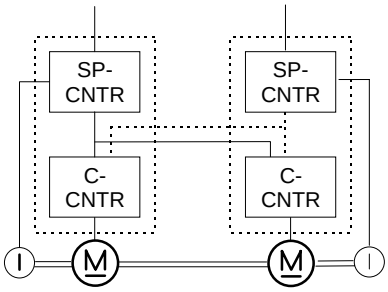
DCS500

Software Application Master-Follower 1.2

3ADT069007R0101 Rev A



Associated application software : MAFO01_2 3ADT40216xR01

Created with	:	GAD, version 2.43/3,	Library DCS500_1.30.
Possible use	:	DCS500	S21.123 and higher
Tools required	:	DDC or CMT Tool	

Mechanical precondition

- Two motors connected to a fixed shaft
- Each motor requires a tacho-generator or pulse encoder

Limits for this application

- Has been designed for operation in the armature control range
- Identical load distribution only with identical, trimmed motors with an identical field supply
- Only the master power converter is responsible for the speed; this applies also and in particular to the "Rapid stop" function.

Control principle

- External preselection of the power converters as single, master or follower
- The power converter which has been selected as the master controls speed and current, while the one selected as the follower receives the current reference from the master and only controls the current
- In single-converter mode, the other power converter must remain disabled.

Monitoring features

- The master power converter monitors the ready-for-operation status of the follower.
- The follower drive does not possess an overspeed monitoring function

Important notes

Please read the notes provided on page 2

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Important notes

Safety note :

For the use of this application software, the safety notes contained in the documentation for the DCS500 units (System Description, Technical Data, Operating Instructions) apply in their entirety.

This application software may be used by properly trained personnel only. Users have to be sufficiently familiar with the requisite tools and the system conditions involved to enable then to assess the suitability of this software for the actual application concerned.

This application software is a non-binding example, which will not meet all system conditions in every individual case. We accept no responsibility for the use of this software.

Contents

1 Components required

1.1 Hardware

For each drive :

- DCS500 incl. accessories, such as reactors and fuses
- SDCS-IOB-1 input/output board
  SDCS-IOB-2 and SDCS-IOB3 also possible
  (The description below refers to the SDCS-IOB-1)
- SDCS-IOE-1 extension unit
- Field supply unit
- 24-V supply for the commands for the SDCS-IOE-1 extension unit if these are not actively specified.

1.2 PC tool

The CMT tool is required for loading the application.

1.3 Master-follower connection

The master unit and the follower unit are connected by external wiring. Shielded two-core cables must be provided for the current reference.

Due to the cycle times and the smoothing of the analog input, a skew of the current reference between the master and the follower must be anticipated. This will be ≤ 14 ms for 99.8 % of the specified value.

2 Description

Compared to the firmware's default values, some function modules are added and parameters altered. You must use the CMT tool to load the software application into the DCS500.
Both units are given the same software.

The unit which has been selected as the master handles speed control and gives the unit selected as the follower the same current reference. The same torque is obtained when both motors are identical and both are receiving the same field current.

A means for cutting in both units must be provided externally.

2.1 Functions

The SDCS-IOE-1 extension units are required for each DCS 500, for controlling and monitoring purposes.

Before starting the drives, the user must preselect master, single or follower by using binary commands. After cutting in (DRIVE ON), these commands will be ignored.

The "Rapid stop", EME_STOP commands at terminals X6:5 (IOB-1) are required for both units. Logic 1 does not signify "Rapid stop" here. It takes effect, however, only on the master or on the single unit.

The RESET command is passed to both units separately via terminal X6:6 (IOB-1).

The DRIVE ON commands, terminal X6:7 (IOB-1), are required for each unit, with the follower additionally waiting for the "Ready for operation" message (RDY_RUNNING) from the master.

The external command for reference enable (RUN), however, may only be passed to the master or the single unit. The follower receives reference enable directly from the master via terminal X1:8 (IOE-1). The master's reference ramp will only be enabled when the acknowledgement messages have been received from the follower as well.

Monitoring features:

When the drive selected as the follower receives the external reference enable at terminal X6:8 (IOB-1), the error message "**Ext. Ind. 1**" is generated, which switches off this drive.

When the master unit is ready for operation, RDY_RUNNING signal = -1, the follower unit will be monitored, too. If the "Ready for operation" message from the follower is absent, then after a presettable time (Parameter 1108) has elapsed, the error message "**Ext. Ind. 2**" will be generated, which will then cause the master to switch off as well.

