STUDER SC - 4016

OPERATING & SERVICE MANUAL

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SICHERHEIT UND ERSTE HILFE

SICHERHEIT

Durch Entfernen von Gehäuseteilen, Abschirmungen etc. werden stromführende Teile freigelegt. Aus diesem Grunde müssen die folgenden Sicherheitsvorschriften unbedingt beachtet werden:

1. **Eingriffe in ein Gerät** dürfen nur von Fachpersonal vorgenommen werden.

2. **Vor Entfernen von Gehäuseteilen:** Gerät ausschalten und vom Netz trennen.

3. **Bei geöffnetem Gerät:**
- Netzteil- oder Motorkondensatoren mit einem passenden Widerstand entladen.
- Bauteile grosser Leistung, wie Leistungstransistoren und -widerstände sowie Magnetspulen und Wickelmotoren erst nach dem Abkühlen berühren.

4. **Servicearbeiten bei geöffnetem, unter Spannung stehendem Gerät:**
- Keine blanken Schaltungsteile berühren
- Isolierte Werkzeuge verwenden
- Metallene Halbleitergehäuse nicht berühren, da sie hohe Spannungen aufweisen können.

ERSTE HILFE (bei Stromunfällen)

1. **Bei einem Stromunfall die betroffene Person raschmöglichst vom Strom trennen:**
- Durch Ausschalten des Gerätes
- Ausziehen oder Unterbrechen der Netzzuleitung
- Betroffene Personen mit isoliertem Material (Holz, Kunstoff) von der Gefahrenquelle wegstossen
- Nach einem Stromunfall sollte immer ein Arzt aufgesucht werden.

ACHTUNG
EINE UNTER SPANNUNG STEHENDE PERSON DARF NICHT BERÜHRT WERDEN, SIE KÖNNEN DABEI SELBST ELEKTRISIERT WERDEN!

2. **Bei Bewusstlosigkeit des Verunfallten:**
- Puls kontrollieren,
- bei ausgesetzter Atmung künstlich beatmen,
- Seitenlagerung des Verunfallten und Arzt verständigen.

SAFETY AND FIRST AID

SAFETY

There are no user serviceable components inside the equipment, live parts are laid open when removing protective covers and shieldings. It is essential therefore to ensure that the subsequent safety rules are strictly observed when performing service work or repairs.

1. **Servicing of electronic equipment** must be performed by qualified personnel only.

2. **Before removing covers:** Switch off the equipment and unplug the mains cable.

3. **When the equipment is open:**
- Discharge power supply- and motor capacitors through a suitable resistor.
- Components, that carry heavy electrical loads, such as power transistors and resistors as well as solenoid coils and motors should not be touched before a cooling off interval, as a precaution to avoid burns.

4. **Servicing unprotected and operating equipment:**
- Never touch bare wires or circuitry
- Use insulated tools only
- Never touch metal semiconductor cases because they may carry high voltages.

FIRST AID (in case of electric shock)

1. **Separate the person as quickly as possible from the electric power source:**
- by switching off the equipment,
- unplugging or disconnecting the mains cable,
- pushing the person away from the power source by using dry insulating material (such as wood or plastic).
- After having sustained an electric shock, always consult a doctor.

WARNING:
DO NOT TOUCH THE PERSON OR HIS CLOTHING BEFORE POWER IS TURNED OFF, OTHERWISE YOU STAND THE RISK OF SUSTAINING AN ELECTRIC SHOCK AS WELL!

2. **If the person is unconscious**
- Check the pulse,
- reanimate the person if respiration is poor,
- lay the body down and turn it to one side, call for a doctor immediately.

SÉCURITÉ ET PREMIERS SECOURS

SÉCURITÉ

Si les couvercles de protection sont enlevés, les parties de l'appareil qui sont sous tension ne sont plus protégées. Il est donc d'une nécessitée absolue de suivre les instructions suivantes:

1. **Les interventions dans les appareils électriques** doivent être faites uniquement que par du personnel qualifié

2. **Avant d'enlever les couvercles de protection:** Couper l'interrupteur principal et débrancher le câble secteur.

3. **Après avoir enlevé les couvercles de protection:**
- Les condensateurs de l'alimentation et des moteurs doivent être déchargés à l'aide d'une résistance appropriée.
- Il est prudent de laisser refroidir les composants de haute puissance, par ex.: transistors de puissance, résistances de puissances de même que des électroaimants et les moteurs de bobinage.

4. **S'il faut que l'appareil soit sous tension pendent les réglages internes:**
- Ne jamais toucher les circuits non isolés
- Travailler seulement avec des outils isolés

PREMIERS SECOURS (en cas d'électrocution)

1. **Si la personne est dans l'impossibilité de se libérer:**
- Couper l'interrupteur principal
- Couper le courant
- Repousser la personne de l'appareil à l'aide d'un objet en matière non conductrice (matière plastique ou boîs)
- Après une électrocution, consulter un médecin.

ATTENTION
NE JAMAIS TOUCHER UNE PERSONNE QUI EST SOUS TENSION, SOUS PEINE DE SUBIR ÉGALEMENT UNE ÉLECTROCUTION

2. **En cas de perte de connaissance de la personne électrocutée:**
- Controller le pouls
- Si nécessaire, pratiquer la respiration artificielle
- Mettre l'accidenté sur le coté latérale et consulter un médecin.

1 Installing the SC4016 controller

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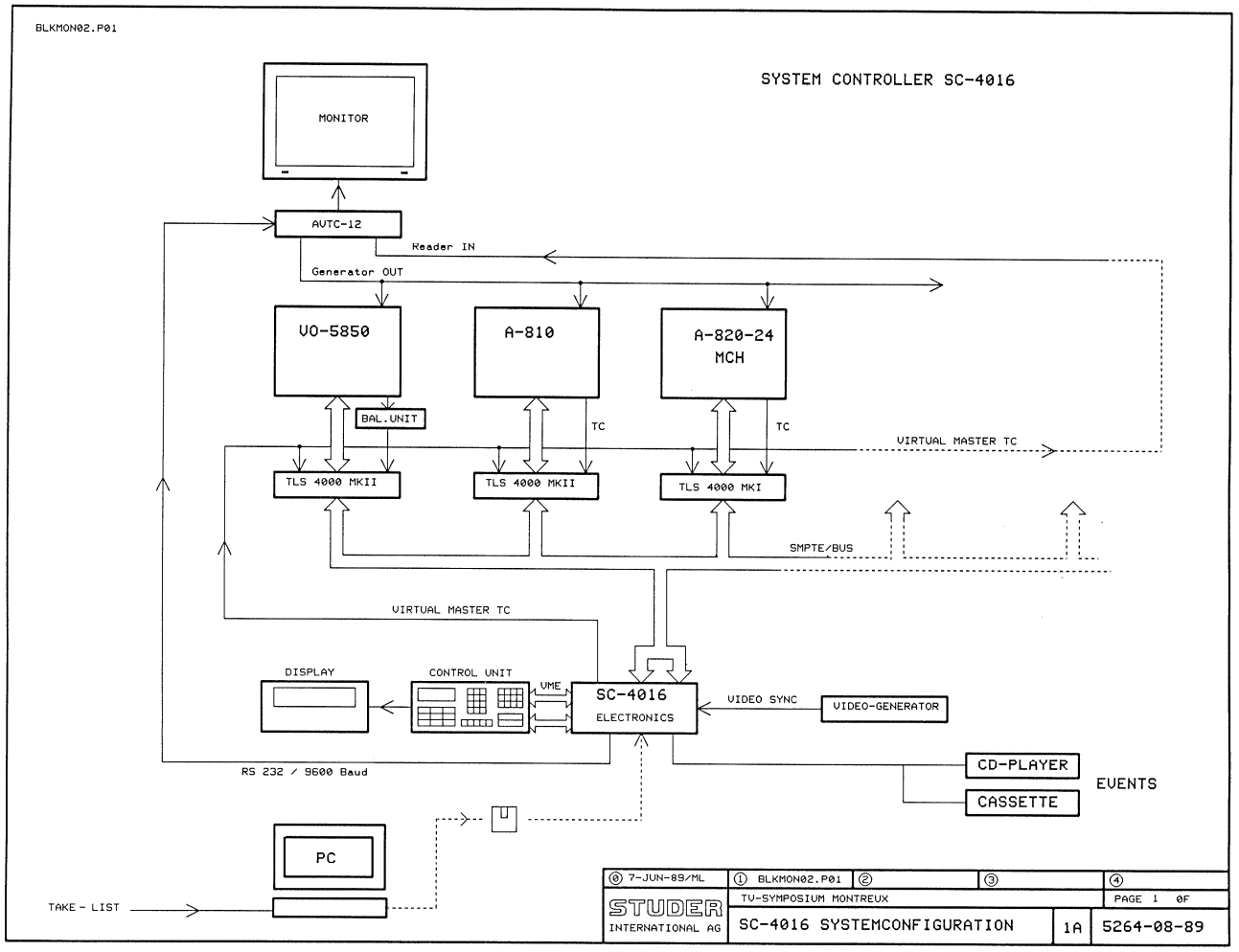
1 Installing the SC4016 controller

1.1 Cabling

General:

- The basic concept of the SC4016 is that a virtual master exists. From the system viewpoint each machine is consequently treated as a slave.
- This means that each machine (also the master) requires a TLS 4000!

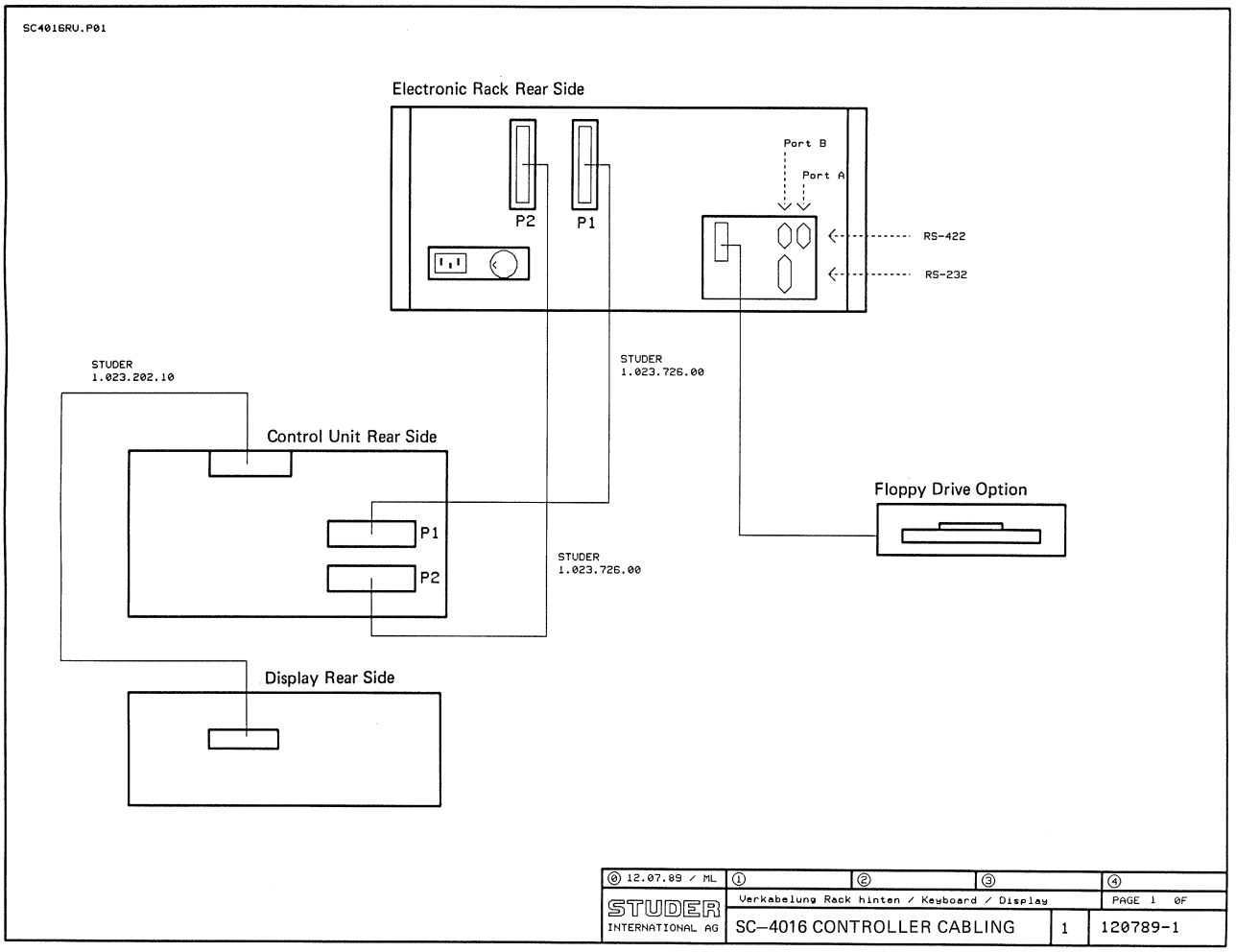


1.1.1 Controller cabling

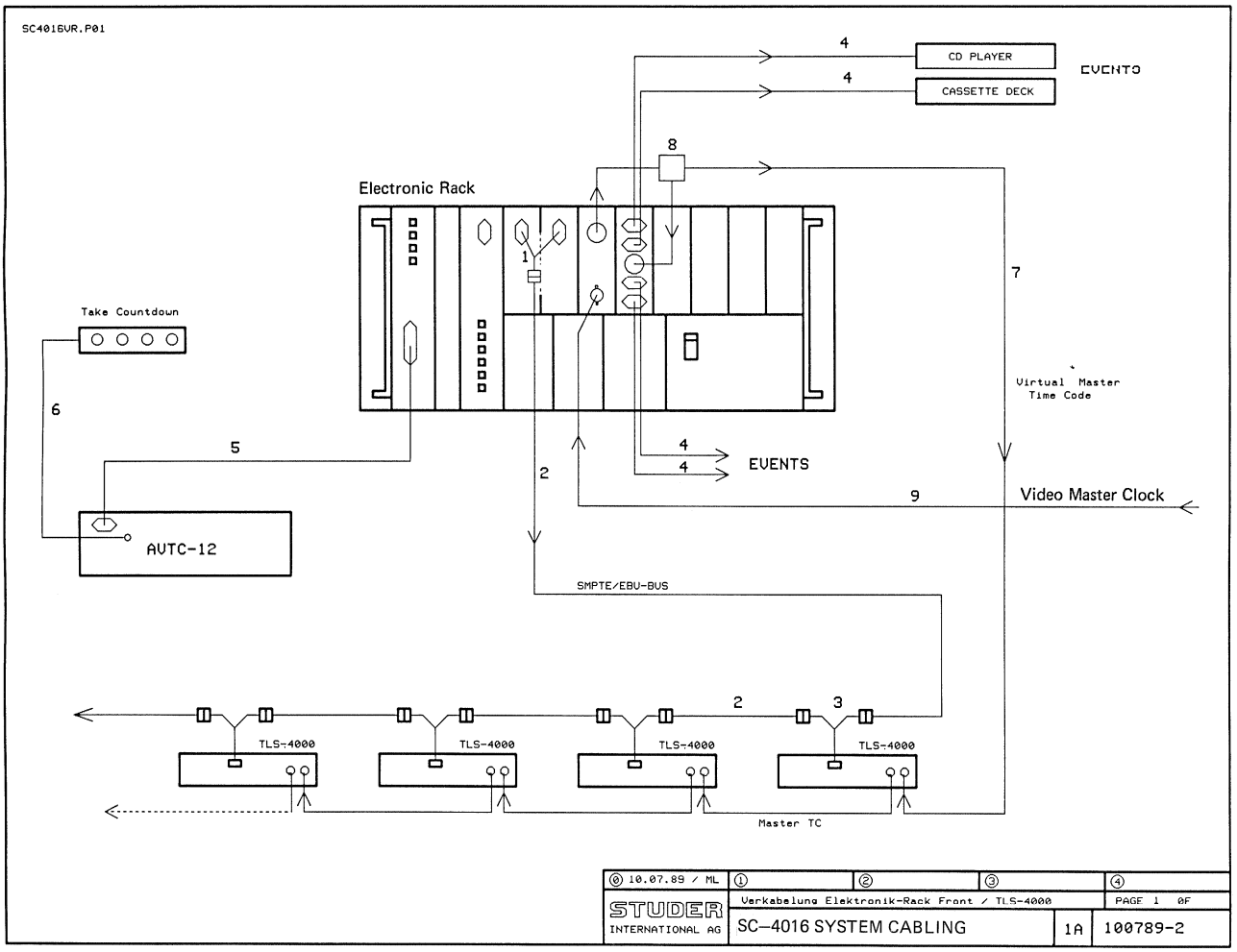
- The SC4016 controller is installed in a 19" rack-mount chassis. It also includes a detached control unit (→ softkey pad, action keys, option keys, etc.) as well as a detached display unit.

Cabling:

- Display unit --> 1 flat cable --> control unit
  Control unit --> 2 flat cables --> to the back of the rack

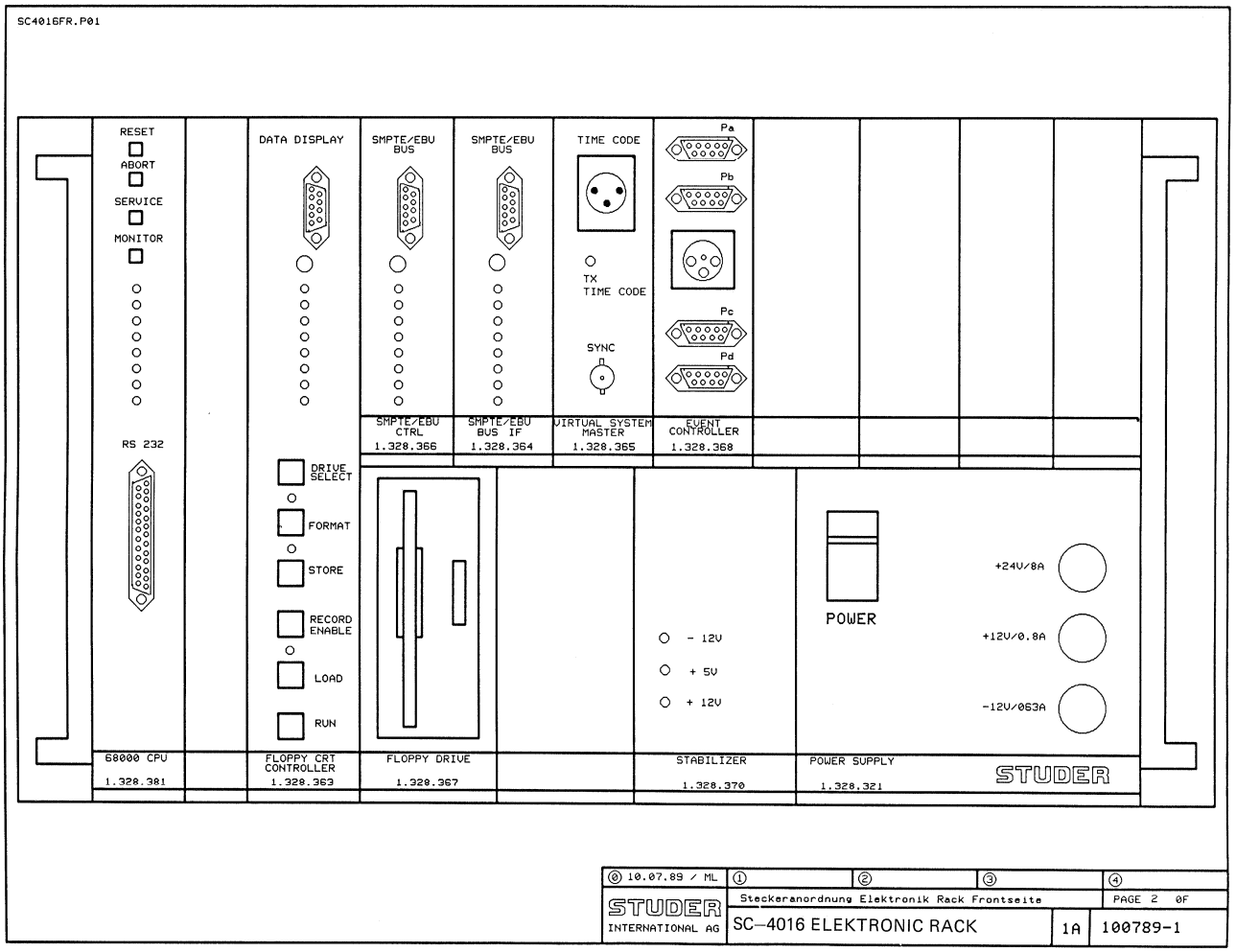


1.1.2 System cabling



List of Cable - Accessories

			STUDER Number
[1]	Y - Connector for BUS - Parallel Wiring		1.023.725.00
[2]	BUS Cable D9	2.5 meter	1.023.720.00
	BUS Cable D9	5 meter	1.023.721.00
	BUS Cable D9	10 meter	1.023.722.00
	BUS Cable D9	15 meter	1.023.723.00
[3]	Y - Connector für BUS Split-up		1.023.724.00
[4]	Event - Cable (Special Design)		
[5]	Interconnection Cable D25-D9		1.023.741.00
	Electronic Rack to AVTC-12/Generator 15 M		
[6]	Interconnection Cable		10.023.102.00
	AVTC-12 to Take Count Down		
[7]	XLR - Cable (Standard)		
[8]	XLR - Distribution Box		
[9]	BNC - Video Cable (Standard)		



1.1.2.1 Master time code

- The master time code is looped from the virtual master (front panel of electronics rack) to all TLS 4000 units. The time code is connected by means of a standard XLR cable.

