lift Z-Init
PltDet	005	Shovel Plate Detection
	006	nc
	007	nc
	008	nc
	009	nc
	010	nc
	011	nc
	012	nc
	013	nc
	014	nc
	015	nc
DrvClk	500	Motor Controller Clock
CarsDat	501	Carrousel Motor Controller Data
LitDat	502	Lift Motor Controller Data
ShvDir	503	Shovel Drive Direction
ShvEn	504	Shovel Drive Enable
BCR	505	BCR on / Plate Det. OFF
	506	
CarEn	507	Cars Enable
CarAct	1801	Initialize Carrousel
Ready	1915	Ready-Bit
Rot.Pos.	DM1	Carousel actual position
Accs.	DM0	Carousel target position

Commands

Command Syntax

For communication only a few commands are required. A command is an ASCII-string which is sent to the controller. Response is an ASCII string sent by the controller. Note that each command is prompted by a Response string.

A command consists of command segments. The first command segment defines the intention of the command. Command segments are separated by Space (ASCII 20h). Response Segments are separated by comma (ASCII 1Ch). The table below gives a list of abbreviations used later on.

Command Segment	Mnemonics
Communication Request	CR
Communication Quit	CQ
Communication Clear	CC
Communication Finished	CF
Set	ST
Reset	RS
Read	RD
Write	WR
Write Set	WS
Data Memory	DM
Timer	T

Open / Close Communication

Prior communication with the controller, the communication has to be opened. Before the communication is opened, the controller accepts only the Open Communication Command (CR). For better safety, it is recommended to close communication (CQ) when no communication is required for a longer period of time.

	Command	Response
Open Communication	CR	CC
Send Commands (see below)		
Close Communication	CQ	CF

Controller Error Messages

In case of an error, the Controller sends one of the following messages in response to a command received. The Controller Error Messages are System Errors, not to be confused with Run or Handling Error Messages (see Handling Error Messages).

Error	Command	Response
Relay Error	Undefined timer, counter, data memory, check if requested unit is valid	E0
Command Error	Invalid Command, check if communication is opened by CR, check command sent to controller, check for interrupts during string transmission	E1
Program Error	Firmware lost, reprogram controller	E2
Hardware Error	Controller hardware error, turn controller ON/OFF, controller is faulty and has to be replaced	E3
Write Protected Error	Unauthorized Access	E4
Base Unit Error	Unauthorized Access	E5

System Status

	Command	Response
Read Ready-Bit	RD 1915	x

The Controller sends either 0 (not ready) or 1 (ready) as response "x" upon querying the Ready-Bit. In Default state, i.e. the Carousel is rotating, the Ready-Bit = 1. For safety reasons, a delay of approx. 100 ms should be provided after a command and before the first Ready querry.

CAUTION

Send Commands to the Controller only if Ready=1.
Provide a Delay of approx. 100 ms between the Command and Ready.

Basic Commands

	Command	Response
Reset	ST 1900	OK
Read Ready Flag	RD 1915	x
Read Error Flag	RD 1814	x
Activate Handling System	ST 1801	OK
Deactivate Handling System	RS 1801	OK
Read Status Handling System	RD 1801	x
Set Carrousel rotation position m (0..9)	WR DM0 m	OK
Set Handler level position n (1..21)	WR DM5 n	OK
Continue Access	ST 1902	OK
Terminate Access	ST 1903	OK
Load Plate to m,n*)	ST 1904	OK
Unload Plate from m,n*)	ST 1905	OK
Bar-code inventory	ST 1908	OK

Response "x" upon querying the Handling-Status:

0 Carousel not activ

1 Carousel activ

m=0 Carousel rotates continually

m=1..9 Carousel stops at the respective position

Use the command Activate Carousel for Instrument Initialization. It was created for a controlled initial startup. Do not use this command to regularly switch the instrument on and off.

*) These functions can only be performed if the Carousel is at a defined position.

The Error Flag is set if a command could not be successfully completed within the time expected.

Recommendation: After a Time-Out Error (Ready Flag 1915 is not "1"), query the Error Flag with RD 1814.