When the master unit is ready to start, RUNNING signal = -1, the follower unit will be monitored as well. If this message from the follower is absent, then after a presettable time (Parameter 1112) has elapsed, the error message "**Ext. Ind. 3**" will be generated, which will then cause the master to switch off as well.

Please note: The "Ext. Ind. x" error messages are not shown in the display, but can be read at the panel or using the CMT tool.

2.2 Modifications at the DCS

After the external wiring is in place, the application must be loaded, using the CMT tool.

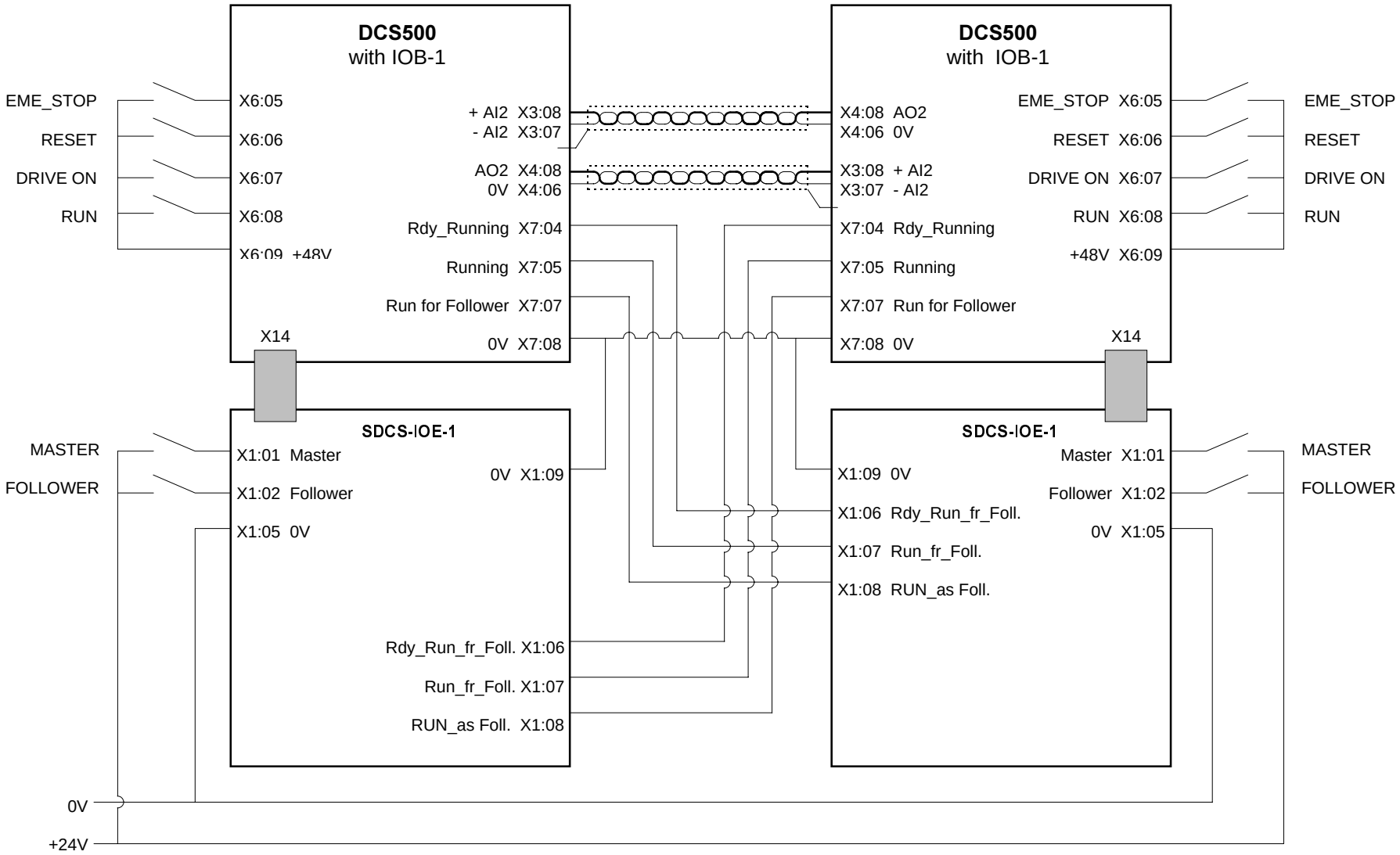
This application example has been created for the S21V1_2 software structure, which corresponds to the DC21.123 firmware. Prior to loading the application, you must make sure that this software actually matches the existing unit.