1.1.2.2 In-house clock

- If the system is operated in conjunction with video machines, it is important that the virtual master is synchronized externally by the in-house (video master) clock.
- The BNC sockets are located on the front of the electronics rack.

Note: The system can alternatively supply an "internal" quartz clock pulse for the video block. This facility can selected in the SETUP.

1.1.2.3 SMPTE BUS

- The various machines or TLS 4000 are controlled via the SMPTE BUS. RS422 cables can be used for interconnection.
- The SMPTE BUS is connected in parallel on the front of the electronics rack by means of a Y-cable from both SMPTE BUS connectors (→ interface & controller modules).
- From here the SMPTE BUS is through-connected in parallel via the TLS 4000 (→ serial remote connections). A Y-cable is required for this at each TLS 4000.
- The group and device address settings of the SMPTE BUS is described in the chapter 1.2 "Switch settings TLS 4000 / SC4016 operation".

1.1.2.4 Time code generator AVTC-12

- The time code generator is controlled via the serial RS232 interface of the CPU board. The connector (25-pin D-type) is located on the front of the electronics rack.

Cable number:	1.023.741.00
Baud rate:	9.6 kbaud
Format:	1 start, 8 data, 1 stop, RS422

1.2 Switch settings of the TLS 4000 / SC4016 operation

To ensure that the SC4016 system functions correctly, each TLS 4000 (MKI & MKII) is to be configured with the corresponding DIL switches and jumpers.
The settings relate to the interfaces / data format and the SMPTE BUS addresses (groups and devices / device numbers).
The settings on the TLS 4000 MKI and TLS 4000 MKII are established in different locations.

Basic settings of the TLS 4000:

- The detailed DIL switch / jumper settings related specifically to the TLS 4000 MKI and MKII can be found on the next page.

Data format:

Data	=	8 bits
Stop	=	1 bit
Parity	=	even
Baud rate	=	38.4 kbaud
Interface	=	SMPTE / RS422

SMPTE/EBU BUS address

- Group address
- Device address

- In the TLS 4000 synchronizer it is essential to define a group address and the device address (device number).
- Four groups with theoretically 64 device addresses are available. However, the SC4016 controller can control only up to 16 devices and only devices within the same group can be controlled simultaneously.
- For the SC4016 this means that all 16 possible devices must have the same group address so that concurrent operation (LOCK etc.) is possible.
- The BUS address comprises two bytes. The first byte is used for identifying the group address. The second byte identifies the device SELECT ADDRESS (within the group address).

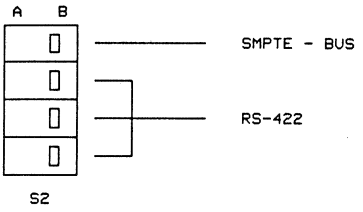
Note:

- The most significant bit is always 1 and the least significant bit is always 0 which means that these do not have to be set.

1.2.1 Settings of the TLS 4000 MKI / SC4016 operations

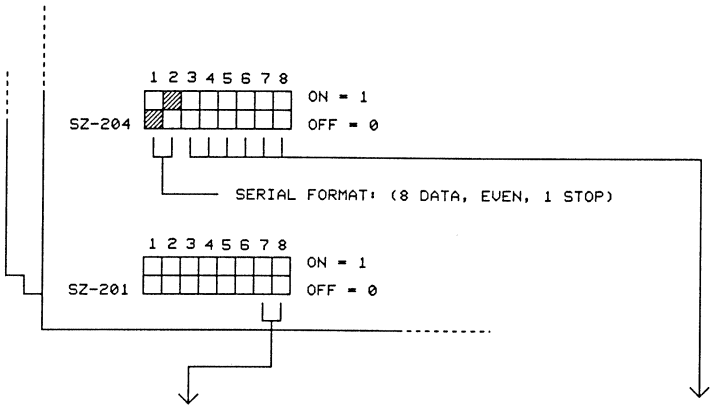
I) SETTINGS OF THE TLS–4000 MKI / SC–4016 OPERATION

INTERCONNECTION BOARD:



SYNCHRONIZER BOARD:

- BAUD-RATE: JUMPER NO. S2 --> POS. 16 (38.4 KBAUD)



DIL-201: GROUP ADDRESS

SWITCH NO. 8	7	GROUP	ADDRESS RANGE
0	0	0	8280H .. 82FFH
0	1	1	8380H .. 83FFH
1	0	2	8480H .. 84FFH
1	1	3	8580H .. 85FFH

DIL-204: DEVICE ADDRESS

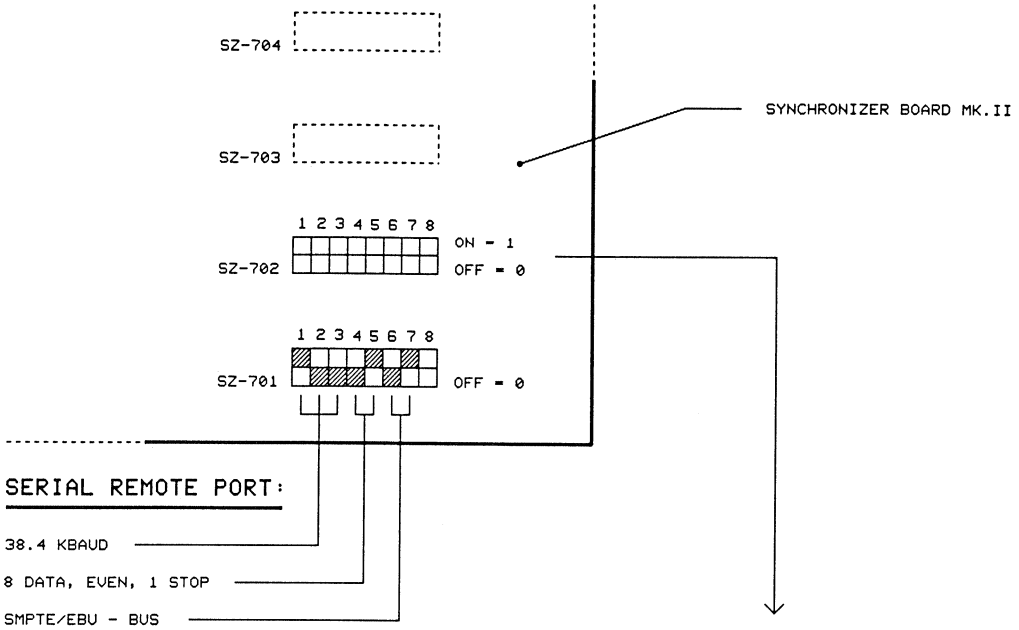
SWITCH NO. 8	7	6	5	4	3	DEVICE NO.	GROUP ADDR.	SELECT ADDR.
0	0	0	0	0	0	01	82	80
0	0	0	0	0	1	02	82	82
0	0	0	0	1	0	03	82	84
0	0	0	0	1	1	04	82	86
0	0	0	1	0	0	05	82	88
0	0	0	1	0	1	06	82	8A
0	0	0	1	1	0	07	82	8C
0	0	0	1	1	1	08	82	8E
0	0	1	0	0	0	09	82	90
0	0	1	0	0	1	10	82	92
0	0	1	0	1	0	11	82	94
0	0	1	0	1	1	12	82	96
0	0	1	1	0	0	13	82	98
0	0	1	1	0	1	14	82	9A
0	0	1	1	1	0	15	82	9C
0	0	1	1	1	1	16	82	9E

⓪ 15-Aug-89/ML	① TLSSETUP.P01	②	③	④
STUDER INTERNATIONAL AG	INSTALLATION : SYSTEMCONTROLLER SC-4016 / TLS4000 MKI			PAGE 1 OF 1
	CONFIGURATION TLS4000 / SC4016		4H	5264-08-89

1.2.2 Settings of the TLS 4000 MKII / SC4016 operations

II) SETTINGS OF THE TLS–4000 MKII / SC4016 OPERATION

SYNCHRONIZER BOARD:



SERIAL REMOTE PORT:

38.4 KBAUD

8 DATA, EVEN, 1 STOP

SMPTE/EBU - BUS

DIL-SWITCH 702: ESBUS ADDRESS

GROUP ADDRESS

SWITCH NO. 8	SWITCH NO. 7	GROUP	ADDRESS RANGE
0	0	0	8280H .. 82FFH
0	1	1	8380H .. 83FFH
1	0	2	8480H .. 84FFH
1	1	3	8580H .. 85FFH

DEVICE ADDRESS

SWITCH NO. 6	5	4	3	2	1	DEVICE NO.	GROUP ADDR.	SELECT ADDR.
0	0	0	0	0	0	01	82	80
0	0	0	0	0	1	02	82	82
0	0	0	0	1	0	03	82	84
0	0	0	0	1	1	04	82	86
0	0	0	1	0	0	05	82	88
0	0	0	1	0	1	06	82	8A
0	0	0	1	1	0	07	82	8C
0	0	0	1	1	1	08	82	8E
0	0	1	0	0	0	09	82	90
0	0	1	0	0	1	10	82	92
0	0	1	0	1	0	11	82	94
0	0	1	0	1	1	12	82	96
0	0	1	1	0	0	13	82	98
0	0	1	1	0	1	14	82	9A
0	0	1	1	1	0	15	82	9C
0	0	1	1	1	1	16	82	9E

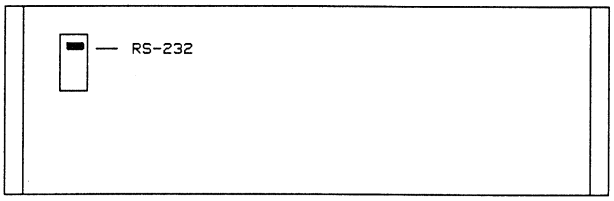
⓪ 15-Aug-89/ML	① TLSSETUP.P02	②	③	④
STUDER INTERNATIONAL AG	INSTALLATION : SYSTEMCONTROLLER SC-4016 / TLS4000 MKII			PAGE 1 OF 1
	CONFIGURATION TLS4000 / SC4016		4H	5264-08-89

1.2.3 Settings of AUTC-12 / SC-4016 operations

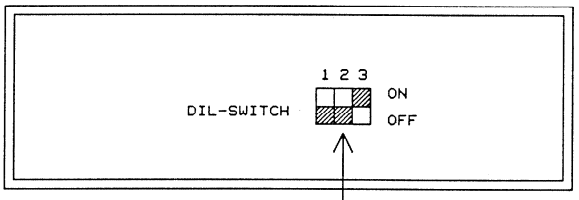
II) SETTING OF AVTC–12 / SC–4016 OPERATION

Format of serial remote : RS-232
9600 Baud
1 Start, 8 Data, 1 Stop

AVTC–12 Rear Side



AVTC-12 / Inside front



Format : 9600 Baud
1 Start, 8 Data, 1 Stop

⓪ 18-OCT-89/ML	① AVTCCFG.P02	② VERSION :1.00	③	④
STUDER INTERNATIONAL AG	ALPERMANN & VELTE TIMECODE GENERATOR / SERIAL REMOTE			PAGE 1 OF 1
	CONFIGURATION AVTC-12 / SC-4016		4H	5264-10-89

1.3 Start-up procedure

Switch on the entire equipment. Insert the program diskette distributed with the equipment into the 3½" drive. The operating procedures for the diskette drive can be found in chapter 2.1, "Operating the diskette drive".

- Insert the diskette.
- Press the LOAD key.
- Press the RUN key.

Note: We urge you to make copies of the original diskettes.

Autoload:

- Automatic loading of the system software after power on or after insertion of the diskette can be initiated by corresponding DIL switch setting on the floppy controller module (auto load).
- In this case the software will also automatically be started (auto run).
- For daily routine operation it is advisable to select the auto load mode.
- For testing the communication between the TLS and the system controller it is necessary to first start the system program.
- When the start menu HW-TEST/LEARN/START appears on the softkeys, initialize the bus by pressing the START key.
- If the select addresses are set correctly (no double assignments, SMPTE BUS operation), the display shows:

  1. Loading directories.
  2. Resetting devices.

- Subsequently select each machine according to the chapter 5.2 "Bus functions, Attach, DEVICE" and check the remote functions.
- If the message "Not started, Directory empty" appears after the START, check the following:
  - DIL switch settings in the TLS 4000
  - Bus cabling (TLS 4000 has two 9-pin couplings, MASTER TALLIES/SERIAL REM ")
- If the display shows the device numbers, the communication between the SC4016 and the TLS 4000 is in order.
- If the selected machine fails to respond to tape deck commands, check the connections TLS 4000 / slave machine (see Interface description).

2 Operating Instructions

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2.1.4 Starting the system software 2
2.1.5 Storing the system software 2
2.1.6 Tips concerning the handling of diskettes 3
2.1.7 Error messages 3

2 Operating Instructions

Current software version: SW Part No. 1.328.960-20 V.47/88
or 1.328.970-20 V.47/88
(Juni 20, 1989)

Special system software: External Master 1.328.961.20 V.47/88

- The SC4016 system controller is equipped with one or several (option) 3½" or 5¼" diskette drive(s) on which program and operating data can be stored.
- In contrast to the 3½" drives which are suited for storing programs as well as data, the 5¼" drives are only suited for storing data. A 5¼" drive can, therefore, be configured only as an optional second drive. Such a drive is principally used for exchanging data with an IBM PC or compatible computer.
- The controller can be operated only with a corresponding program diskette from which the system program is downloaded into working storage after AC power has been switched on.
- The basic diskette functions can be performed also without system software as soon as the unit answers with "SC4016 System Controller" on the system display.

2.1 Operating the diskette drive

The basic functions of the diskette drive can be operated directly by means of the corresponding keys on the 19" chassis. Additional functions can be controlled via the control panel (see below).
The diskette drive accepts commands only when the red pilot lamp on the drive glows. Should this not be the case, press the reset button on the CPU board and wait until the lamp lights up.

2.1.1 Selecting the drive

If your SC4016 is equipped with more than one diskette drive, you can select the individual drives consecutively by pressing the DRIVE SELECT key. In response the red pilot lamp of the selected drive lights up. The drive selection is only enabled for the basic functions. During normal operation the correct drive is selected by the system software.

2.1.2 Formatting

A new diskette must be formatted before it is used in the SC4016 for the first time. A previously used diskette can also be reformatted at any time.

Caution: Formatting destroys all data stored on the diskette. Before you format a disk that contains data, make absolutely sure that you no longer need the information stored on this diskette.

RECORD ENABLE and FORMAT

- To start the formatting process, press the RECORD ENABLE key and concurrently the FORMAT key. The corresponding lamp above the FORMAT key lights up. The message "Formatting track xx" appears on the system display, where xx indicates the corresponding track number. Upon completion of the formatting process the diskette is immediately verified. The message "Verifying track xx" is displayed, and the end is signalled with the message "Init. FAT & Directory". When these processes are completed, the diskette is ready for other operations.
- If errors are detected during the formatting operation, they will be reported on the system display, and one or several fault lamps light up on the diskette controller module. (For fault description see below).
- A 3½" diskette can be formatted only if the write protect tab on the diskette jacket is opposite the READ ONLY position (i.e. the opening is closed), otherwise the process will be aborted with an error message.

2.1.3 Manual/automatic loading of the system software

- The system software can be loaded only if the red pilot lamp on the corresponding drive glows. Should this not be the case, press the reset switch on the CPU module and wait until the pilot lamp lights up. The diskette can now be inserted with the slanted edge on the top and in front, until it engages.

LOAD

- Read the system software into working storage. The pilot lamp above the LOAD key glows while the message "Loading from disk" is displayed.
- Automatic loading of the system software after the AC power is switched on or after insertion of the diskette (auto load) can be enabled with corresponding DIL switch settings on the floppy controller module.
- In this case the software is subsequently also started automatically (auto run).
- For daily operation it is recommended to activate the auto load mode.

2.1.4 Starting the system software

RUN

- Upon completion of the loading process the system software can be started by pressing the RUN key.
- This applies also to situations in which the program has been cancelled by pressing the RESET switch, provided the software is still located in working storage.
- If the auto load mode has been enabled, the software is started automatically after the AC power has been switched on.

2.1.5 Storing the system software

This function is activated for copying the system software from one diskette to another.
The system software can be copied only if it is available in working storage of the SC4016 (load it, if necessary). If this is the case, insert a formatted diskette into the drive. The write protect tab must be opposite the READ ONLY position (i.e. the opening is closed), otherwise the operation will be aborted with an error message.

RECORD ENABLE and STORE

- The store process is started by pressing RECORD ENABLE together with STORE. The message "Recording data" appears on the system display. The pilot lamp above the STORE key also lights up.
- The system software can also be read from or stored on the micro floppy drive 1, if the SC4016 is configured with such a drive. In this case the desired drive must first be selected with the DRIVE SELECT key. The basic rule is that the disk function relates to the drive on which the ready lamp glows.

2.1.6 Tips concerning the handling of diskettes

- Careful handling is recommended even though the fully enclosed jacket largely protects the micro floppy diskettes from detrimental influences.
- Do not store or use the diskette in excessive heat or humidity, in a dusty environment, or in the vicinity of strong magnetic fields.
- The metallic slide which closes the head opening should never be opened by hand.
- We recommend that you remove the diskette from the drive before you switch off the AC power.
- It is important to create at least one (or more) working copies of the program diskettes you have received with the equipment and to store the original diskette in a safe place. The same applies also to subsequent program versions.
- Use only diskettes of the specified type: DS (double sided); 135 TPI.

2.1.7 Error messages

The following errors can be signalled in conjunction with floppy disk accesses:

"No disk available" or "NOT READY" lamp

- A function has been initiated that calls for a read/write operation on the diskette, but there is no diskette in the drive.

"Write protected" or "WRITE PROT" lamp

- An attempt has been made to write on a disk on which the write protection is enabled.

"Disk full" or "DISK FULL" lamp

- An attempt has been made to write data on a disk, but there is not sufficient space left on the disk to hold the corresponding amount of data.

"Record not found" or "REC NOT FND" lamp

- The specified track, sector address or disk side from which the data are to be read cannot be found.

"CRC" Error or "CRC ERROR" lamp

- A checksum error has been detected when reading/writing on the diskette. The data cannot be read without error.
- This error can also originate from an unformatted diskette. If this error occurs only briefly while data are being read, this is not critical because the read operation is retried several times and the error will probably be corrected automatically.

"Data lost" or "DATA LOST" lamp

- The time limit for reading the serial stream has been exceeded and information has consequently been lost.