Extended Commands

	Command	Response
Read Error Flag (default = 0)	RD 1814	x
Read Positioning Offset (default = 10)	RD T20	x,ttttt,sssss
Set Positioning Offset (default = 10)	WS T20 ttttt	OK
Read Actual Carrousel Position n (0..9)	RD DM1	nnnnn
Read Handler z-Offset (default = 100)	RD DM20	ddddd
Read Handler dz Pick & Place Movement in Cassette (default = 400)	RD DM21	ddddd
Read Handler In-Transfer z-Position (default ~1000)	RD DM22	ddddd
Read Handler z-Pitch (default = 1925)	RD DM23	ddddd
Read Handler Out-Transfer z-Position	RD DM24	ddddd
Read Max. Number of Levels (default = 21)	RD DM25	ddddd
Read Handler dz Pick & Place Movement at Transfer Station (default = 700)	RD DM26	ddddd
Read Handler max. upper Level (default = 9999)	RD DM27	ddddd
Read Handler barcode reader z-offset (default = 1000)	RD DM28	ddddd
Read barcode reader dark-zone (default = 500)	RD DM29	ddddd
Read Handler z-Range (default = 41200)	RD DM30	ddddd
Set Handler z-Offset	WR DM20 d	OK
Set Handler dz Pick & Place Movement	WR DM21 d	OK
Set Handler In-Transfer z-Position	WR DM22 d	OK
Set Handler z-Pitch	WR DM23 d	OK
Set Handler Out-Transfer z-Position[1]	WR DM24 d	OK
Set Handler dz Pick- & Place-Movement at Transfer Station	WR DM26 d	OK
Set Handler max. upper Level (default = 9999)	WR DM27 d	OK
Set Handler barcode reader z-offset (default = 1000)	WR DM28 d	OK
Set barcode reader dark-zone (default = 500)	WR DM29 d	OK
Set Handler z-Range (default = 41200)	WR DM30 d	OK

[1)] Handler: DM24 = DM22

d = data (Word=16Bit)

x = 0,1 (Word=16Bit)

t = actual value (Word=16Bit)

s = set value (Word=16Bit)

Handling Error Messages

Error Commands are used when the Carussell Handling detects an internal error (e.g. when loading a plate to an occupied location). In case of error the Error Flag (1814) is set from '0' to '1'. The exact cause of an error can be found in the data memory 200 (DM200). For each type of error an error code is set in DM200. The list below shows the meaning of the error code.

Errors are read by reading the content of DM200. On a time-out, first the Error Flag is read (RD 1814). Then DM200 is read in order to find the cause of error. An error is reset by sending the Reset Command (ST 1900).

Errors DM200=1xx are Load Plate Errors, errors DM200=2xx are Unload Plate Errors.

	Command	**Response**
Read Error Flag (default =0)	RD 1814	x
Read Error Code	RD DM200	x

Error	**Cause**	**Code**
Read Load Plate Carousel Positioning Error	Carousel could not reach desired radial position during Load Plate procedure or Lift could not reach transfer level during Load Plate procedure.	00100
Read Load Plate Shovel Transfer Back Error	Shovel could not reach back position at transfer level during Load Plate procedure.	00101
Read Load Plate Shovel Transfer Center Error	Shovel could not reach center position at transfer level during Load Plate procedure.	00103
Read Load Plate Lift Cassette Travel Error	Lift could not reach desired cassette level during Load Plate procedure.	00105
Read Load Plate Shovel Cassette Front Error	Shovel could not reach front position on cassette access during Plate Load procedure.	00106
Read Load Plate Lift Cassette Place Error	Lift could not reach cassette place level during Load Plate procedure.	00107
Read Load Plate Shovel Cassette Center Error	Shovel could not reach center position at cassette plate placement during Load Plate procedure.	00108
Read Load Plate Lift Travel Back Error	Lift could not reach lower level during Load Plate procedure.	00109
Read Load Plate Lift Init Error	Lift could not be initialized after Load Plate procedure.	00110
Read Unload Plate Carousel Positioning Error	Carousel could not reach desired radial position during Unload Plate procedure or Lift could not reach desired cassette level during Unload Plate procedure.	00200
Read Unload Plate Shovel	Shovel could not reach front position on cassette access	00201

Cassette Front Error	during Unload Plate procedure.	
Read Unload Plate Lift Cassette Pick Error	Lift could not reach cassette pick level during Unload Plate procedure.	00202
Read Unload Plate Shovel Cassette Center Error	Shovel could not reach center position at cassette plate placement during Unload Plate procedure.	00203
Read Unload Plate Lift Transfer Travel Error	Lift could not reach transfer level during Unload Plate procedure.	00205
Read Unload Plate Shovel Transfer Back Error	Shovel could not reach back position at transfer level during Load Plate procedure.	00206
Read Unload Plate Shovel Transfer Center Error	Shovel could not reach center position at transfer level during Unload Plate procedure.	00208
Read Unload Plate Lift Travel Back Error	Lift could not reach lower level during Unload Plate procedure.	00209
Read Unload Plate Lift Init Error	Lift could not be initialized after Unload Plate procedure.	00210

d = data (Word=16Bit)

x = 0,1 (Word=16Bit)