Furthermore, the following parameters must be set at **both** units:

Parameter	old value	**new value**	**Meaning**
107	0	1	Activating the second analog input
108	2000	4200	Conditioning: +10 correspond to 4200
109	-2000	-4200	Conditioning: -10 correspond to -4200
205	10505	12402	Assigning the current reference to the second analog output (AO2)
206	5000	10000	Output voltage 10 V for AO2
207	0	0	Offset for AO2
208	4095	4200	Conditioning: 10 V correspond to 4095
901	10713	12676	DRIVE ON for the drive logic of the application
902	10715	12679	RUN for the drive logic of the application
903	11902	0	
1702	0	12613	Run ramp-function generator to zero : signal from the application

2.3 Connections for the selectable master/follower

Revisions and supplements to the typical circuit from the DCS 500 system description



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2.4 Software structure

You will find the plans for this application in the attachment. These depict the structure's difference from the firmware supplied.

Loading this application will overwrite only the parameters listed there.

3 Suggestion for start-up

Differences when compared to a start-up routine with individual drives:

- Load application with the CMT tool, and alter parameters as detailed in the list
- Preset variables like line voltage, motor data, field unit, etc. at both units.
- Check mechanical and electrical connections, and also the parameters set both at the master and at the follower unit.
- The drives can be started up consecutively one by one as single drives.
  Care must be taken to ensure that the direction of rotation and the maximum speed of both units are identical.

APPL	
Name	DCS500 Option : Master—Follower 1
Version	01
Description	Two DC—Motors with a fixed mechanical connection
Complied	