3 After the start-up ...

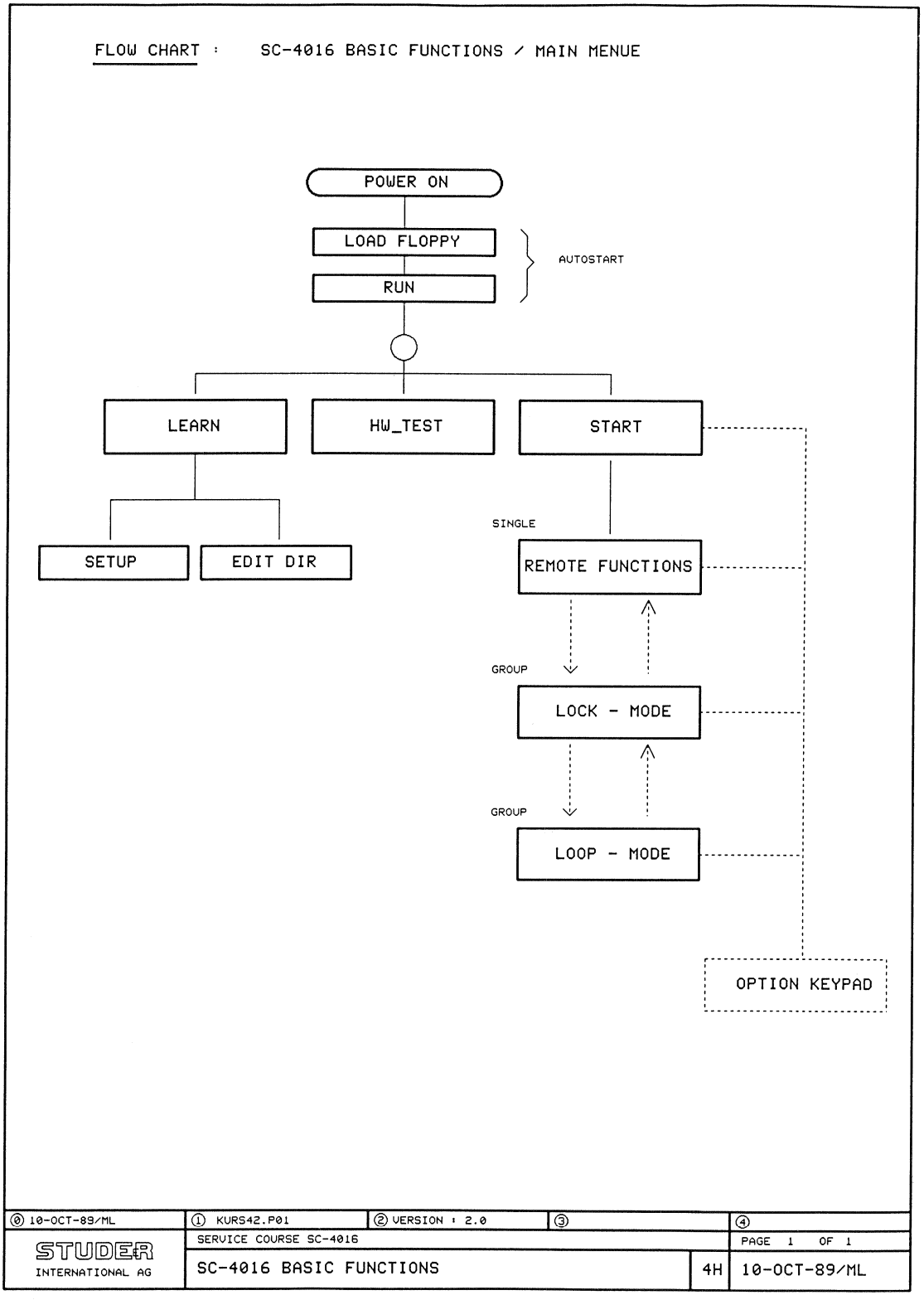
3.1 HW_TEST Checking the control panel 2

3.2 LEARN Entering/modifying the operating parameters 2

3.3 START Starting the bus operation 3

3 After the start-up ...

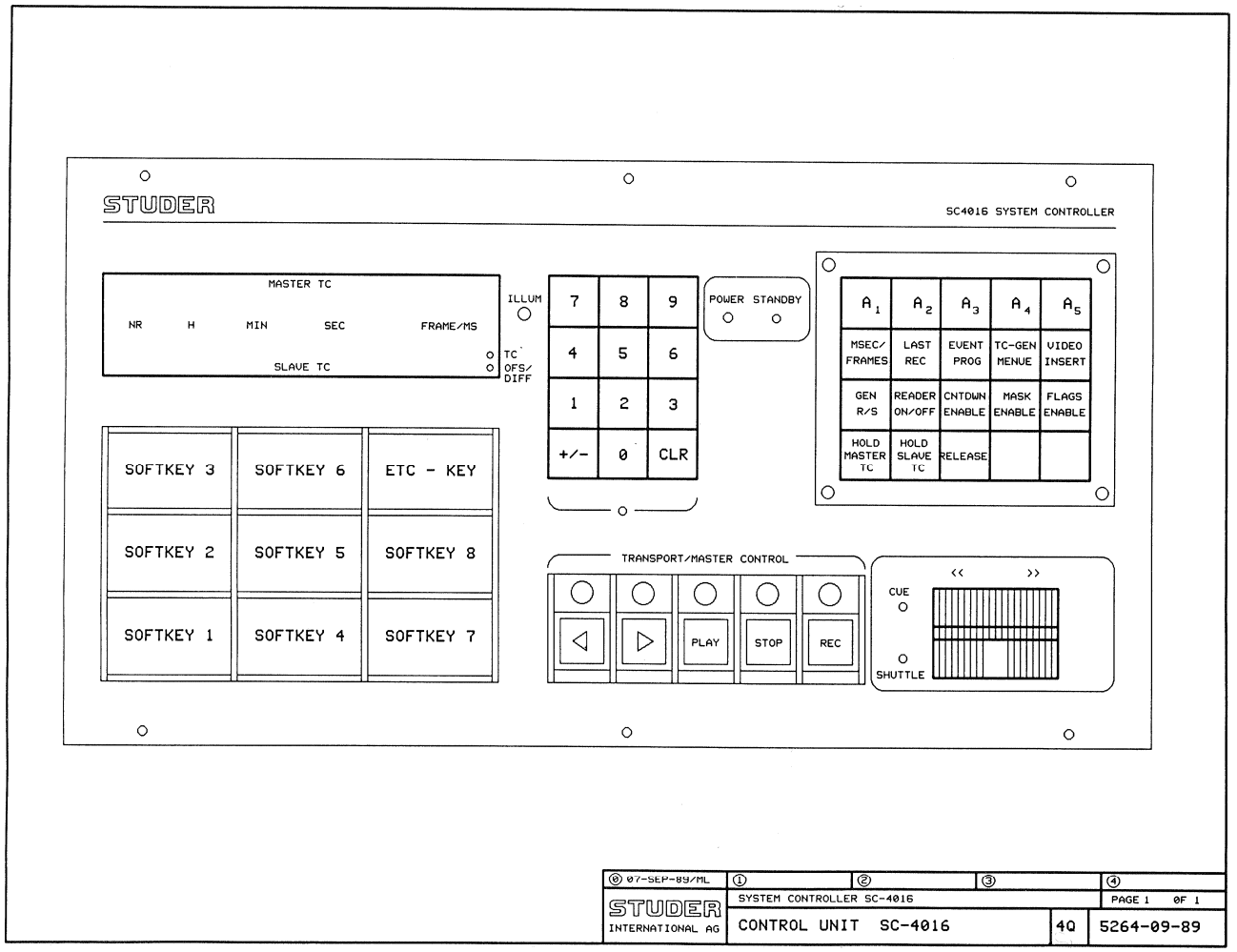
After the system software has been started, the start format with the equipment type and software version appears on the system display, e.g.: "SW Rel. 06.03.87". The start menu with the following function key menu is displayed:



3.1 Checking the control panel

HW_TEST

- All existing display elements are consecutively activated for a brief period. The complete character set is written on the system display.
- All keys can subsequently be tested. The identification of a key is shown on the system display for as long as the corresponding key is pressed.



3.2 Entering/modifying the operating parameters

LEARN

- Activates the menu for editing the operating parameters. Various basic parameters and the linkage directory can be checked and modified, if necessary. Normally this is only needed when the equipment is put into operation for the first time or when you change to a new software system. The linkage directory and the operating parameters are available in DATA FILES stored on the system software diskette.
- The system can be operated even if no directory and parameter files exist on a new diskette, because the SC4016 can always access default values in its firmware (ROM) or tables. The LEARN menu is described in more detail in the next section.

3.3 Starting the bus operation

START

- Initialize the EBU/SMPTE BUS operation. All units addressable via the bus are restored to their normal state.
- The entire initialization process takes approximately 10 seconds: first the linkage directories are loaded into the bus controller and the device directories are loaded into SMPTE/EBU interface ("Loading directories"). The machines are subsequently restored to their normal state. At the same time the virtual master outputs time code ("Resetting devices") for approximately 5 seconds which gives the connected synchronizers the opportunity to decode the master time code and to recognize the code type, etc.

Error message: "Not started, directory is empty!"

- If this message is displayed after the START command this means that no bus devices in ready status have been found. Possible causes are:
  - The bus devices are switched off.
  - The bus connection between the SC4016 and the other devices is interrupted.
  - The bus connection on the SC4016 is interrupted between the SMPTE BUS controller and the SMPTE BUS interface.
  - An individual bus device short circuits the signal path of the bus.
  - The communication parameters (DIL switches) in one or several TLS 4000 are not correctly set, causing the bus to be blocked.

4 Learn mode

4.1 Reading data files from diskette 1

4.2 Storing the data files on diskette 2

4.3 Modifying the SETUP files 3

4.4 Modifying the linkage directory file 10

4 Learn mode

The LEARN mode is used prior to the first time operation for adapting the SC4016 to certain specific customer requirements.
After the LEARN key has been pressed, the main menu is displayed on which you can select between reading/writing the basic parameters (from now on referred to as SETUP) and the linkage directory from diskette, or modifying the SETUP - or the contents of the linkage directories.

4.1 Reading data files from diskette

READ

- After the READ key has been pressed, the menu changes, and the controller asks for the name of the file to be read.

<SETUP> and ENTER

- This command sequence reads the SETUP file. The message "Reading from disk" appears on the system display, followed by the message "File read" after the file has been read successfully. The new parameters are effective immediately.
- If the directory cannot be read for any reason (no diskette in the selected drive) the cause will be displayed, e.g. "No disk available" together with the message "Deflt setup" which means that the SC4016 is operating with its internal default values.

<LINK_D> and ENTER

- This command sequence reads the directory from the diskette. The message "Reading from disk" appears on the system display, followed by the message "File read" after the file has been read successfully. This directory will be used the next time the SMPTE/EBU BUS is started.
- If the directory cannot be read for any reason (e.g. not existing on selected diskette), the cause will be displayed, e.g. "Record not found" together with the message "Default directory" which means that the controller is operating with its internal default directory.

<ALL> and ENTER

- Reads the SETUP file and the directory file. This command sequence can be used, for example, if the stored parameters are to be transferred from an old program diskette to a new one.
- The procedures are the same as when reading individual files.

4.2 Storing the data files on diskette

STORE

- After the STORE key has been pressed the SC4016 asks for the name of the data files to be stored on the diskette.

<SETUP> and ENTER

- This command sequence reads the current SETUP file from working storage and stores it on the diskette. The data must be stored on the system diskette.
- The message "Storing setup" is displayed followed by "File stored". Should storing not be possible, the corresponding cause will be displayed.

<LINK_D> and ENTER

- The currently valid linkage directory is stored on diskette. The data must be stored on the system software diskette. The message "Storing directory" is displayed followed by "File stored". Should storing not be possible, the corresponding cause will be displayed.

<ALL> and ENTER

- Stores the SETUP and the DIRECTORY files. The procedures are the same as for storing individual files.
- This command is principally used for transferring data files to a new system diskette.

Example:

- Transferring the data files from an old to a new system diskette.
  - Insert new system diskette and load system software. Since there are no data files on the new diskette, the default values will be taken.
  - Remove new diskette and insert the old diskette. The command sequence READ - <ALL> - ENTER reads the data files from the old diskette.
  - Reinsert the new system diskette. The command sequence STORE - <ALL> - ENTER stores the data files on the new diskette.

4.3 Modifying the SETUP files

SETUP

- This function executes an interactive menu for defining/modifying the system parameters. The user only needs to answer the questions of the controller and to acknowledge the determined values with ENTER.

General information:

The SETUP menu can be cancelled at any time by pressing the END key. In this case the parameter changes will NOT be incorporated into the current menu step.

Step 1: "Modify virt. mast?"
In this menu section the parameter values of the "Virtual Master" generator are modified.

NO

- Bypasses this section. Continue with step 4.

YES

- The SC4016 asks for the time code format to be processed. The default value is 25 frames/sec.
- The input value can be modified with the keys NEXT and LAST. The SC4016 supports the following time code formats:

  24 frames/sec
  25 frames/sec
  30 frames/sec
  Drop frame format (29.97 frames/sec)

ENTER

- Accept displayed value and continue with next step.

Step 2: "Max. wind : .. x Play"
The maximum winding speed of the virtual master can be specified.

UP

- Select higher value.

DOWN

- Select lower value.
- The possible values range between 5 times and 40 times the play speed.

ENTER

- Accept displayed value and continue with next step.

Step 3: "Master shuttle speed (default): .. x PLAY"
The initial maximum shuttle speed of the virtual master can be selected.

UP
- Select higher value.

DOWN
- Select lower value.
- The possible values range between 1x and 20 x the play speed. Steps 1x, 2x, 3x, 5x, 10x, 15x, 20x.

ENTER
- Accept displayed value and continue with next step.

Note: The value can also be temporarily modified with the aid of the command keys while the unit is in operation. While the shuttle rocker is deflected, the keys specified below have the following function:

< < : one step slower
> > : one step faster
each time the key is pressed.

Step 4: "Prog. numeric keys ?"
The SC4016 asks whether or not the address storage keys are to be programmed/modified.

NO
- Bypass this section. Continue with step 5.

YES
- The SC4016 asks for the address for key 1.

0...9 and ENTER
- Enter the complete address via the 10-key pad and load it with ENTER.
- The SC4016 continues by asking for the next key until all five address keys have been programmed. If you wish to quit before the fifth key, simply press ENTER without entering any digit.

Step 5: "Modify defaults ?"
In this step the default settings of certain general parameters can be defined. If necessary, these parameters can subsequently be changed also while the unit is in operation.

NO
- Bypass this section. Continue with step 8.

YES
- "TC-Disp. ....."
- The SC4016 asks for the desired representation of the time code format on the display. You can select between frames and milliseconds.

FRAME
- Representation in frames.

MSEC
- Representation in milliseconds.

ENTER
- Accept displayed value and continue with the next step.

Step 6: "Shift : ....."
This step asks for the desired increment/decrement of the SHIFT function.

FRAME
- Shift one frame each time this key is pressed.

MSEC 0...9
- *Shift .. milliseconds each time this key is pressed.* The desired number of milliseconds must be entered via the numeric 10-key pad.
- The SC4016 accepts values from 1 to 99 milliseconds.

ENTER
- Load the displayed value and continue with next step.

Step 7: "Remote shuttle speed (default): .. x Play"
The initial maximum shuttle speed in REMOTE mode can be selected.

UP
- Select higher value.

DOWN
- Select lower value.
- The possible values range between 1x and 20x the play speed. Steps: 1x, 2x, 3x, 5x, 10x, 15x, 20x.

ENTER
- Accept displayed value and continue with next step.

Note: The value can also be temporarily modified with the aid of the tape command keys while the unit is in operation. While the shuttle rocker is deflected, the keys specified below have the following function:

< < : one step slower
> > : one step faster
each time the key is pressed.

Step 8: Modify serial I/O?
The SC4016 asks whether the settings or the function of the serial interface are to be altered.
Identification of the hardware dependence:

CPU 1.328.362.20:
Port 1 corresponds to socket P3
Port 2 corresponds to socket P5

CPU 1.328.381.20:
Port A on the rear panel of the 19" housing
Port B on the face of the CPU board.

NO
- Bypass this section and continue with step 11.

YES
- "Port 1/A setting : ....."

NEXT
- Select next value.

LAST
- Select last value.
- The following settings are possible:
  - 7 data bits, 2 stop bits, even parity
  - 7 data bits, 2 stop bits, odd parity
  - 7 data bits, 1 stop bit, even parity
  - 7 data bits, 1 stop bit, odd parity
  - 8 data bits, 2 stop bits, no parity (default)
  - 8 data bits, 1 stop bit, no parity
  - 8 data bits, 1 stop bit, even parity
  - 8 data bits, 1 stop bit, odd parity

ENTER
- Load the displayed value. The next step follows the same procedure for port 2 or port B respectively.

Step 9: "Port 2/B setting : ....."
After the parameters for port 2 or B have been defined in the same way as in step 8, continue with step 10.

Step 10: "Master time output ..."
The SC4016 asks whether the serial master time output function on port 1 (P3) or port A should be enabled or disabled.

ON
- Serial time output enabled.
- OFF Serial time output disabled.

ENTER
Load the displayed value. Continue with step 11.

Step 11: "Modify the record functions ?"
You can select whether or not the following record functions should be modified.

NO
- Skip this section. Continue with step 13.

YES
- The SC4016 asks for the rollback time to be used when the LAST-REC key is actuated.
- The LAST_REC function parks the group of synchronized machines at the address of the last manual drop-in less the specified rollback time.

0...9 and ENTER
- Enter the desired value and load it with ENTER. Only rollback times between 0 and 99 seconds will be accepted. Continue with step 12.

Step 12: "Single-key record: ..."
Enable/disable single-key record function.

ON
- The record command is initiated in all modes by pressing only the REC command key.

OFF
- The record command is initiated by simultaneously pressing REC - PLAY or PLAY - REC.

ENTER
- Load the displayed function and continue with step 13.

Step 13: "Modify the loop functions?"
In this group it is possible to modify various parameters related to the loop function.

NO
- Skip this section. Continue with step 19.

YES
- The SC4016 first displays the question shown in step 14.

Step 14: "Modify the record delay compensation ?"
Here it is possible to enter for each bus device an individual compensation of the delay that results from the physical distance between the record and the reproduce head.

NO
- No change in compensation time, continue with step 15.

YES
- The SC4016 displays the compensation time for the first machine.

0...9
- The desired time can be entered as a 3-digit figure. The valid range is between 0 and -999 milliseconds.

Note: A machine-specific automatic time compensation is already installed in the TLS 4000 MKII. If a compensation value is entered under these conditions, it will be ignored by the controller, but it is significant for the MON_SYNC/SRC_SYNC function.
This MON_SYNC/SRC SYNC function is principally intended for Film reproduction units in master function. The compensation time to be entered in this case must the source-monitor delay time of the corresponding recording machine and not the one of the master.

ENTER
- Load the displayed value.
- The SC4016 then requests the compensation value for the next machine. After the compensation for the 16th machine has been entered, the program continues with step 15.

END
- Terminate the compensation input (fewer than 16 machines). Continue with step 15.

Step 15: "Select loop mode: ...."
The default setting of the loop mode can be entered here. The mode can also be changed while the loop mode is active.

AUDIO
- In this mode drop-in and drop-out times always coincide with the loop limits. The latter are therefore designated as RECIN/RECOUT. The loop limits and consequently the RECIN/RECOUT times can be set in the millisecond resolution. This mode is principally intended for work restricted to audio recordings.

FILM
- The FILM mode is principally suited for mixed film, video and audio applications. The loop limits and the drop-in / drop-out times are treated separately within certain limits. The loop limits (BEGIN/END) can only be set in frame resolution (full frames). In case of deviations they are automatically shifted by the SC4016 to the nearest frame boundary. The drop-in / drop-out times can be shifted relatively within the range of +/- 2 seconds. This shifting is also possible in the frame as well as millisecond resolution.
- With a shift of 0 (default setting of the SC4016) the record times coincide with the loop limits.

ENTER
- Load the displayed mode. Continue with the next step.

Step 16: "RECIN vs. loopbeg. shifting: ..."
This parameter applies only to FILM mode:
Shifts the RECIN time relative to the loop start time.

MSEC
- Input in millisecond resolution.

FRAME
- Input in frame resolution.

0...9 ENTER
- Desired shift to be entered as a 2- to 4-digit number. Load by pressing ENTER. Continue with step 17.

Step 17: "RECOUT vs. loopend shifting: ...."
As described in Step 16, the RECOUT time can be shifted relative to the loop END time. The program then continues with step 18.

Important: The shift values set in steps 16 and 17 are permanent settings that are valid as soon as the FILM mode is selected. This will only be desirable in special cases.
Since the shift values can also be entered while the loop function is active without being permanently stored, it will generally be more convenient to modify the value in this way.

Step 18: "Auto-append mode: ...."
It is possible to select whether the auto-append function is to be enabled or disabled when the SC4016 is started up.

OFF
- Function disabled.

ON
- Function enabled.

ENTER
- Load the displayed value and continue with the next step.

Step 19: "Store new setup ?"
The SC4016 asks whether the new values are to be stored on diskette.

YES
- The values entered during this session will be stored on diskette. The new SETUP file overwrites the old one.

NO
- The entered values are NOT stored on diskette. However, they remain active until they are changed or new parameters are read from the diskette or until the AC power is switched off.

The SC4016 is now again in the LEARN main menu which can be quit by pressing the END key.

4.4 Modifying the linkage directory file

EDIT_DIR
- Entry into the linkage directory editing menu. The directory can be examined and edited with various function keys. The bottom display line is the input line.

UP
- Page up in the directory.

DOWN
- Page down in the directory.

> >
- Shift cursor to the right.

< <
- Shift cursor to the left.

0...9
- Enter numeric values.

xx - RECALL
- Recall the original line (status before ENTER has been pressed). xx is the number of the line to be recalled.
- 00 - RECALL: recall the entire directory. The default values are fetched from the ROM.
- If the values are to be recalled from the diskette, it is necessary to quit the edit menu (END) and to subsequently read the entire directory (READ <LINK_D> ENTER).

CLEAR
- Erase line, i.e. delete it from the directory.
- Please note: The ATTACH function can no longer be used for deleted entries.

ENTER
- Accept the line as displayed.

The ETC key releases additional menus.

A .. F
- Enter hexadecimal digits.

<ALPHA>
- Select the menu with the upper case letters of the alphabet.
- With the letters it is possible to enter hexadecimal values or to specify the equipment designations as desired.

/, [,], -, _, <SPACE>, &, +
- Auxiliary characters for text input.
- The CLR key in the numeric keypad deletes individual characters and replaces them with dots.

END
- Quit the alphabet submenu called with <ALPHA> or the directory editing menu. The SC4016 responds by asking whether or not the newly created linkage directory is to be stored on diskette.

YES
- Store the directory on diskette. The new directory overwrites the old one.

NO
- The entered directory is NOT stored on the diskette. However, it remains active until the next modification is made or the next directory is read from diskette, or until the AC power is switched off.

The SC4016 is now again in the LEARN main menu which can be quit by pressing the END key.

5 Bus Operation

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5 Bus Operation

There are basically three operating modes for a machine connected to the SC4016:

Remote mode
- Remote control, machine not coupled and asynchronous.

Lock mode
- Machine coupled as master or slave.

Loop/Take mode
- A special case of lock mode in which the loop or edit function of the SC4016 is active.

For each of these modes there is normally a different menu, however, there are also mixed menus made up of different basic conditions, depending on the momentary state the selected machine. Some of the functions are identical in all menus.

5.1 General

5.1.1 Numeric values

Numeric parameters are entered through the special numeric 10-key pad. When the SC4016 unit expects a numeric entry, the yellow pilot lamp below the keypad turns on. Incorrect entries can be cancelled or restarted with the CLR key. The sign of the value can be inverted with the +/- key, where this makes sense.
The validity of all entered numeric values is immediately checked where possible. Invalid entries are either not read in (the prompt is repeated), or rejected with a plain-text error message.
If only the input of a time code address is expected, it is possible to retrieve a stored value by means of the address store keys A1..A5. An address can also be captured from the master or slave time (HOLD MASTER TC or SLAVE TC) and be transferred into an input register (TRANS). The TRANS function is only enabled if a value has been retrieved with HOLD. The HOLD state is cancelled when the TRANS function or the RELEASE key is activated.

5.1.2 TC computer

If difficult values are to be entered, the input of time code addresses can be simplified with the aid of the computer function.

CALC
- When the CALC key is pressed the value found in the current input line is transferred into the computer register. At the same time the input line is erased so that a new value can be entered.

0...9
- Enter the value to be added or subtracted by means of the numeric keys.

ADD
- The displayed value is added to the existing value and the result is written into the input register. The computed parameter contained in the input register can now be loaded as usual by pressing ENTER.

SUB

- The displayed value is subtracted from the existing value and the result is written into the input register. The computed parameter contained in the input register can now be loaded as usual by pressing ENTER.

Note: The TC computer automatically computes in the correct time code format and in any form of representation (frames or milliseconds).

5.2 Bus functions

After the bus mode has been started, the bus functions are available via the background menu which can be accessed by pressing the ETC key. The bus functions are feasible in most operating states of the controller. If they are not feasible, the corresponding menu cannot be retrieved.

STOP_BUS - Quit bus mode

STOP_BUS

- The controller responds with the message "Executing".
- Terminates the bus mode. Deletes the linkage directory in the bus controller and the device directory in the bus interface.
- The power-on menu with the functions HW_TEST, LEARN, and START is subsequently displayed on the function keypad.

ATTACH - couple an individual machine

ATTACH

- With this function, an individual machine that has been restored to operational condition after a malfunction, or which has been powered on later, can be signed on to the bus without cancelling and restarting the entire bus operation.
- However, this functions is only applicable to machines which have not been deleted by the user from the linkage directory by means of the directory editing menu.
- The controller responds by asking for the system number of the machine to be coupled with "New dev.: .."

0...9 and ENTER

- Use the numeric keypad to enter the two-digit system number of the machine to be coupled.
- The controller subsequently starts the initialization sequence for the new machine with the message "Recovering device".
- The machine is set to its basic state after which it receives the master time code for approximately 5 seconds. During this time the controller tries to read the slave time code of the machine. For this purpose the machine briefly enters play mode.
- If the master has dropped off the bus in lock mode, the machine is parked at the correct address and the original lock state is reestablished by remaining in lock mode and by executing the ATTACH function for the former master. In this way it is not necessary to again search for the formerly found synchronization points and to rebuild the entire synchronization complex.

Error messages:

"Device not available"

- The machine does not respond under the entered system number.

"Device exists"

- A machine exists already under the system number you have entered for the machine to be locked.

"No valid address"

- The linkage directory contains no bus address for the machine to be coupled, i.e. under the specified system number.

5.3 Remote functions

DEVICE - Select machine

DEVICE
- The controller responds by asking for the two-digit device number "Dev.: .."

0...9
- Enter 2-digit machine number.
- Selects the machine. The time code from the tape or the tape counter is indicated on the "Slave-TC" display. If the time code supplied by the machine is valid, the "TC" pilot lamp adjacent to the display turns on.

RESET - Cancel an incomplete entry

RESET
- An incomplete input sequence can be cancelled at any time, and the preceding menu can be retrieved by pressing this function key.

PLAY, STOP, < <, > >, REC - Tape deck functions

PLAY, STOP, < <, > >, REC
- These are remote tape deck commands for the selected machine. The tape deck feedback lamps flash while the corresponding command is being accepted and executed; they switch to steady light when the desired state has been attained.

Example: Transition from fast forward to stop: stop lamp flashes during the deceleration phase and changes to steady light when the tape has come to a full standstill.

SHUTTLE - Variable spooling in EDIT mode

Machines that support this function can be spooled at variable speed with the tape making head contact. This is accomplished by deflecting the shuttle rocker in the desired direction. The maximum speed in the stop position can be preselected in SETUP mode, but can also be varied while the function is in progress. If the fast forward key > > is pressed while the rocker is deflected, the ultimate speed can be increased in steps up to 20x play speed.
If the rewind key is pressed in the same way, the ultimate speed can be decreased in steps to 1x play speed.
The following speed values are possible: 1x, 2x, 3x, 5x, 15, 20x play.
The current shuttle deflection can be stored by pressing the store button on the shuttle rocker.
This shuttle deflection remains stored until the store button is pressed again or the shuttle is deflected again. If PLAY, STOP, or RECORD are pressed the machine switches to STOP mode.

CUE - fine-positioning

CUE
- Activates the CUE function for the selected machine. The CUE function can be switched off again by pressing STOP or any other tape deck key. This function has no effect on machines without CUE facilities.

GO_TO - Locator function

GO_TO
- In the lower right of the system display the controller asks for the input of a time code address. If the machine has previously been parked, the old address is displayed as a default value.

0...9 and ENTER
- Key in the new address and press the ENTER key. The entry can be in frames or milliseconds since the values are automatically converted.

or
ENTER
- Load the stored address displayed by the controller as a default value.

or
A1...A5 and ENTER
- Retrieve an existing address with the memory keys and load it with ENTER.

or
HOLD MASTER/HOLD SLAVE TRANS ENTER
- The master time (if existing) or a slave time can also be loaded with the key sequence.
- During the park process the "Locating" state is indicated on the system display. The accuracy of the operation depends on the park window of the TLS 4000.

Note: If the time code of the corresponding machine is not defined (e.g. no tape transport function has yet been performed since the machine was switched on), the GOTO command cannot be executed and will be rejected with the error message "Slave-TC undefined".

SET_TC - Define the time code starting address

SET_TC
- The desired time code starting address can be defined for film equipment without time code track (synchronization with biphase signal). In the bottom right of the system display the controller asks for the input of a time code value. If a time code has previously been set, it is displayed as a default value that can be overwritten.

0...9 and ENTER
- Key in the new value and press the ENTER key.

or
ENTER
- Accept the default value displayed by the controller.

or
A1...A5 and ENTER
- Recall the time code value of one of the address memories and press ENTER to load the value.

or
HOLD MASTER/HOLD SLAVE TRANS ENTER
- Accept the master time or slave time directly as the input value.

SET_MAST - define the master

SET_MAST
- The selected machine is declared as the master. The current tape time of the machine is taken as the synchronization point of the master ("start cross") and serves as the start time for the virtual master. From this point on the master time is updated in the "Master-TC" display field. However, as long as no coupling is active, the tape time of the master is still displayed.
- The master is identified on the system display by a cross below the machine number.

Note: If the time code of a machine is not defined (e.g. no tape transport function has yet been performed since the machine was switched on), the SET_MAST command cannot be executed and will be rejected with the error message "Slave-TC undefined".
If a master machine has already been defined to the system, the function keys are displayed for the other machines so that the selected machines can be declared as slaves. There are three ways of declaring a machine as a slave:

SYNCH - Set synchronization point

SYNCH

- The current tape time of the selected machine is used as the synchronization point. The slave is marked on the system display by a circle below the machine number.
- The offset value for the machine is automatically computed and set by the controller. The machine can still be remote controlled as long as coupling is not yet active.

Note: If the time code of the machine is not defined (e.g. no tape transport function has yet been performed since the machine was switched on), the SYNCH command cannot be executed and will be rejected with the error message "Slave-TC undefined".

ZERO_OFS - Append to the master

ZERO_OFS

- This functions declares a selected machine as the slave that must follow the master without offset (offset value zero).
- A circle appears below the machine number when an offset has been defined.

OFFSET - Enter offset

OFFSET

- With this function the user can define an offset value for the slave machine. The following relationship applies: Master time + Offset = Slave time.
- The controller expects a time code value as the offset parameter.

0...9 and ENTER

- Enter the desired offset value and press ENTER.
- The "+/-" key can be used to enter the corresponding sign. Please note that only those values can be entered with a negative sign that are smaller than ten hours. Larger values must be entered in the 24-hour format.

or
A1...A5 and ENTER

- Basically an offset value can also be stored and recalled as an address.
- A square appears below the machine number when an offset has been defined.

SYNC_ALL - Special function: couple all available slaves with offset 0

SYNC_ALL

- This function is intended for working with frequently used tapes on which identical time code is recorded.
- The offset of all machines is set to 0.

CLEAR - Cancel synchronization point/offset

CLEAR

- The synchronization point and the offset are cancelled for the selected machine. This is visibly acknowledged in that the locked state marker below the machine number is also removed.
- If the selected machine is a master, its master functions are cancelled.
- In this case the synchronization points and offset values of all slaves are also cancelled because they now no longer have a reference point.

5.4 Lock mode functions

5.4.1 Main functions

LOCK_ON

LOCK_ON - Activate the coupling

- If in addition to the master at least one slave machine has been defined, the LOCK_ON function is offered. Coupling is activated as soon as the LOCK_ON key is pressed. The status "Executing" appears on the system display and the following activities are performed:
  - The virtual master and the master machine park at the start position ("start cross").
  - The MASTER TC display is switched to virtual master time.
  - The virtual master is now controlled by the tape deck keys and the SHUTTLE rocker.
  - The slave machines park at the synchronization point which has previously been defined relative to the master.
  - The SLAVE TC display changes to the synchronization difference of the currently selected slave machine relative to the master machine (or virtual master). This is signalled by the OFS/DIFF lamp.

During the execution of this command, no menu appears on the function keys because no other functions are acceptable. As soon as complete coupling has been achieved, "System.locked" appears on the system display and a menu with various lock mode functions is offered.

LOCK_OFF

LOCK_OFF - Deactivate the coupling

- All actions described under LOCK_ON are terminated. The machines are no longer coupled and the currently selected machine can be remote controlled.
- However, the synchronization points and offset values are retained until they are explicitly cancelled.

REPARK

REPARK - Virtual master locator

- With this function it is possible to park the virtual master and consequently the entire synchronized group at the desired time code address.
- The controller expects a time code address as the input parameter.
- As a default value the controller supplies the starting address ("start cross") of the master.

0...9 and ENTER

- Key in the desired time code address and press ENTER.
- To prevent unthreading of the tape, the controller does not accept any address that is lower than the master start address displayed as a default value.

or
ENTER

- Accept the default value displayed by the controller.

or
A1 ..A5 and ENTER

- Recall a stored address with one of the memory keys and load the value by pressing ENTER.

CUE

CUE - Virtual master fine-positioning

- Enables the CUE function for the virtual master. The virtual master can be moved forward or backward one frame at a time with the aid of the CUE wheel.
- The CUE function is cancelled when any other tape command key is pressed (e.g. STOP).

If the selected machine is a slave, various other functions are available:

UNLOCK

UNLOCK - Decouple an individual machine

- The selected slave is immediately decoupled.
- At the same time the synchronization point marker and the offset value are cancelled. The synchronization mark below the machine number disappears to confirm that decoupling has been performed. The current offset of the machine remains STORED until it is overwritten.
- From this point on the machine can be individually remote controlled as an asynchronous machine.

INSTLOCK

INSTLOCK - couple an individual machine

- The selected machine can be coupled immediately to the synchronous group ("instant lock" function).
- The tape deck status of the machine or the virtual master is not relevant in this case. The momentary offset value to the master is automatically determined by the controller.
- If the time code of a machine is not defined (e.g. no tape deck function has been performed since the machine was switched on), the LOCK command cannot be executed and will be rejected with the error message "Slave-TC undefined".

ZEROLOCK

ZEROLOCK - Couple an individual machine with offset 0

- The selected machine is immediately coupled to the master with an offset value of 0. The machine can be in any tape deck status.
- However, coupling is not feasible if the time code of the machine is undefined (e.g. no tape deck function has been performed since the machine was switched on). In this case the ZEROLOCK command is rejected with the error message "Slave-TC undefined".

LOCK

LOCK - Couple an individual machine with existing offset

- The selected machine is coupled to the master with the offset value currently stored in the offset register. For example a slave can be temporarily decoupled and recoupled with the previously existing offset value. If the machine has never been synchronized since it was powered on, the register will normally contain an offset value of 0.

SHIFT [+] SHIFT [-]

SHIFT - Correct the offset

- Each time one of these buttons is pressed, selected slave machine is shifted forward or backward one frame at a time relative to the master. The resulting difference to the original offset value (i.e. the nominal offset) is displayed in the "Slave-TC" display field.
- The built-up difference is retained for the corresponding machine until the synchronization point is cancelled or until a cancel command is entered.

CLR_SHFT

CLR_SHFT - Cancel the difference

- Cancels the offset built up by means of the SHIFT key.
- On the "Slave-TC" display the difference to the nominal offset value is again 0.

When the system is in locked condition, additional menus are available with functions that are used less frequently. The menus can be accessed by pressing the ETC key.

5.4.2 Background functions of the master

MAX_WIND - Modify spooling speed of master

MAX_WIND
- The maximum winding speed of the virtual master can be specified with this function.
- The SC4016 responds by asking for the desired speed and by displaying the old value.

UP
- Select higher speed.

DOWN
- Select lower speed.

ENTER
- Accept displayed value as the new speed. The possible speed value ranges between 5x and 40x the play speed.

ADDR_KEY - Programming an address memory

ADDR_KEY
- With this function the address keys can be reprogrammed for as long as the SC4016 is powered on. The values read in from diskette will be temporarily overwritten.

0...9
- Enter the value to be stored.

or
HOLD MASTER/HOLD SLAVE and TRANS
- The current master time or the slave time is taken as the input value.

A1...A5
- Press the desired address memory key. The value is now stored under the corresponding key.

Important: The values are stored in volatile memory, i.e. they are only preserved until the SC4016 is switched off. If a memory value should be permanently available on a specific address key, it must be programmed via the SETUP menu and stored on the diskette. If this procedure is followed, the corresponding key is automatically initialized with this value when the machine is switched on.

ROLLBACK - Set the rollback time for the LAST_REC function

ROLLBACK
- The currently valid rollback time is shown on the system display.

0...9
- Enter the desired time by means of the numeric keys. The valid range is 0 to 99 seconds.

ENTER
- Load the displayed value. The new rollback time remains valid for as long as the machine is switched on or until it is changed again.

MON_SYNC / SRC-SYNC Monitor/Source synchronization

- If the result of a recording is to be monitored immediately, the master machine (picture/original sound) in a synchronous group is usually no longer synchronous to the slave machines by exactly the distance between the record and the reproduce head.
- The monitoring capability can be restored with the MON_SYNC function.

MON_SYNC

- The master is switched to monitor sync mode.
- When LOCK_OFF is selected, the MON_SYNC function is also cancelled.

Note: The record function is disabled in this mode.

SRC_SYNC

- The master is switched to source sync mode. This is the standard setting that is also in effect after LOCK_ON has been activated.

Important: Record mode is only possible when the master is in SRC_SYNC mode.

Note: The shift time taken is the difference between the record and the reproduce head of the machine as specified in the SETUP menu.
This function is principally intended for picture reproduction machines so that they can run in synchronism with a recording machine.
However, the delay time of the recording machine and not the delay of the master itself must be specified for the master machine.

5.4.3 Background functions of the slaves

NEW_OFS: - Redefine offset value

NEW_OFS

- With this function the offset value of the selected slave machine can be redefined directly without prior decoupling of the system, or individual decoupling of the affected machine.
- When a new offset value is input, the originally entered synchronization point is shifted correspondingly.

0...9 and ENTER

- An input parameter consisting of the new offset value is expected. The old value is displayed by the SC4016 to inform the user.
- The entry may be signed, provided the value can be represented on the displays of the controller. Otherwise the entry must be in the 24-hour format. Load the input by pressing the ENTER key.

ENTER

- No change. The cold offset value is confirmed.

A1...A5 and ENTER

- A stored value can be retrieved and loaded.

HOLD MASTER/HOLD SLAVE TRANS and ENTER

- Accept the current master time or slave time as the input value.

TIME_DSP - Display the tape time

TIME_DSP

- In locked mode the "Slave-TC" display can be changed over to indicate the real time based on the tape of the selected slave machine.

OFFS_DSP - Display offset

OFFS_DSP

- In locked mode the "Slave-TC" display can be changed over to indicate the momentary offset value between the master and the selected slave machine.

DIFF_DSP

DIFF_DSP - Display difference

- In locked mode the "Slave-TC" display can be changed over to indicate the synchronization difference between the master and the selected slave machine.
- This display mode corresponds to the default setting. It is automatically selected by the SC4016 when (LOCK) is activated.

SLOW_LCK

SLOW_LCK - Slow difference regulation

- The synchronizer of the selected slave machine is changed over to slow compensation of synchronization differences. When this mode is active, synchronization is initially fast but as soon as the slave runs in synchronism, slow compensation is activated. Any subsequent deviation is compensated at such a speed that no audible pitch variations occurs.

FAST_LCK

FAST_LCK - Normal difference regulation

- Changes the synchronizer of the selected slave machine from SLOW LOCK mode to normal mode.

AOS_ON

AOS_ON - Process slave time code jumps

- Automatic Offset Storage.
- This function corresponds to the STORE OFFSET function of the TLS 4000.
- When this option is active, time code jumps of the corresponding slave machine are automatically counted toward the offset for as long as the master remains in PLAY mode and consequently do not interrupt the synchronous running of the slave.

Please note: This function is dynamically active and is principally intended for protecting the record operation. The original offset is reestablished as soon as the master no longer runs at play speed.

AOS_OFF

- Switches AOS mode off.

CONFIG

CONFIG - Modify operating parameters

- This functions calls an additional menu on which certain operating parameters of the controller can be modified. (In LOCK-mode)

MAX_WIND

- Refer to background functions of the master.

ADDR_KEY

- Refer to background functions of the master.

ROLLBACK

- Refer to background functions of the master.

SHF_MODE

- With this function the value can be changed by which the slave in SHIFT mode is shifted relative to the master each time this key is pressed.

FRAME

- Shift one frame each time this key is pressed.

MSEC

- Shift by the defined number of milliseconds each time this key is pressed. The SC4016 consequently asks that the corresponding value can be entered.

0...9 ENTER

- Enter the desired shift value and press the ENTER key.

You can quit the CONFIG menu by pressing the END key.

5.4.4 System display

While the system is in the locked state, the controller continuously checks the synchronous running and coupled state of the slaves. When the machines are running synchronously, this is indicated on the system display by a symbol below the machine number. When the synchronous state is attained, the corresponding symbol changes from an empty to a full circle on the slaves (O -> ▒), and from a cross to a star for the master (x -> *).

5.4.5 Malfunctions in lock mode

- Slave drops out of locked state:
  If a slave drops out of locked state (e.g. when the tape becomes unthreaded), the controller automatically removes this machine from the synchronous group in order to prevent interference with the synchronous operation of the other devices. The locked state symbol of this machine is turned off.
- Master drops out of locked state:
  If the master drops out of locked state, the message "MASTER: failed" is displayed.
  In this case the master machine is, of course, not automatically cancelled, otherwise all variables relating to the slaves would be lost.
  If the machine status permits this, the locked condition can be reestablished, by selecting LOCK_OFF followed by LOCK_ON.

Emergency operation: In this condition it is also possible to continue without a master machine, for example to continue a recording that has been started. For this reason record mode can be activated even when the master does not indicate synchronism.

- Slave drops off the bus:
  If the symbol "E" appears below the machine number, the machine has dropped off the bus. This does not interfere with the operation of the other machines. It is possible to continue in normal operation by selecting a different machine of the synchronous group. However, if the dropped machine is needed, it can be reconnected to the bus with the ATTACH function after the fault has been remedied. With the LOCK function it can subsequently be restored to the synchronous group. The machine may possibly have to be reparked first.
- Master drops off the bus:
  If the master has dropped off the bus, the symbol "E" appears below the master machine number and the message "Master failed" is displayed.

Emergency operation: In this condition it is possible to continue the operation of the synchronous group without the master machine, and also drop-in is possible.
If the group is to be preserved, do not initiate the LOCK_OFF function. After the fault has been remedied, the master can be recoupled to the bus with the ATTACH function.
The controller will then reinitialize the master based on the available data and restore it to the locked condition. The synchronous group is now again ready for operation.
However, if continued existence of the synchronous group is no longer desired, the entire group can be cancelled by means of the LOCK_OFF function. Since no master exists at this point, all synchronization points and offset values of the slaves are cancelled.

5.5 Loop functions

5.5.1 Main functions

The desired operating mode must be preselected in the SETUP menu. The operating modes AUDIO and FILM are available. Both modes results in a loop operation.
The operating mode can also be changed via the LOOPMODE function (in the ETC menu) while the system is running. However, such a change is dynamic, i.e. the default mode or the mode preselected in the SETUP menu is reactivated after the SC4016 has been switched off and on again.
In the absence of any definition in the LOOPMODE submenu of the SETUP mode, the AUDIO mode becomes the default mode after the SC4016 is powered on.

LOOP - Initiate loop mode

For executing the loop mode the controller needs a start and stop time.
The SC4016 supports two different loop modes which differ principally in the record function.

AUDIO

- In this mode, the drop-in and drop-out times always coincide with the loop limits. The latter are therefore referred to as RECIN/RECOUT. The loop limits and the RECIN/RECOUT times can be entered in millisecond resolution. This mode is principally intended for work limited to the audio sector.

FILM

- The FILM mode is principally suited for mixed film/video and audio equipment configurations.
- The loop limits and the drop-in/drop-out times are treated separately within certain limits. The loop limits (BEGIN/END) can only be set with frame resolution (full frames). Entries that differ from this restriction are automatically shifted to the nearest frame boundary.
- The RECIN/RECOUT times can be shifted relative to the loop limits but only within the range of +/- 2 seconds.
- This shift can be specified either in frames or milliseconds.
- If the shift is 0 (corresponds to the default setting of the SC4016), the record times coincide with the loop limits.
- The loop limits can be defined in several ways. The parameters of the last loop entered since the machine has been powered on are saved in temporary storage and can be retrieved at any time.
- The SC4016 can store up to 512 loops on a diskette. The loop parameters can be stored at any time while the loop is active and the corresponding loop parameters can also be retrieved in the same way. The start and end times as well as the preroll and postroll values are stored together with the loop mode.