TARGET	
Target	DCS500
Version	>= 21.123
Library	DCS500
Version	DCS500_1.30

Function MASTER — FOLLOWER

1 Download application MASFOL01.QOA

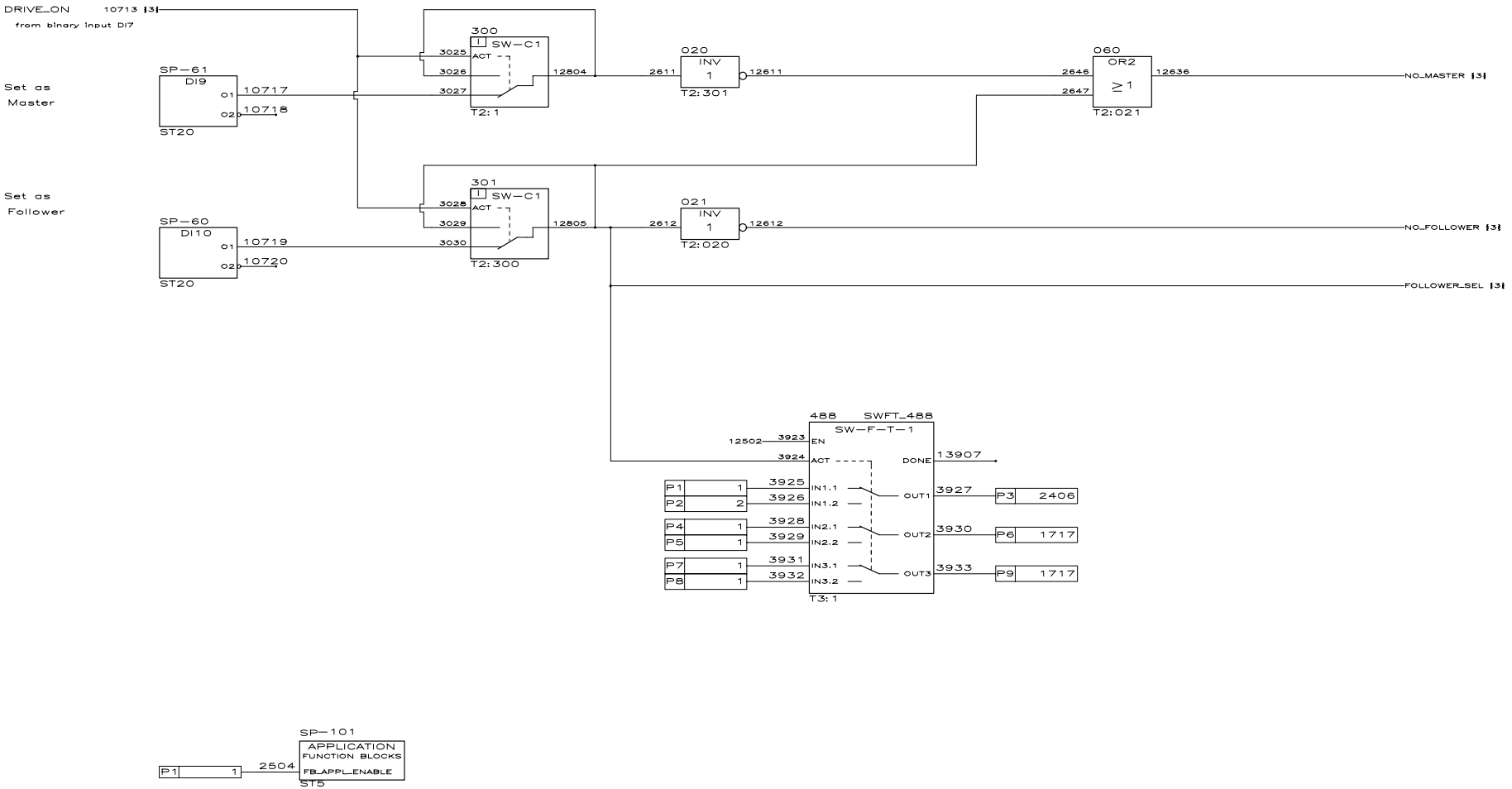
2 Change the followed parameters

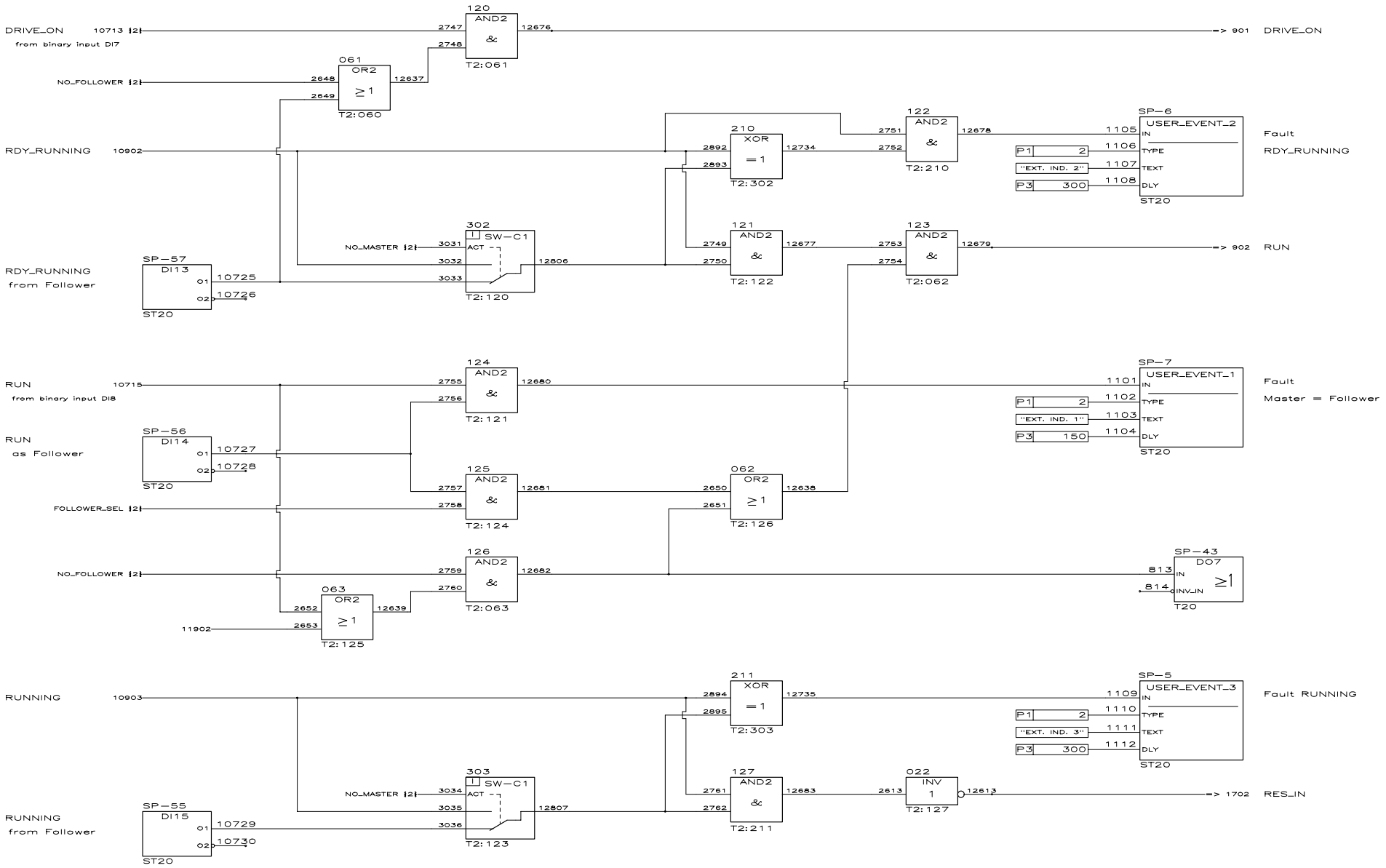
	Parameter	Value old	Value new
	107	0	1
AI2	108	2000	4095
	109	—2000	—4095
	205	10505	12402
AO2	206	5000	10000
	207	0	0
	208	4095	4095
	901	10713	12676
DRIVE—	902	10715	12679
LOGIC	903	11902	0
RAMP GEN.	1702	0	12613