Initial definition of the loop (after power on)

Entering the start time of the loop:

LOOP
- The controller responds by asking for the start time of the loop
  "Recin: ..:..:..:..."

or
  "Begin : ..:..:..:..."

0...9 and ENTER
- Key in the time with the numeric keys and press ENTER. The controller responds by asking for the end time of the loop
  "Recout: ..:..:..:..."

or
  "End : ..:..:..:..."

or

A1...A5 and ENTER
- Recall the desired time by pressing an address memory key and transfer it with ENTER. The controller responds by asking for the end time of the loop
  "Recout: ..:..:..:..."

or
  "End : ..:..:..:..."

The current master time can be used as the start time without having to be keyed in:

LOOP
- The controller responds by asking for the start time of the loop
  "Recin: ..:..:..:..."

or
  "Begin : ..:..:..:..."

ENTER
- Transfers the current master time into the loop time register. The controller responds by asking for the end time of the loop:
  "Recout: ..:..:..:..."

or
  "End : ..:..:..:..."

Entering or transferring the end time of the loop:

The end time can be defined in the same way as the start time. Refer to steps "Entering the start of the loop" or "The current master time can be used as the start time without having to be keyed in".
An additional possibility is to copy the start time into the end register by pressing the TRANS key and then to add the loop duration by means of the TC computer function CALC:

TRANS
- The start time is copied into the end time register.

CALC
- The end time register content is copied into the computer register. A blank input line appears on the display
  "End : ..:..:..:..."

or
  "Recout: ..:..:..:..."

0...9 ADD and ENTER
- The loop duration can now be entered and added to the start time with the ADD function. The computed result is stored by pressing ENTER.

After the end time has been defined, the loop is automatically activated. All coupled machines park at the loop start less the preroll time. The controller is in SINGLE loop mode.

Redefining the loop (loop has previously been entered)

Entering the start time of the loop:

LOOP
- The controller responds by asking for the start time of the loop and displays the old loop start time, e.g. "Recin: 10:00:30:00." or "Begin: 10:00:30:00.".

ENTER
- Confirm the displayed start time.

or

0...9 and ENTER

Overwrite the displayed start time by entering a new value with the numeric keys and press ENTER.

or

A1..A5 and ENTER
- Recall the desired time by pressing an address memory key and transfer it with ENTER.
- In all three cases the controller responds by asking for the end time of the loop and displays the old end time, e.g.:
  "Recout: 10:00:35:00."

or
  "End : 10:00:35:00."

Using the current master time as the start time:

LOOP
- The controller responds by asking for the start time of the loop and displays the old start time, e.g.
  "Recin: 10:00:30:00."

or
  "Begin: 10:00:30:00."

There are two possibilities of continuing:

CLR ENTER
- If you pressed the ENTER key now, the old start time would be accepted. CLR cancels the old start time.

HOLD MASTER/HOLD SLAVE TRANS ENTER
- Pick up the current master time or the slave time by means of the transfer function.
- In either case the controller responds by asking for the end time and displays the old end time, e.g.:
  "Recout: 10:00:35:00."

or
  "End : 10:00:35:00."

- Method "Entering the start time of the loop" is somewhat faster because only 2 keys need to be pressed.

If the master time is to be used as the start time, this can also be accomplished while the master is running (on the fly). If Method "Entering the start time of the loop" is chosen, note that the time input line must be blank (CLR!) when the ENTER key is pressed, otherwise the master time will not be read in.

Using the END/RECOUT time of the old loop as the START/RECIN time:

LOOP
- The controller responds as usual by asking for the start time of the loop and displays the old start time, e.g.
  "Recin: 10:00:30:00."

or
  "Begin : 10:00:30:00."

LAST_END or LAST_OUT
- Provided an "old" loop exists, the end time is now displayed as the start time of the "new" loop, in our example:
  "Recin : 10:00:35.00."

or
  "Begin : 10:00:35:00."
- The controller immediately proceeds by asking for the end time and displays a blank line:
  "Recout: ..:..:..:..."

or
  "End : ..:..:..:..."

Entering the loop end time:
- The end time can be defined in the same way as the start time. Refer to steps "Entering the start time of the loop" or "Using the current master time as the start time".
- As has been mentioned previously, the start time can be copied into the end time register by means of TRANS so that a value can be added with the TC computer function.

After the end time has been defined, the loop is automatically activated. All locked machines park at the loop start less the preroll time. The SC4016 is in SINGLE loop mode.

Retrieving a loop from data diskettes

LOOP
- The controller responds by asking for the start time of the loop and displays the last valid loop start time, e.g.
  "Recin: 10:35:00:00." or a blank line.
  "Recin: ..:..:..:..." if this is the very first loop.

RECALL
- The controller responds by asking for the number of the stored loop with
  "Loop # : ..."

or
  "Take # : ..."

- If a loop has previously been retrieved or stored, the number of the next loop is displayed as the default input value.

ENTER or 0..,9 and ENTER
- Accept the default number with ENTER or enter a 1- to 3-digit loop number (e.g. for loop 1 enter "Loop # 1..") and load it from the diskette by pressing the ENTER key.

The controller now transfers all required loop parameters from the diskette and activates the loop. All locked machines park at the start of the loop less preroll time. The SC4016 is in SINGLE loop mode. Since the diskette contains for each loop also the corresponding loop mode, the corresponding mode is automatically selected when this loop is retrieved.

Important: If a loop is stored or retrieved the first time since the data diskette has been inserted, the process takes considerably longer than usual. This is NOT an error. The reason for it is that an initialization process must be performed which does not have to be repeated for as long as the same diskette remains in the drive.

STORE_LP - Storing the loop data on diskette

STORE_LP

- The controller responds by asking for the desired loop number with "Loop # : ..."
- If a loop has already been defined, the SC4016 displays the next number as the default value.

ENTER 0...9 and ENTER

- Key in the 1- to 3-digit loop number and store it by pressing ENTER.

Note: If a loop is found on the diskette under the specified number, the SC4016 asks: "Loop already exists, continue ?".

YES

- The old loop parameters on the diskette will be overwritten by the new values.

NO

- Nothing is stored.

Important: If a loop is stored or read the first time since the corresponding data diskette has been inserted, the process takes considerably longer than usual. This is NOT an error. The reason is that an initialization process must be performed which does not have to be repeated with the same diskette.

5.5.2 Loop operation

SINGLE - Operation in single loop mode

SINGLE

- The controller is switched to single loop mode. The current mode of operation is indicated on the system display.

Starting the loop

PLAY

Meaning:
- "I would like to play the loop once".
- The loop is started. The machines stops automatically at the end of the loop (+ postroll time), then rewind and repark at the start of the loop.
- The play pilot lamp flashes as long as the rehearse mode is active.

Appending additional loops

PLAY

Meaning:
- "I would like to play the loop again after the current loop is completed".
- The loop is reexecuted after the loop has been completed and the machines have reparked at the start of the loop.

Display:
- Whenever the current loop is followed by another one, the PLAY pilot lamp flashes.

Interrupting the loop

STOP, < <, > >

- The loop is interrupted and the machines are immediately reparked at the start of the loop.

Record - Loop is already in progress

PLAY - REC or REC - PLAY

- After the current loop has been completed, a new loop is appended to the current loop and all machines with preselected record function switch to RECORD: The REC pilot lamp flashes from the time the REC command is entered until the end of the current loop. During the park process the PLAY and REC pilot lamps flash concurrently. After the record loop has been started the REC lamp flashes until the actual drop-in occurs (preroll).

Record - Machines are parked at the start of the loop

PLAY - REC

Meaning:

- "I would first like to play a loop and then record the subsequent loop".
- The loop is started and executed normally. A SECOND loop is then performed, but this time the machines with preselected record function will switch to RECORD (drop-in).

Display:

- The REC pilot lamp flashes until the play loop is completed. The subsequent signalization is identical as described in "Appending additional loops" above.

REC - PLAY

Meaning:

- "I would like to start a loop and record it immediately".
- Only one loop is executed. The machines with preselected record function will switch to RECORD. The REC lamp flashes before the drop-in (preroll).

REC signalization in REHEARSE mode:

The PLAY and REC lamps flash continuously. During the record loop the REC lamp switches off for the duration of the preroll.

AUTO - Operation in continuous mode

AUTO

- Selects continuous mode and immediately starts the loop execution. Upon completion of the loop the machines rewind and the loop is restarted. This procedure continues until the function is terminated by returning to SINGLE loop mode. Display: The PLAY pilot lamp flashes while the machines rewind to the start of the loop.

Interrupting the loop

STOP

Meaning:

- "I would like to interrupt the loop and start it from the beginning."
- The execution of the loop is interrupted immediately, the machines reposition at the start of the loop and the loop is automatically reexecuted.

Display:

- The PLAY pilot lamp flashes while the machines rewind to the start of the loop.

Recording

REC - PLAY or PLAY - REC

Meaning:

- "I would like to record when the next loop is started".
- When the next loop is started, all machines with preselected record function switch to RECORD.

Display:

- The REC pilot lamp flashes until the end of the loop is reached. During the park process the PLAY and REC lamps flash concurrently until the start of the loop is reached. The REC lamp then flashes alone until the actual drop-in occurs.
- After this loop has been recorded, the loop is reexecuted until the continuous mode is cancelled.

Return to single loop mode

SINGLE

- The current loop is played to the end after which the machines rewind and wait at the start of the loop.

PREROLL - Modifying the preroll time

Note: The preroll time can be modified only in SINGLE mode and while the virtual master stands still.

DEVICE xx

- Select the master. The PREROLL key is displayed in the function key field.

PREROLL

- The controller responds by displaying the previously valid preroll time, e.g. "Preroll: 05 sec.".

0...9 and ENTER

- Key in the two-digit preroll time (range 00 to 99 seconds) and press ENTER.
- The controller reparks the machines, taking the modified preroll time into consideration.

Note:

- If the preroll time is modified immediately after the setup of a loop or while the slaves are still in the process of parking, it may take several seconds before parking to the new preroll time is actually performed.
- The default preroll time used by the controller is 10 seconds.
- If the preroll time is modified in FILM mode, the SC4016 makes sure that the minimum play time since the drop-in is at least 1 second in order to prevent illogical states. However, it is still up to the user to define a preroll time that is suited for his specific application.

POSTROLL - Modifying the postroll time

Note: The postroll time can be modified only in SINGLE mode and while the virtual master stands still.

DEVICE xx
- Select the master. The POSTROLL key is displayed in the function key field.

POSTROLL
- The controller responds by displaying the previously valid postroll time, e.g. "Postroll: 03 sec."

0...9 and ENTER
- Key in the two-digit postroll time and press ENTER. The controller accepts only values between 0 and 99 seconds. The controller immediately accepts the new postroll time.

Note:
- If the postroll time is modified immediately after the setup of a loop or while the slaves are still in the process of parking, it may take several seconds before the new postroll time becomes active and the loop can be started.
  The default postroll time used by the controller is 2 seconds.
- If the preroll time is modified in FILM mode, the SC4016 makes sure that the minimum play time since the drop-in is at least 1 second in order to prevent illogical states. However, it is still up to the user to define a preroll time that is suited for his specific application.

MOD_LOOP - Modifying the loop limits

The MOD_LOOP function key is displayed when the master machine is selected. With this key a second menu can be selected on which the loop limits can be modified.

NEW_LOOP
- Define completely new loop without leaving the loop mode. For operation refer to the foregoing chapter 5.5.1 "Redefining the loop".

With the following functions you can trim the drop-in and drop-out times. Regardless of whether these times are specified in frames or milliseconds, the SC4016 maintains them internally in milliseconds because they also serve as the drop-in/drop-out times.

TRIM_BEG
- Correcting the drop-in time. If the display is set to frames, you can trim in seconds and frames, otherwise in frames and milliseconds.
- Changeover is possible with the "Frames/Msec" key on the supplementary keypad.

+/- SEC and +/- FRAME
- Increase or decrease the drop-in time and in seconds or frames resolution.

or

+/- FRAME and +/- MSEC
- Increase or decrease the drop-in time in milliseconds or frames resolution.

TRIM_END
- The drop-out time can be trimmed in the same way as the drop-in time.

Please note: In FILM mode it is not possible to shift the loop limits in milliseconds resolution.

END
- Terminate the loop correction function. Return to the loop main menu. The new loop values are activated.

LOOP_OFF - Dropping out of loop mode

LOOP_OFF

- Terminate the loop mode and return to the locked state.
- The last loop parameters are automatically stored and retained until the controller is switched off.

5.5.3 Supplementary loop mode functions

In loop mode, additional functions are available which can be accessed via the background menu (ETC key).

SLEW - Modifying the slave time module

With the slew function the playing time defined by the loop limits for the selected slave machine can be shortened or extended within certain limits, i.e. to gain or drop a predefined number of frames between the start time and the end time of the loop. This is accomplished by multiplying the slave time by a corresponding factor. This factor can theoretically range between 0.5 and 2.

Slave not in slew mode

SLEW

- The controller responds by asking for the time to be compensated (positive or negative) with "Slew: ..:..:..:...".

0...9 and ENTER

- Key in the desired slew value, i.e. the desired number of frames that are to be gained or dropped and the corresponding sign (see explanation below) and press the ENTER key. This entry can also be specified in milliseconds.

- **Positive sign:**
  SLOWER, i.e. lose the specified time over the loop duration. The machine loses the specified time while playing between the loop limits. Explanation: the positive sign leads to a slew factor that is greater than 1. The slave time multiplied by this factor thus appears to run faster. The effect is that the synchronizer makes the machine run slower in order to keep it in synchronism with the master.

- **Negative sign:**
  FASTER, i.e. gain the specified time over the loop duration. The machine gains the specified time while playing between the loop limits.

- **Explanation:**
  Analogously to positive sign, but inverse effect.

- A machine that has been set to slew mode enters the wait lock state and parks two seconds after the preroll position of the master. In the wait lock state a slave follows the master only when the latter operates in play mode. As soon as the master runs no longer at play speed, the slave machine returns immediately to its cue position.

Slave already in slew mode

SLEW
- The controller responds by displaying a submenu with which the slew value can be modified or the slew mode disabled.

CHANGE
- The controller asks for a new slew value to be entered. For further procedures refer to the previous section.

SLEW_OFF
- The slew mode is switched off for the corresponding slave machine. Return to the normal loop selection menu.
- The slew mode is automatically switched off when the loop mode is cancelled.

REHEARSE function

If machines are connected to the bus that support this function, such machines can be switched to rehearse mode.

REHEARSE
- Activate rehearse mode.
- The record commands are simulated by the machines.
- In rehearse mode the PLAY and REC lamps flash continuously as additional signalization.

REC_ENAB
- Cancel rehearse mode.
- **Important:**
  Remember that the record commands will now be performed after the rehearse has been cancelled.

Note: The REHEARSE function should not be considered as a 100% record inhibition because the implementation in certain interface versions of older generation may be incomplete.

LOOPMODE - Changeover the loop mode

LOOPMODE
- The SC4016 displays the current loop mode and expects the input of the desired mode.

AUDIO
- AUDIO loop mode

FILM
- FILM loop mode
- The difference between these two modes is described in chapter 4.3, "Modifying the SETUP files" Step 15.

ENTER
- Accept the entered mode.

If the FILM mode is selected, the TRIM_REC function key is also offered. With this function it is possible to shift the RECIN/RECOUT times relative to the loop limits.

TRIM_REC - Shift the RECIN/RECOUT time

TRIM_REC

- The SC4016 displays the currently valid shift relative to the loop begin. "RECIN vs. loopbeg. shifting: ....".
- **Sign rules:**
  A NEGATIVE sign means that RECIN will occur before the loop begin by the displayed amount (1st display picture), a POSITIVE sign means that RECIN in starts AFTER the loop begin.

MSEC

- Shift value specified in milliseconds.

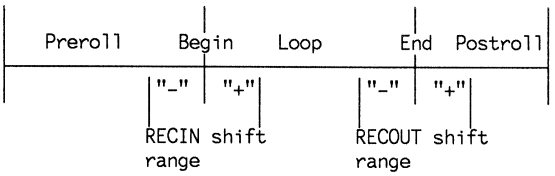
FRAME

- Shift value specified in frames.

+/- 0...9 ENTER

- Enter the desired shift with the numeric keys and store it. The SC4016 asks for the RECOUT time relative to the loop end in the same way:
  "RECOUT vs. loopend shifting: ..."
- The input procedure is the same as for RECIN.

TRIM_REC sign rule:



Please note: The SC4016 makes sure that the preroll/postroll times will not conflict with the record times or that illogical loop durations are generated.
The RECIN and RECOUT times can be shifted relative to the loop limits by an amount not exceeding +/- 2 seconds.

Recording devices

REC_DEV - Declare the recording devices

Up to 3 recording devices can be declared in loop mode. The so-called APPEND function can subsequently be applied to these specially defined recording devices.

No recording devices have been declared yet

REC_DEV

- The controller responds by asking for a recording device as follows: "Rec.dev: .."

0...9 and ENTER

- Enter the 2-digit system number of the slave machine to be declared as a recording device and press the ENTER key.

Important: The specified machines must be slaves of the synchronous group, otherwise the entry will be rejected.
When the controller has accepted the entry, it responds by asking for the next recording device until three devices have been declared. It then returns automatically to the loop menu.
If fewer than three recording devices are to be declared, the input sequence can be terminated by pressing the ENTER key on a blank input line.

Recording devices already declared

REC_DEV

- The controller responds by asking for a recording device and also displays the recording machine with the lowest system number.

ENTER

- Confirm the displayed recording device. The controller displays the number of the next recording device, if there is any. If no further recording device exists a blank input line is displayed.

0...9 and ENTER

- Overwrite the displayed system number and press ENTER. The controller cancels the old recording device and accepts the entered machine as a new recording device.

CLR and ENTER

- Cancel the displayed recording device.
- If additional recording devices are defined, the system number of the next machine is shown, otherwise a blank input line is displayed.

CRL_ALL

- Cancel all recording devices. The controller returns automatically to the loop selection menu.

Append functions

The SHIFT-LOOP function parks the recording machine in the forward direction by the amount of the current loop duration (+ preroll time). The user is thus able to make several recording attempts in a loop without having to erase the previous attempts or having to compute new offset values.

SHIFT-LOOP - Park the recording devices

SHIFT_LP

- The machines declared in the synchronous group as recording devices are parked in the forward direction by the amount of the current loop duration (+ preroll time).
- The SHIFT LOOP function is only feasible if recording devices have been declared, otherwise this function key does not appear on the menu.

APD_MODE - AUTO-APPEND function

APD_MODE

- The AUTO-APPEND function can be toggled on/off with this key. The current status is indicated.

ON

- Enable the function.

OFF

- Disable the function.

ENTER

- Return to background menu.

Principle of operation:
Whenever the loop mode is switched off (LOOP_OFF), the SHIFT_LOOP function is automatically initiated at the recording devices. As soon as the recording devices are parked at the new location, they are removed from LOCK mode. This process is signalled on the system display by the wording "Auto-appending".
When this process has been completed, the synchronization point symbols (0) below the machine number disappear from the system display.
With the other machines of the group a new loop can now be set up or recalled from diskette.
As soon as the master has parked at the start of the loop, the recording devices are automatically recoupled (LOCK). This process is signalled by the wording "Auto-appending" and the synchronization point symbols (0) on the system display reappear.

6 Event Controller Board

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6 Event Controller Board

6.1 Description of the directly controlled event relays

Event 1: All parked

Active in LOCK state as well as in loop mode.
Picks up as soon as all machines of the synchronous group are in coincidence with the virtual master.

Event 2: All synchronous

Active in LOCK state as well as in loop mode.
The contact closes as soon as all machines of the synchronous group are in play condition within their synchronizing window.

Event 3: Start band signal

Active in loop operation in conjunction with FILM mode.
The contact closes for an adjustable period within the preroll time and opens at the first frame (start band duration). The closing time can be set to an integer number of seconds between 0 and 15 by means of DIL switches (refer to hardware description).

Event 4: Loop signal

Active in loop mode.
The contact closes when the first frame of the loop is processing and opens after the last frame of the loop.

Event 5: Record signal

Always active.
Picks up whenever a record command is initiated in the system and remains energized until the command is cancelled.

Event 6: Record enable (i.e. rehearse off)

Active when the rehearse function is switched off.

Event 7: Master in shuttle mode

Active when the shuttle function of the virtual master is switched on. The contact closes when the shuttle rocker is deflected and remains closed until all tape decks stand still or a cancelling tape command is initiated.

Event 8: Master in spooling mode

Active in LOCK state as well as in loop mode.
The contact closes as soon as the virtual master moves at spooling speed (spooling command, repark function, loop rewind, stop) and opens as soon as all tape decks stand still or a cancelling tape command is initiated.

6.2 Functional description of the user-programmable events

The programmable event functions consist of hardware (1.328.368) and corresponding program modules in the SC4016 system software.

6.2.1 Hardware

The event controller module 1.328.368 comprises 8 relay contacts which are controlled as a function of the time read at the time code input. Six of these contacts are make (N/O) contacts and 2 are changeover contacts. The desired closing duration can be set by means of DIL switches on the module. Normally the time code signal supplied by the master is input to the event controller module. The SC4016 can optionally be expanded to a total of 16 programmable relay contacts.

6.2.2 Software

The software package comprises a user interface module which contains the programming menu and manages the event parameters, as well as a process control module which integrates the control/initiation of the programmable events into the sequence of operations of the SC4016 (synchronous operation or loop mode).

6.2.3 Function

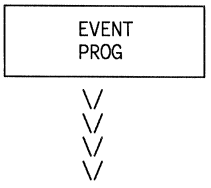
When the system software is started it automatically checks for the presence and the number of event controller modules.
The event times can be derived from the master time "on the fly" or alternatively be entered or modified by hand. The desired work contact must always be manually assigned to the corresponding event. 99 event registers are available.
A given relay contact can be assigned to any number of events, subject to the available memory capacity.
The programmed events can be enabled and disabled globally.

6.2.4 Operation

Event programming menu

EVENT PROG - Call the event programming menu

The EVENT PROG key in the supplementary keyboard call the event programming menu.



ENABLE	SEARCH	
EDIT	LAST	NEXT
CLR_ALL	CLR_EVT	MARK_EVT

The system display uses lines 3 and 4 for the event programming.
Line 3 is used for possible user information or error messages. Line 4 always shows the content of an event register in the following format:

"Ev.#: 01 Time: 10:59:02:16 Relay #: 03"

An event number can also be entered directly via the numeric keypad, and the corresponding event register can be displayed.

Description of all functions

A brief description of all push button functions related to the event programming menu is given in the following paragraphs. Also refer to the menu overview at the end of this section.

ENABLE - Enable all events:
All programmable events are enabled with this command and loaded into the execution memory of the event controller. Whenever a time code address with a programmed event is read at the time code input of the event controller, the event will be initiated. On the system display, the status is shown in the status line with the wording "Events enabled".

DISABLE - Disable all events:
The execution of all programmed events is inhibited. The programmed times and switching operations remain stored in the system and can be activated by reenabling them. The status is shown on the system display in the status line with the wording "Events disabled".

SEARCH - Jump to the next available event register:
The SEARCH function searches the next higher, unassigned event register and displays it:

e.g. "Ev. #: 07 Time: ..:..:..:.. Relay #

If no available event register is found, the program jumps to register 99 and displays its content.

"nn" - Direct event register selection:
If a 2-digit register number is entered via the numeric keypad, the controller branches directly to the desired event register and displays its content.

EDIT - Edit the content of the event register:
The event editing mode can be activated by pressing the EDIT key in order to modify the content of the event register, or, if the latter is empty, to manually enter new data.
The event registers can only be edited when the events are disabled.
The status is signalled by the wording "Editing mode" in the status line of the system display. The cursor jumps to the field "Time: ..:..:..:.." or "Relay #: .." .

The following edit functions are available:

< <, > >
- Position the cursor.
- The cursor can be positioned within an input field or to the next input field.

TRIM +/-
- Modify the event time in frame resolution.
- These keys are only enabled if a time value exists in the time input field.

ENTER
- Accept the register content as shown on the display.
- The controller echoes the transferred content.

END

- Quit the editing mode.
- The cursor jumps back to the event number field. The text "Editing mode" disappears from the status line of the system display.

LAST - Page through the event registers:
With the LAST key it is possible to display the register preceding the one currently shown on the display. This function responds in two different ways:
- In editing mode the immediately preceding register is displayed.
- In display mode, vacant event registers are skipped, i.e. the preceding register that has actually been programmed will be displayed.

NEXT - Browse through the event registers:
With the NEXT key it is possible to display the register following the one currently shown on the display. This function responds in two different ways:
- In editing mode the immediately following register is displayed.
- In display mode, vacant event registers are skipped, i.e. the following register that has actually been programmed will be displayed.

CLR_ALL - Clear all event registers:
The CLR_ALL function irrevocably erases the content of all event registers. To prevent unintentional erasure, the prompt "Clear all events ?" is displayed which must be explicitly answered by pressing either the YES or the NO key.

YES

- The erase process is initiated and the acknowledgment "All events cleared" is displayed on the status line.

NO

- The erase process is cancelled and the acknowledgment "No action taken" is displayed on the status line.

CLR_EVT - Clear an individual event:
The content of the event register currently shown on the system display is erased. The acknowledgment "Event cleared" is displayed on the status line.

MARK_EVT - Accept the event-time "on the fly" from the virtual master:
The event times can be transferred directly into the event register during the play process. This is possibly as soon as the SC4016 is in LOCK condition.
When the MARK_EVT is pressed, the momentary master time is transferred into the field "Time: ..:..:..:.." of the corresponding event register. The next register is automatically selected. On the system display, line 3 of the register that has just been programmed is shown while on line 4 the next register to be programmed is displayed. The registers are written starting consecutively, with the register currently displayed.
An event is considered as defined if not only the time but also the relay number is given. The relay numbers are not set by the MARK_EVT function and must subsequently be added to the information in the registers.

Important: The MARK_EVT function ALWAYS overwrites the old register content.

This function is automatically cancelled when a new function is selected.

"EVENT PROG" - Quit event programming menu:
You can quit the event programming menu by pressing the EVENT PROG key a second time.
The previous menu is again displayed on the function keys of the SC4016.

6.3 Menu overview

ENABLE	SEARCH	
EDIT	LAST	NEXT
CLR_ALL	CLR_EVT	MARK_EVT

"ENABLE" \/ \/ \/ \/ /\ /\ /\ /\ "DISABLE"

DISABLE		

Important: The events cannot be edited once they have been enabled.

ENABLE	SEARCH	
EDIT	LAST	NEXT
CLR_ALL	CLR_EVT	MARK_EVT

"EDIT" \/ \/ \/ \/ /\ /\ /\ /\ "END"

ENTER	END	
TRIM +	LAST	NEXT
TRIM -	< <	> >

7 AVTC-12 Generator/Reader remote control option

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7 AVTC-12 Generator/Reader remote control option

Functional description:
The SC4016 supports the serial remote control for one external time code generator/reader.
The unit is operating in such a way that the operating procedure of the SC4016 is integrated, that the most important functions are continuously available on permanently assigned keys and that the less frequently used functions are offered on a menu that can be called as needed.

7.1 Hardware

Generator reader

- Alpermann & Velte AVTC 12
  - With video insertion
  - With/without optional VITC reader

Interface

- Serial, asynchronous, according to RS232 or RS422

- **Data organization:**
  1 Start bit
  8 Data bits
  No parity
  1 Stop bit
  9600 baud

- **Electrical signals:**
  RxD, TxD, common, shield

- **Communication protocol:**
  According to separate description
  (Glance Ltd. ed. 7.7.87)
  not included in this manual

Additional information

- AV TC-12 operating instructions
  Alpermann & Velte GmbH.

7.2 Software

7.2.1 Overview of the remotable functions

The following functions can be remote controlled:

Device configuration and control (menu functions)

- Setting the TC code type
- Selecting the generator synchronization source
- Setting the user bits of the generator
- Setting the start address of the generator
- Selecting the information to be displayed (generator/reader)
- Selecting the display mode (TC/user bits)
- Jam on/off
- Continuous jam mode
- CTL continuous jam mode
- Selecting the SMPTE reader input

Permanent key functions

- Generator start/stop
- Reader on/off
- Video insertion globally on/off
- Countdown on/off
- Switching the grey mask during the countdown or the preroll/postroll function on/off
- Flags on/off (Cued, Sync, Rec)
- Call/cancel TC Gen menu

The functions listed in chapter 7.2.1, "Device configuration and control (menu functions)" are offered as softkeys in the generator menu.
The generator menu can be called and terminated with the TC-GEN MENU key.
The generator menu offers the most important operating parameters in the lower half of the SC4016 system display. For example:

```
Gen.: stop              Reader-Inp.:    SMPTE-1
Att.: cjam  cd  m       R. Time: 23:37:25:18
```

In the parameter input functions, the values are displayed by the SC4016 in the familiar format on a single input line. These values can be modified either by direct numeric input or by browsing through the valid range with the aid of two keys.

Legend to the attribute indication (att.):

jam : Jam mode active

cjam : Continuous jam mode active

cctl : CTL continuous jam mode active

Cd : Countdown activated

m : Grey mask activated

7.3 Operation

7.3.1 Description of all functions

Starting the generator program:
Normally the AVTC-12 remote control program is automatically started when the SC4016 is put into operation. Occasionally it can happen that the AVTC-12 was not switched on when the SC4016 is started. As a consequence the remote control program in the SC4016 will not be activated. In order to prevent a full restart of the SC4016, the AVTC-12 control process can be started separately in the background menu of the SC4016 when the GEN_TASK is displayed.

Permanent key functions

GEN R/S - Start and stop the generator TC output:
With this key the generator can be toggled on or off.

READER ON/OFF - Switch the time code reader on/off:
With this key the reader can be toggled on and off. If a VITC reader is configured, it is connected in parallel. The video insertion, if activated and enabled, is switched on/off together with the reader.

VIDEO INSERT - Video insertion globally on/off:
With this key the video insertion can be globally switched on and off. Most insertions can also be switched on/off selectively or be switched off on the unit itself (not all functions are remotable!).

CD ENABLE - Countdown insertion ("electron. start band"):
The countdown insertion can be switched on/off selectively with this key. However, the insertion will only be performed if the VIDEO INSERT has been globally activated.

MARK ENABLE - Switch the grey mask on/off:
The grey mask is displayed during the preroll/postroll phase and can optionally be superposed with the countdown insertion, provided VIDEO INSERT has been globally enabled.

FLAGS ENABLE - Status flag insertion:
The status flags CUED, SYNC, and REC can optionally be inserted into the display. It is controlled in parallel to the corresponding fixed events of the SC4016 provided VIDEO INSERT has been globally enabled.

TC-GEN MENU - Call/cancel generator menu:
The TC-GEN MENU can call the menu with the auxiliary functions of the AVTC-12. The menu is displayed on the function keys of the SC4016. When this key is pressed a second time, the menu is cancelled and the SC4016 returns to the preceding menu. Precondition: global enabling of the insertions (VIDEO INSERT).

Generator menu functions

While the SC4016 is in the generator menu, no controller functions can be performed other than the tape deck functions.
The operating state of the AVTC-12 is simultaneously shown on the system display.

DSP_GEN/DSP_READ - Display changeover between generator/reader:
All active indications are switched over to the desired display mode.

DSP_USER/DSP_TIME - Display change over user bit/time code:
The AVTC-12 (including video insertion) is changed over from TC to user bit indication and vice versa. This changeover applies also to the SC4016 system display.

JAM_ON/JAM_OFF - Switch jam mode on/off:
Enables the basic Jam mode. If this key is pressed again, the jam mode is switched on. The Off function applies to all jam modes. When the generator menu is active, the wording "jam" appears on the system display.

CONT_JAM - Continuous jam mode:
Enables the continuous jam mode. When the TC generator menu is active, the wording "cjam" appears on the system display. This mode can be cancelled with the JAM_OFF key.

CTL_JAM - CTL continuous jam mode:
Enables The CTL continuous jam mode. When the TC generator menu is active, the wording "cctl" appears on the system display. This mode can be cancelled with the JAM_OFF key.

INPUT-1/INPUT-2 - Select TC reader input:
With this function key you can select between the SMPTE inputs 1 and 2. The key designations are changed analogously.

SET_TIME - Set the time code start value of the generator:
With the SET_TIME function you can set the start address of the generator. After this key has been pressed the blank input field is displayed as follows: "G.Time : ..:..:..:.."

0...9 and ENTER

- The desired start time can be entered and loaded.

or

A1...A5 and ENTER

- If desired, it is possible to retrieve an address from the SC4016 memory.

RESET

- No start time is to be enter, return to the menu.

SET_USER - Set user bits of the generator:
The SET_USER function can be used for setting the user bits of the generator to the desired value. The valid range comprises the hexadecimal digits 0 to F. After this key has been pressed the blank input field is displayed as follows: "G.User : ..:..:..:..".

0...9 A..F and ENTER

- Enter the desired value with the numeric or the alphanumeric keypad. The hexadecimal digits A..F are offered on the function keys.

or
A1...A5 and ENTER

- If desired it is also possible to retrieve a value for the SC4016 memory. It should be noted, however, that no hexadecimal values can be stored in memory locations A1...A5.

RESET

- No user bits are to be entered, return to the menu.

ETC - Select secondary menu:
Two less frequently used functions are accessible in a second menu level.

CODE - Select time code format:
With the CODE function you can set the time code format of the AVTC-12. All formats form 24, 25, 30 to drop frame can be read and generated. The prompt

e.g. "Define code format: 25 frames/sec"

appears on the system display and the existing settings are shown.

LAST / NEXT

- With these keys you can browse through the available input values.

ENTER

- The displayed value is accepted.

Note: When the SC4016 is started, the AVTC-12 is automatically set to the time code format set in the SC4016.

SYNCH - Select synchronization source:
With this function you can select the synchronization source for the generator. The prompt

e.g. "Select sync. source: internal"

appears on the display and the existing settings are shown.

LAST / NEXT

- With the NEXT and LAST keys you can browse through the available input values.

ENTER

- The displayed value is accepted.

Notes:

- The AVTC-12 retains the setting also after it has been switched off which means that it does not have to be reentered each time the machine is started up.
- When video insertions are used, we recommend that you select the "video" synchronization mode in order to obtain a clean image.

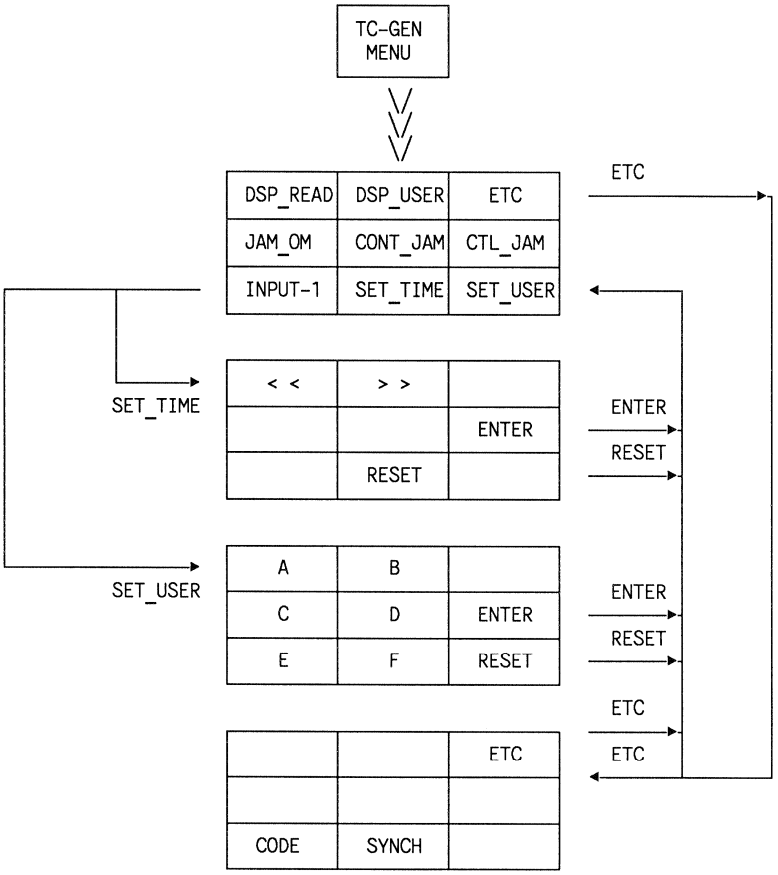
7.3.2 Function key layout

Permanently assigned keys

On the SC4016 supplementary keypad lines 2 and 3

			TC-GEN MENU	VIDEO INSERT
GEN R/S	READER ON/OFF	CD ENABLE	MASK ENABLE	FLAG ENABLE

Generator menu



8 Softkey menues

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Menu 2 SETUP Address key
Menu 3 SETUP Modify defaults
Menu 4 SETUP Modify defaults
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Menu 6 SETUP Modify RECORD, LOOP
Menu 7 SETUP Modify LOOP
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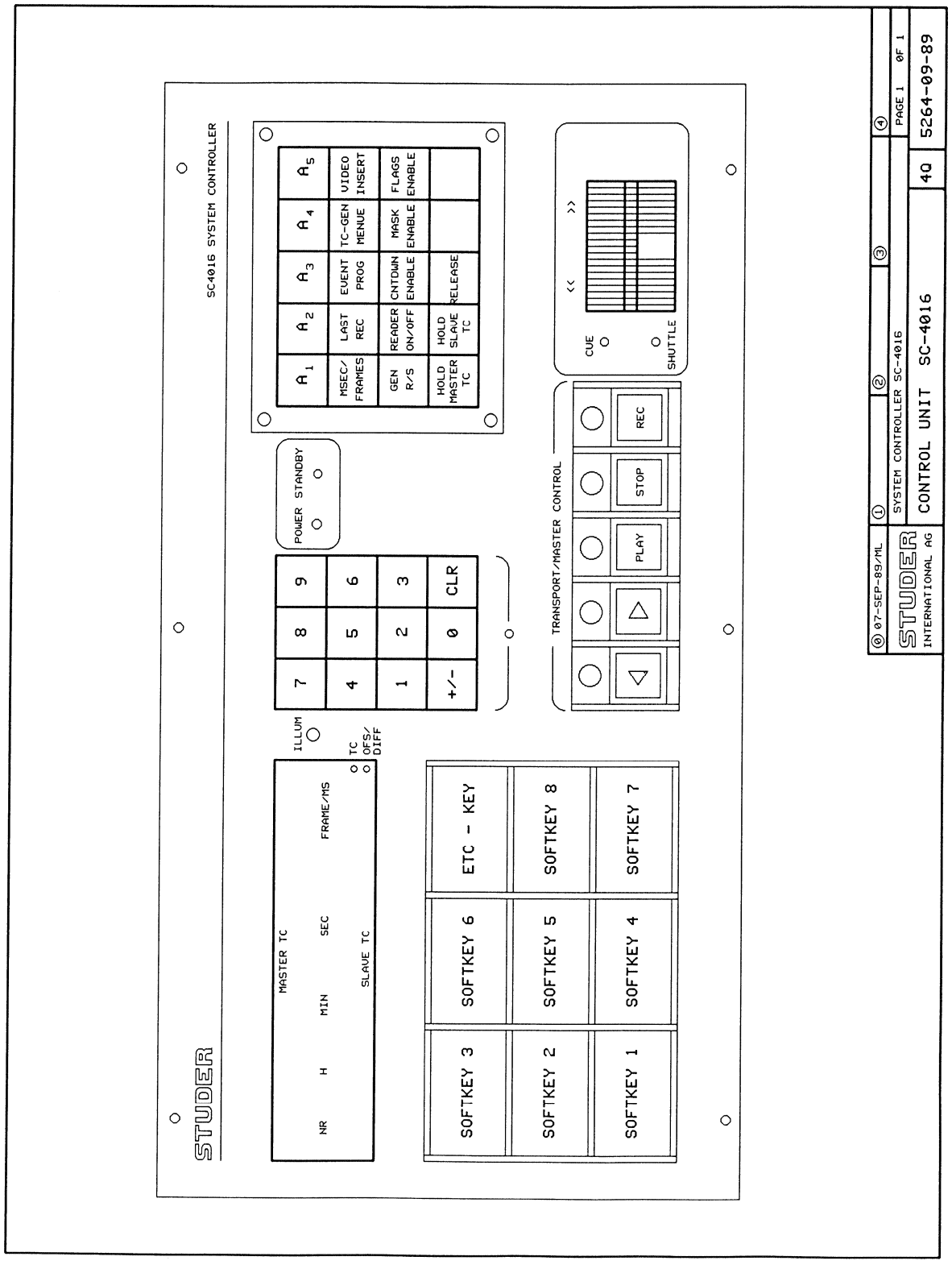
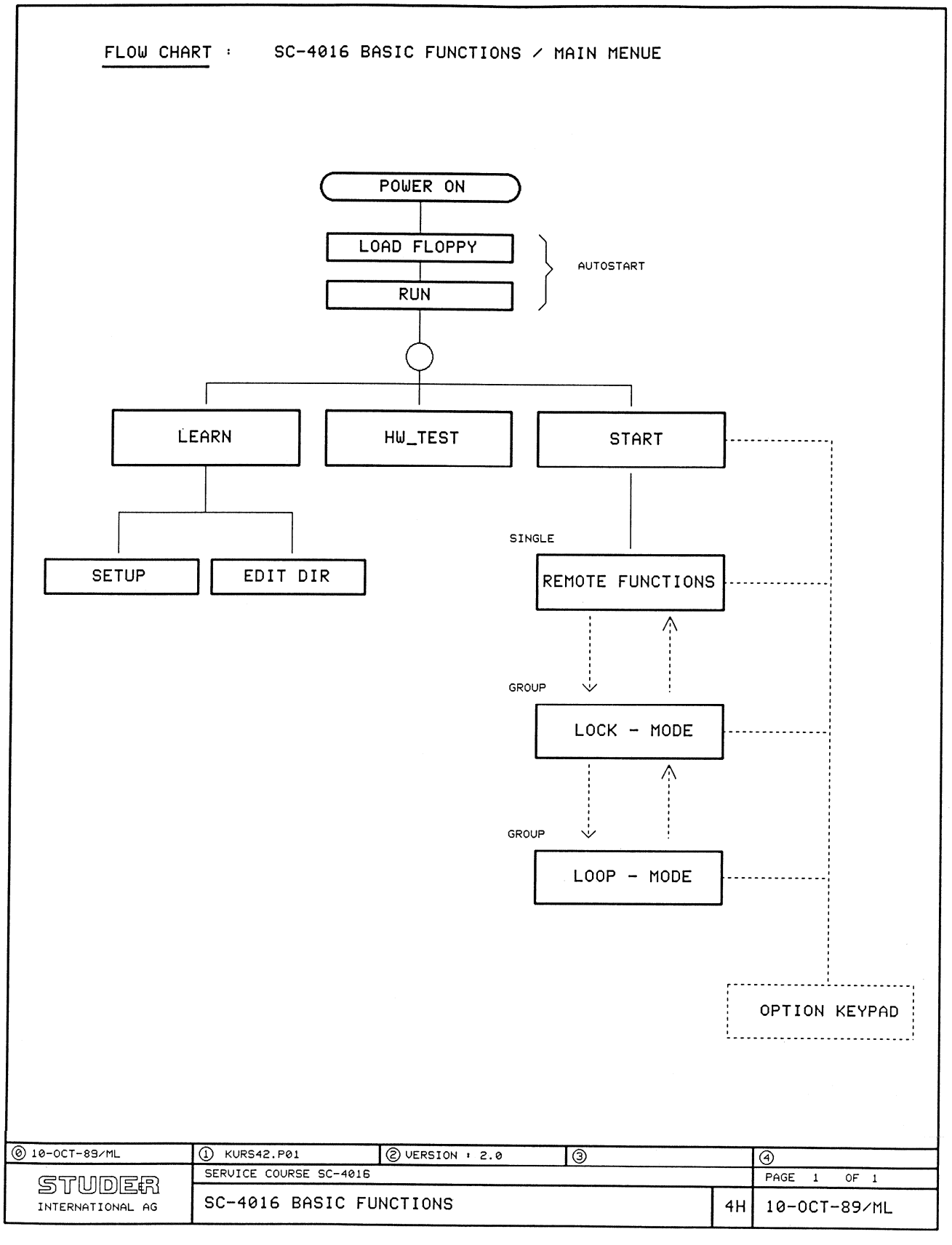
Menu 11.2 MEW LOOP, MOD LOOP, TRIM BEG
Menu 11.3 LOOP MODE, TRIM REC, APD MODE
Menu 11.4 SLOW, REHEARSE, TRIM REC