3 Save the parameters BACKUPSTOREMODE

4 Switch the electronic supply off and on again

5 Check the wiring


DRIVE_ON
10713
from binary input DI7
Set as Master
SP-61
DI9
10717
10718
ST20
300
SW-C1
ACT
3025
3026
3027
12804
T2:1
020
INV
1
2611
12611
T2:301
060
OR2
≥ 1
2646
2647
12636
T2:021
NO_MASTER
Set as Follower
SP-60
DI10
10719
10720
ST20
301
SW-C1
ACT
3028
3029
3030
12805
T2:300
021
INV
1
2612
12612
T2:020
NO_FOLLOWER
FOLLOWER_SEL
488 SWFT_488
SW-F-T-1
12502
3923
EN
3924
ACT
DONE
13907
P1 1
P2 2
3925
3926
IN1.1
IN1.2
OUT1
3927
P3 2406
P4 1
P5 1
3928
3929
IN2.1
IN2.2
OUT2
3930
P6 1717
P7 1
P8 1
3931
3932
IN3.1
IN3.2
OUT3
3933
P9 1717
T3:1
SP-101
APPLICATION FUNCTION BLOCKS
P1 1
2504
FB_APPL_ENABLE
ST5


DRIVE_ON
10713 |2|
from binary input DI7
120
AND2
&
2747
2748
12676
T2:061
=> 901
DRIVE_ON
061
OR2
≥ 1
NO_FOLLOWER |2|
2648
2649
12637
T2:060
RDY_RUNNING
10902
210
XOR
= 1
2892
2893
12734
T2:302
122
AND2
&
2751
2752
12678
T2:210
SP-6
USER_EVENT_2
IN
TYPE
TEXT
DLY
1105
1106
1107
1108
P1 2
"EXT. IND. 2"
P3 300
ST20
Fault
RDY_RUNNING
302
SW-C1
ACT
NO_MASTER |2|
3031
3032
3033
12806
T2:120
121
AND2
&
2749
2750
12677
T2:122
123
AND2
&
2753
2754
12679
T2:062
=> 902
RUN
SP-57
DI13
01
02
10725
10726
ST20
RDY_RUNNING
from Follower
RUN
10715
from binary input DI8
124
AND2
&
2755
2756
12680
T2:121
SP-7
USER_EVENT_1
1101
1102
1103
1104
P1 2
"EXT. IND. 1"
P3 150
ST20
Fault
Master = Follower
SP-56
DI14
10727
10728
ST20
RUN
as Follower
125
AND2
&
2757
2758
12681
T2:124
062
OR2
≥ 1
2650
2651
12638
T2:126
FOLLOWER_SEL |2|
126
AND2
&
2759
2760
12682
T2:063
SP-43
DO7
IN
INV_IN
813
814
T20
NO_FOLLOWER |2|
063
OR2
≥ 1
2652
2653
12639
11902
T2:125
RUNNING
10903
211
XOR
= 1
2894
2895
12735
T2:303
SP-5
USER_EVENT_3
1109
1110
1111
1112
P1 2
"EXT. IND. 3"
P3 300
ST20
Fault RUNNING
303
SW-C1
ACT
NO_MASTER |2|
3034
3035
3036
12807
T2:123
127
AND2
&
2761
2762
12683
T2:211
022
INV
1
2613
12613
T2:127
=> 1702
RES_IN
SP-55
DI15
10729
10730
ST20
RUNNING
from Follower