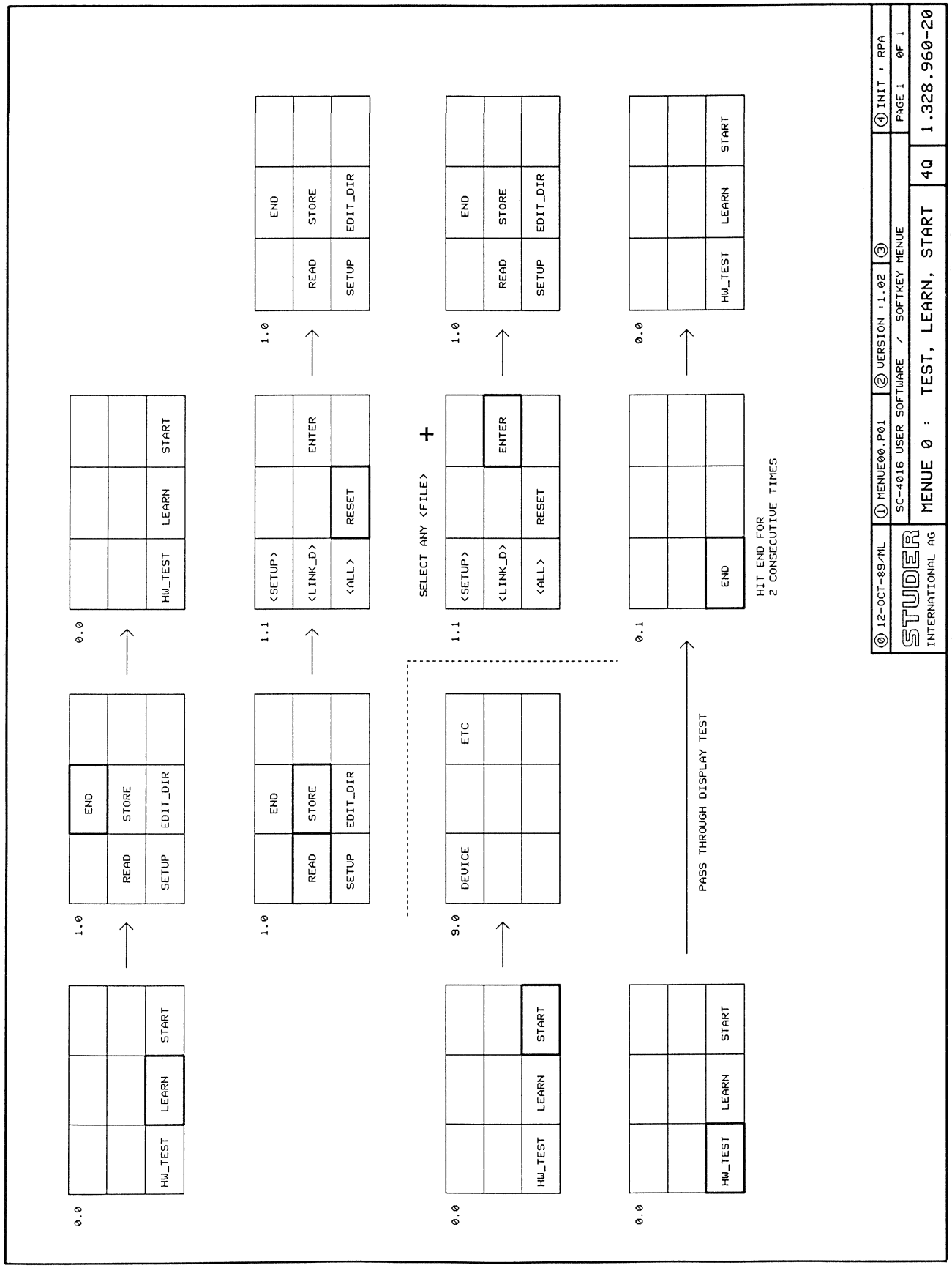
8 Keyboard

8.1 Keyboard layout of the operating unit

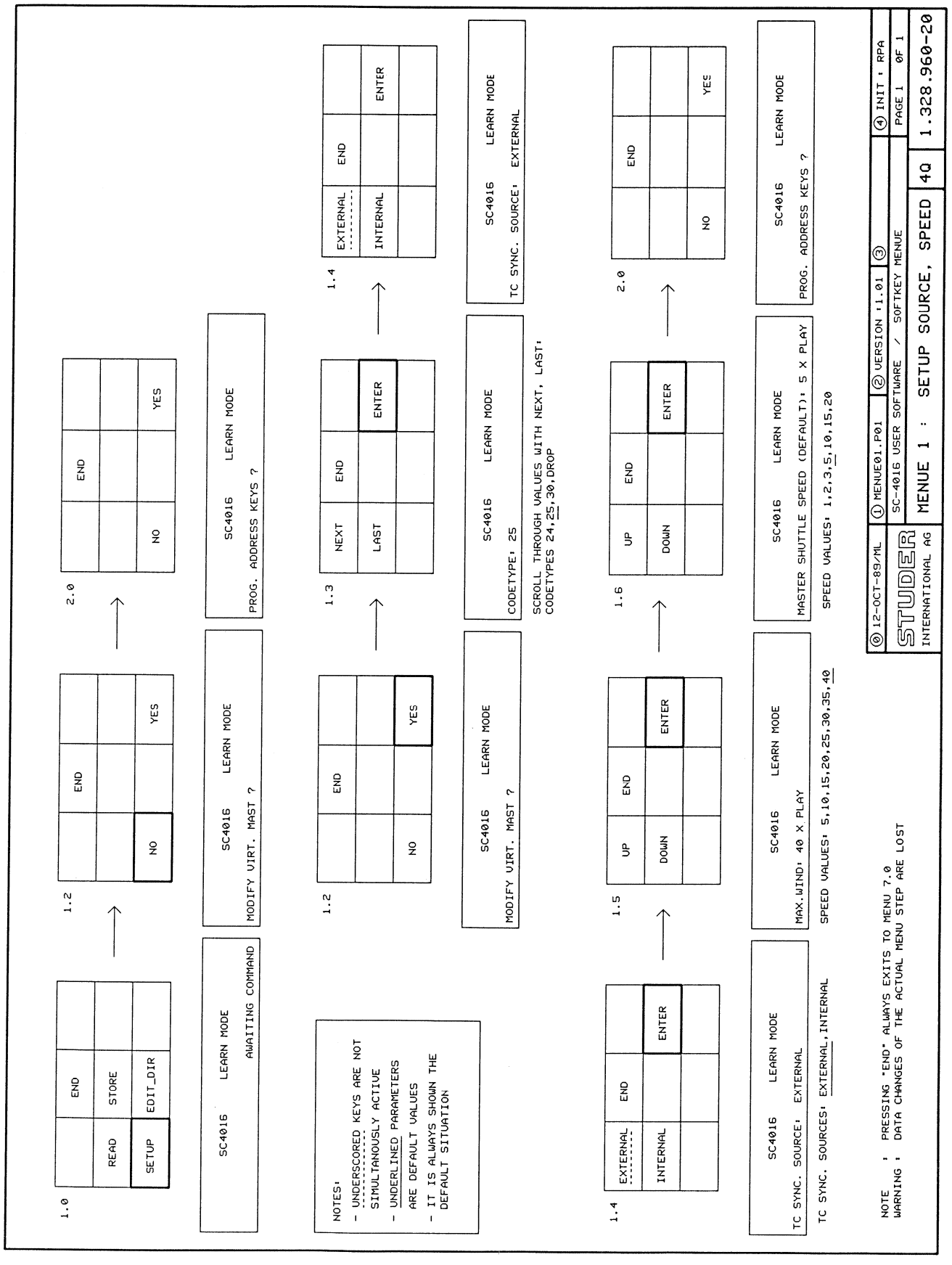


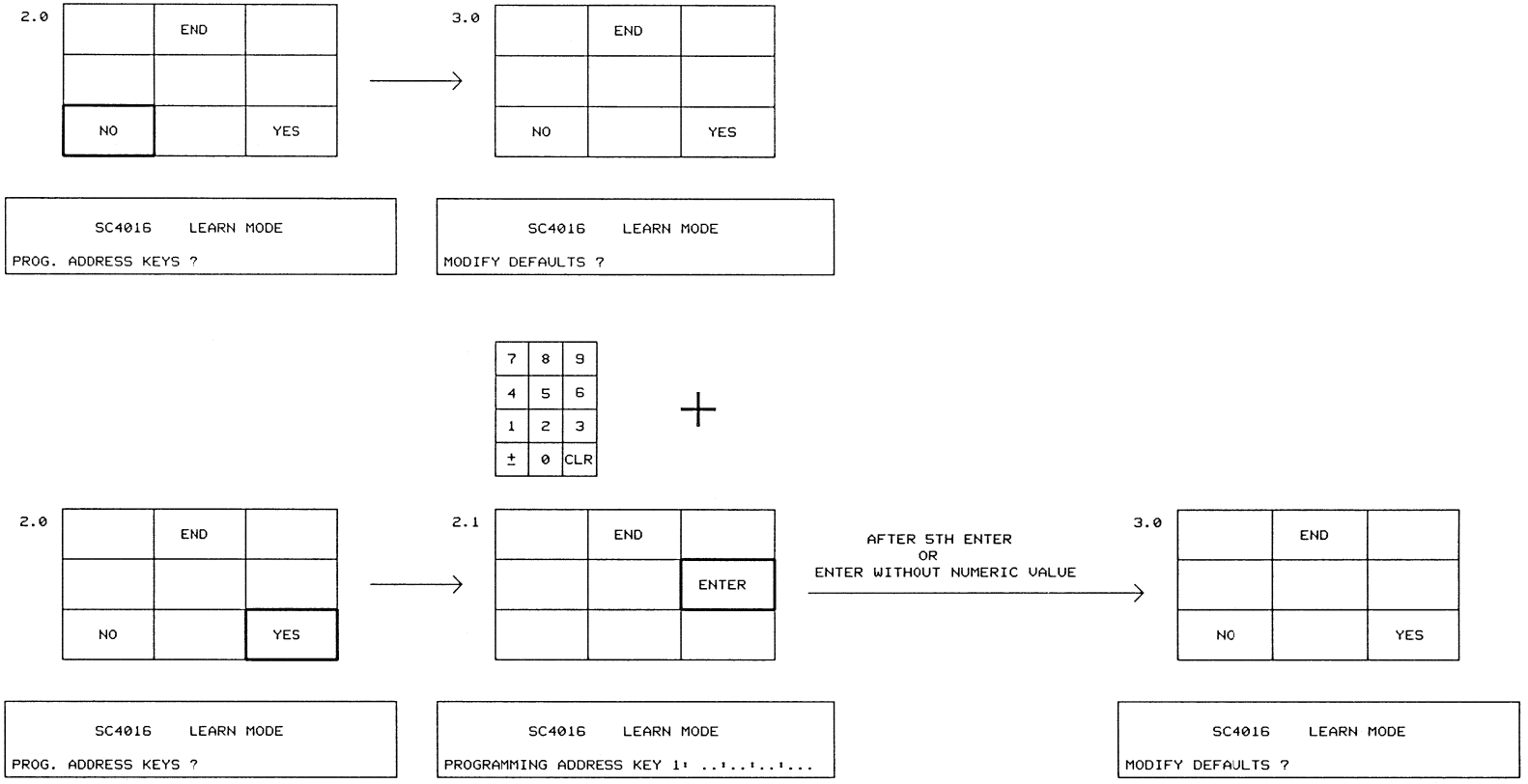
8.2 Basic menue - LEARN, START, HW-TEST




0.0
HW_TEST
LEARN
START
1.0
SETUP
READ
STORE
EDIT_DIR
END
0.0
HW_TEST
LEARN
START
1.1
<ALL>
RESET
<LINK_D>
ENTER
<SETUP>
1.0
SETUP
EDIT_DIR
STORE
READ
END
1.0
SETUP
EDIT_DIR
STORE
READ
END
SELECT ANY <FILE>
+
0.0
HW_TEST
LEARN
START
9.0
DEVICE
ETC
0.0
HW_TEST
LEARN
START
1.1
<ALL>
RESET
<LINK_D>
ENTER
<SETUP>
0.1
END
PASS THROUGH DISPLAY TEST
HIT END FOR
2 CONSECUTIVE TIMES
0.0
HW_TEST
LEARN
START
1.0
SETUP
EDIT_DIR
STORE
READ
END
0.0
HW_TEST
LEARN
START
⓪ 12-OCT-89/ML
① MENUE00.P01
② VERSION '1.02
③
④ INIT ' RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 1 OF 1
MENUE 0 : TEST, LEARN, START
4Q
1.328.960-20

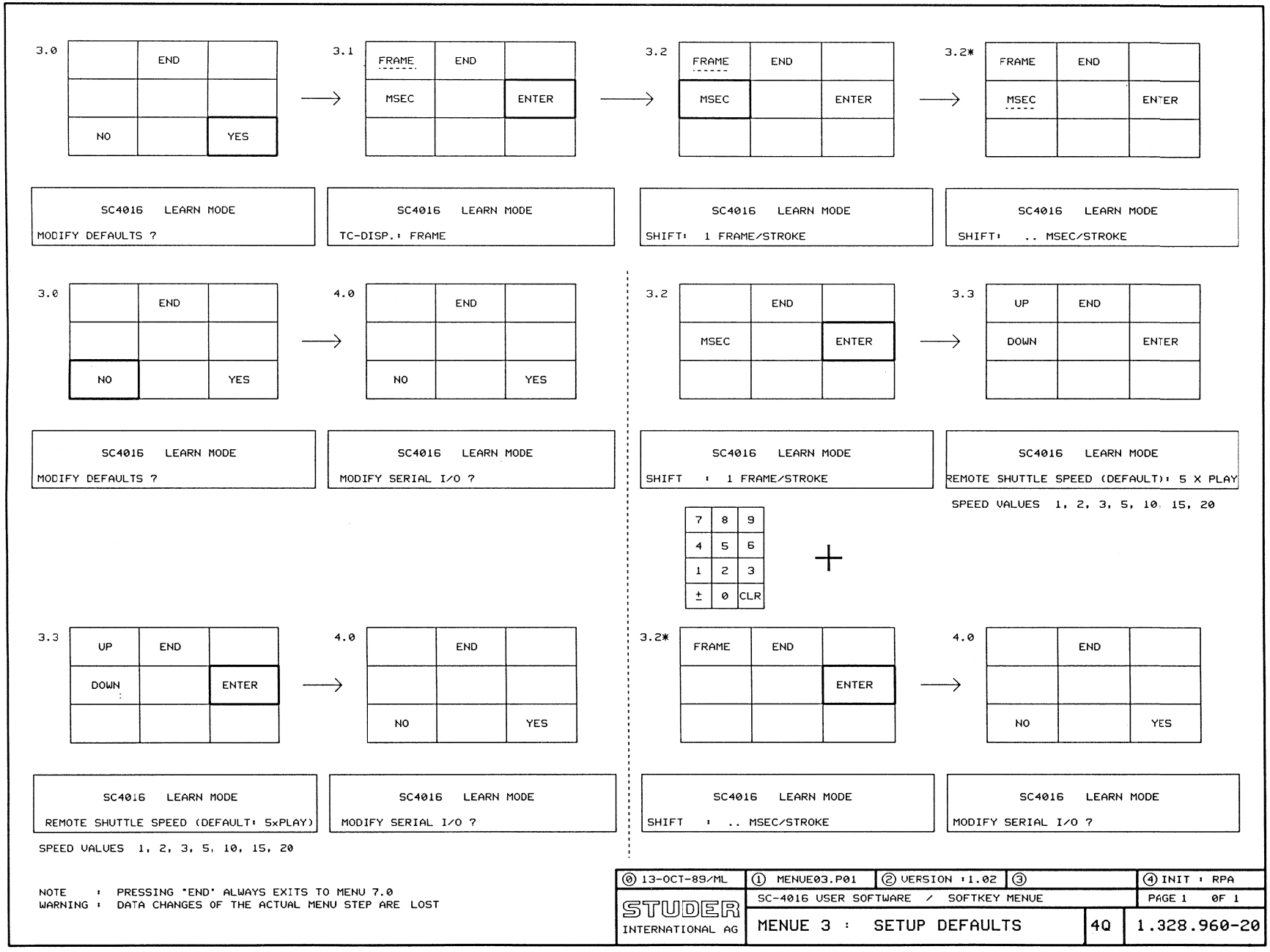
8.3 LEARN MODE

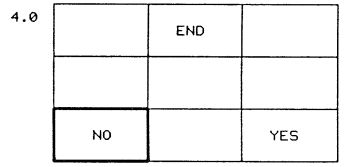


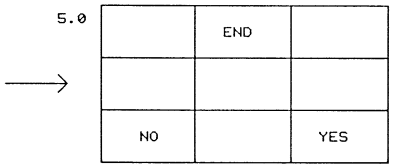


NOTE: PRESSING "END" ALWAYS EXITS TO MENU 7.0
WARNING: DATA CHANGES OF THE ACTUAL MENU STEP ARE LOST

⓪ 13-OCT-89/ML	① MENUE02.P01	② VERSION :1.02	③	④ INIT : RPA
STUDER INTERNATIONAL AG	SC-4016 USER SOFTWARE / SOFTKEY MENUE			PAGE 1 OF 1
	MENUE 2 : SETUP ADRESS KEY		4Q	1.328.960-20

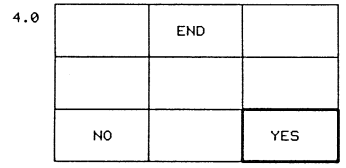

3.0
END
NO
YES
SC4016 LEARN MODE
MODIFY DEFAULTS ?
3.1
FRAME
END
MSEC
ENTER
SC4016 LEARN MODE
TC-DISP.: FRAME
3.2
FRAME
END
MSEC
ENTER
SC4016 LEARN MODE
SHIFT: 1 FRAME/STROKE
3.2*
FRAME
END
MSEC
ENTER
SC4016 LEARN MODE
SHIFT: .. MSEC/STROKE
3.0
END
NO
YES
SC4016 LEARN MODE
MODIFY DEFAULTS ?
4.0
END
NO
YES
SC4016 LEARN MODE
MODIFY SERIAL I/O ?
3.2
END
MSEC
ENTER
SC4016 LEARN MODE
SHIFT : 1 FRAME/STROKE
3.3
UP
END
DOWN
ENTER
SC4016 LEARN MODE
REMOTE SHUTTLE SPEED (DEFAULT): 5 X PLAY
SPEED VALUES 1, 2, 3, 5, 10, 15, 20
7 8 9
4 5 6
1 2 3
± 0 CLR
3.3
UP
END
DOWN
ENTER
SC4016 LEARN MODE
REMOTE SHUTTLE SPEED (DEFAULT: 5xPLAY)
SPEED VALUES 1, 2, 3, 5, 10, 15, 20
4.0
END
NO
YES
SC4016 LEARN MODE
MODIFY SERIAL I/O ?
3.2*
FRAME
END
ENTER
SC4016 LEARN MODE
SHIFT : .. MSEC/STROKE
4.0
END
NO
YES
SC4016 LEARN MODE
MODIFY SERIAL I/O ?
NOTE : PRESSING "END" ALWAYS EXITS TO MENU 7.0
WARNING : DATA CHANGES OF THE ACTUAL MENU STEP ARE LOST
⓪ 13-OCT-89/ML
① MENUE03.P01
② VERSION :1.02
③
④ INIT : RPA
STUDER INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 1 0F 1
MENUE 3 : SETUP DEFAULTS
4Q
1.328.960-20

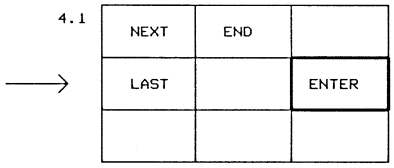


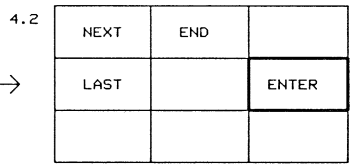


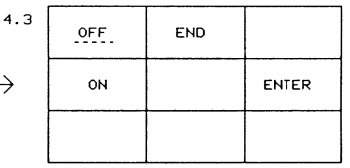
SC4016 LEARN MODE
MODIFY SERIAL I/O ?

SC4016 LEARN MODE
MODIFY THE RECORD FUNCTIONS ?









SC4016 LEARN MODE
MODIFY SERIAL I/O ?

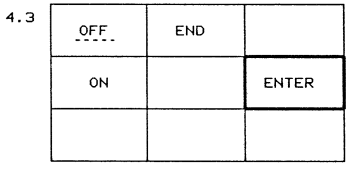
SC4016 LEARN MODE
PORT A SETTING : 8DATA,2STOP,NO PAR.

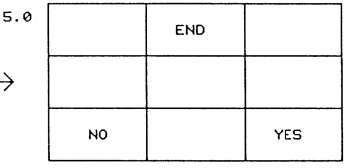
SCROLL THROUGH VALUES WITH NEXT,LAST
LIST OF SETTINGS: 7DATA,2STOP,EVEN
7DATA,2STOP,ODD
7DATA,1STOP,EVEN
7DATA,1STOP,ODD
8DATA,2STOP,NO PAR.
8DATA,1STOP,NO PAR.
8DATA,1STOP,EVEN
8DATA,1STOP,ODD

SC4016 LEARN MODE
PORT B SETTING : 8DATA,1STOP,NO PAR.

SCROLL THROUGH VALUES WITH NEXT,LAST
LIST OF SETTINGS: SEE MENU 4.1
DEFAULT SETTING: 8DATA,1STOP,NO PAR.

SC4016 LEARN MODE
MASTER TIME OUTPUT: OFF



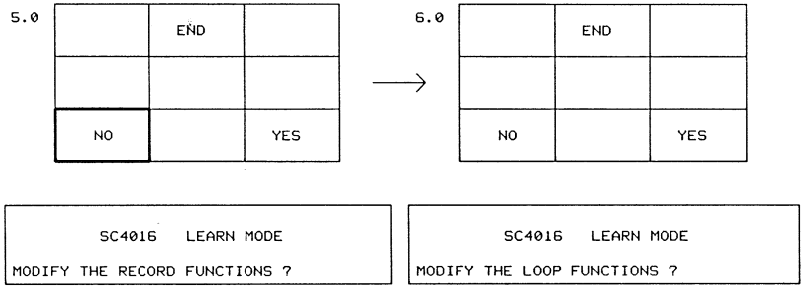


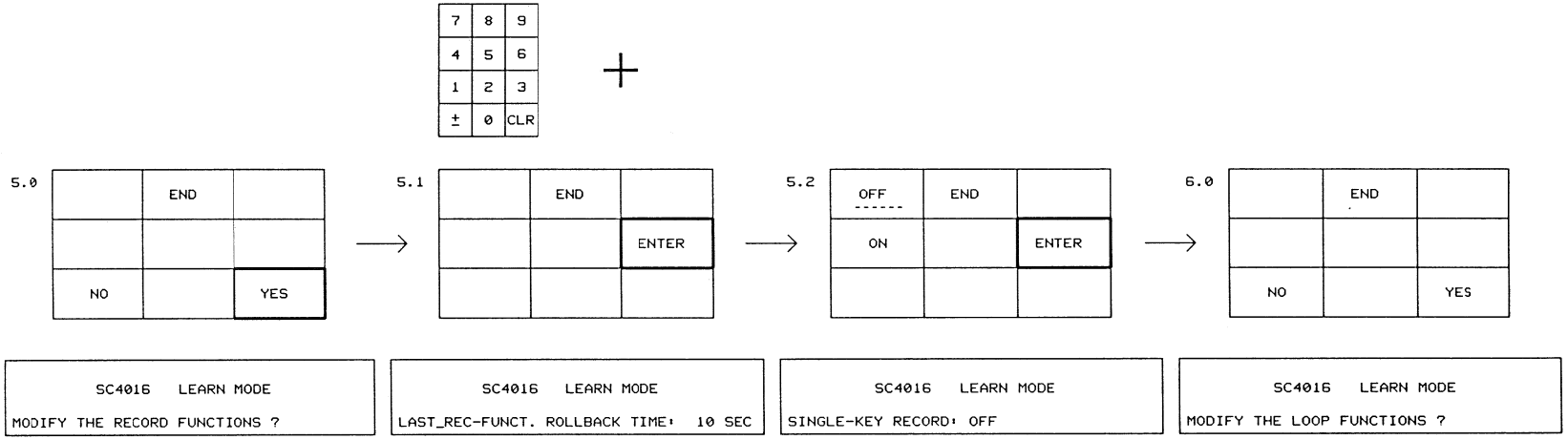
SC4016 LEARN MODE
MASTER TIME OUTPUT: OFF

SC4016 LEARN MODE
MODIFY THE RECORD FUNCTIONS ?

NOTE: PRESSING "END" ALWAYS EXITS TO MENU 7.0
WARNING: DATA CHANGES OF THE ACTUAL MENU STEP ARE LOST

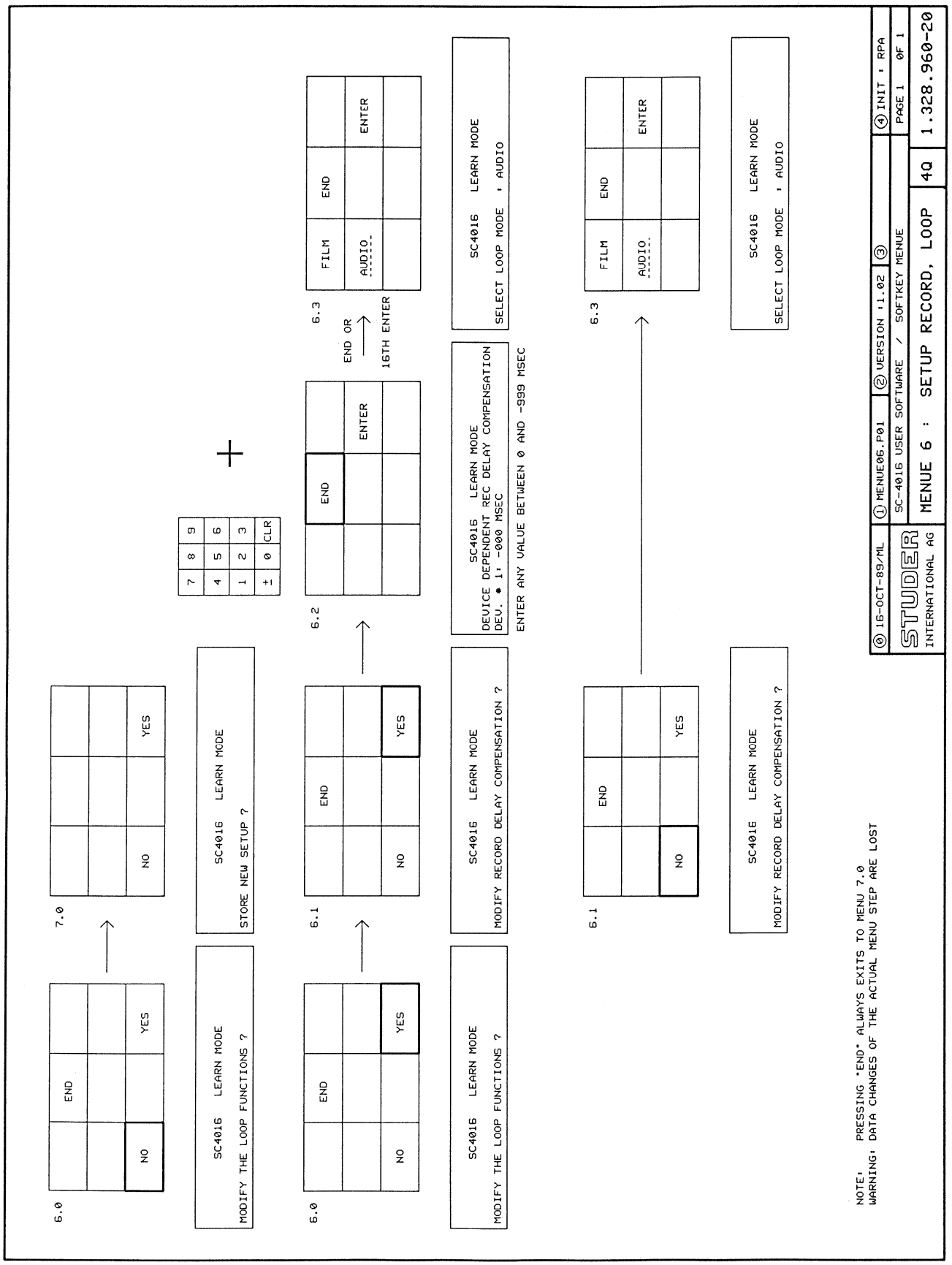
⓪ 16-OCT-89/ML	① MENUE04.P01	② VERSION : 1.02	③	④ INIT : RPA
STUDER INTERNATIONAL AG	SC-4016 USER SOFTWARE / SOFTKEY MENUE			PAGE 1 OF 1
	MENUE 4 : SETUP DEFAULTS		4Q	1.328.960-20

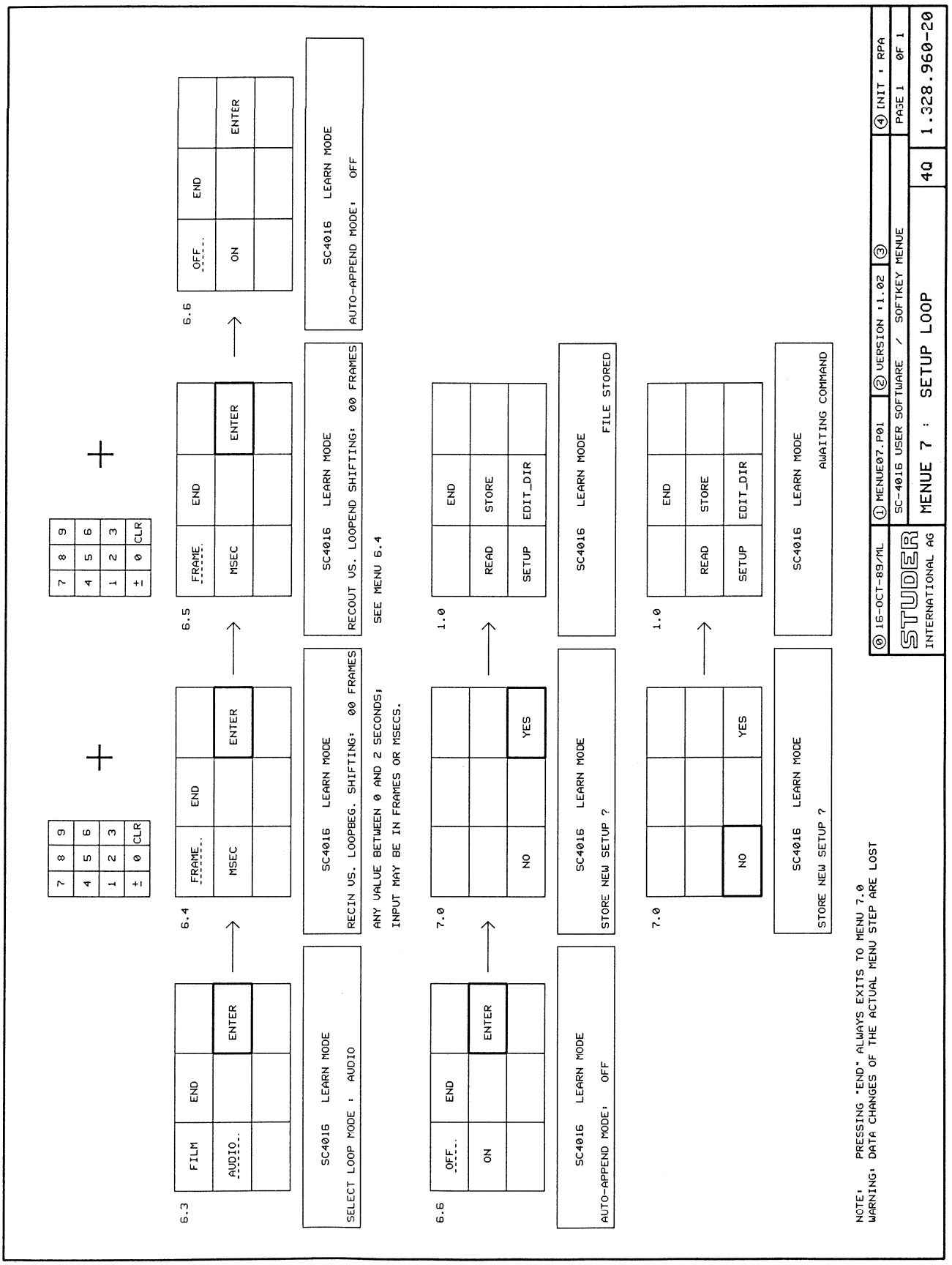


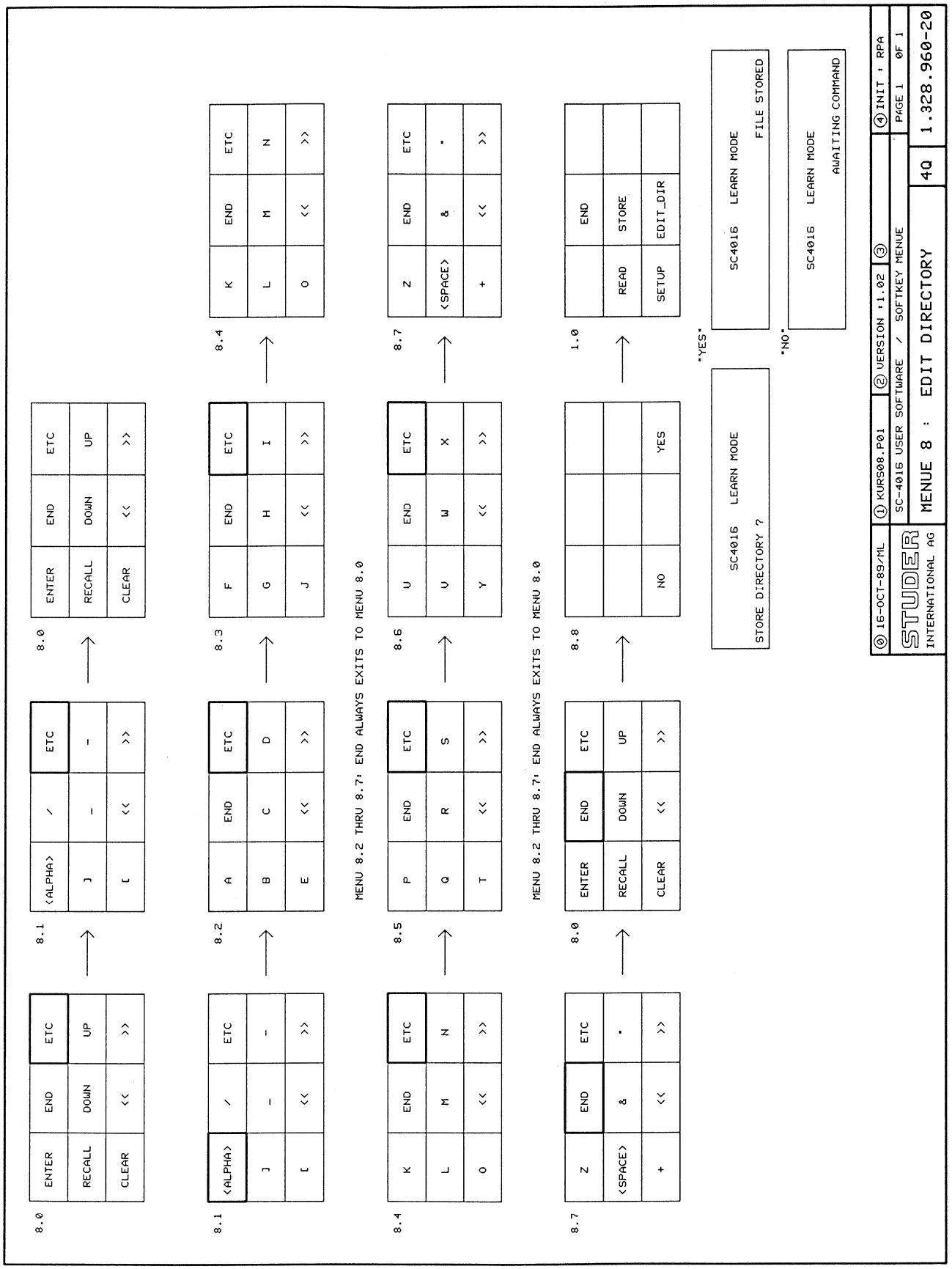


NOTE: PRESSING "END" ALWAYS EXITS TO MENU 7.0
WARNING: DATA CHANGES OF THE ACTUAL MENU STEP ARE LOST

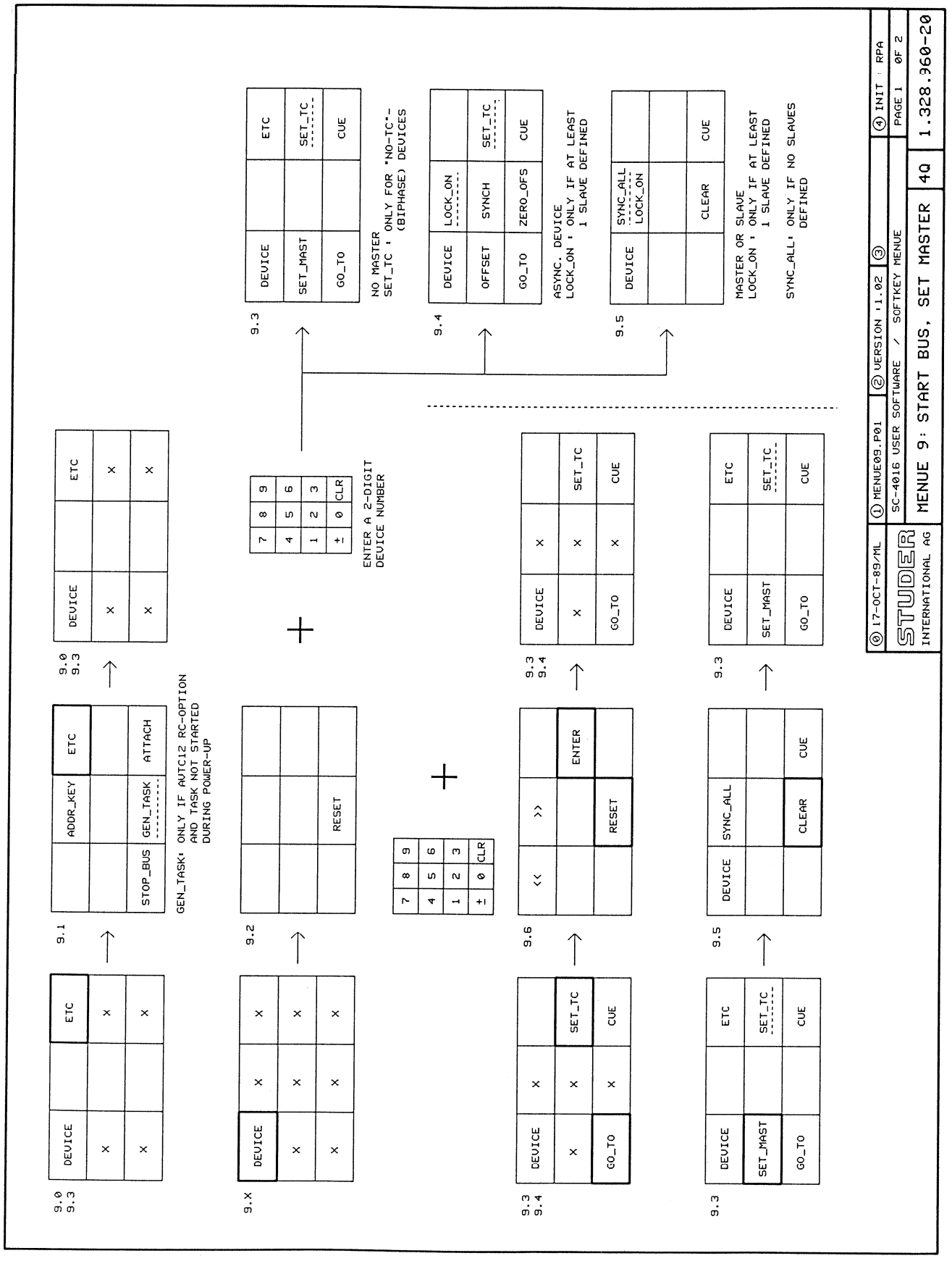
⓪ 16-OCT-89/ML	① MENUE05.P01	② VERSION : 1.02	③	④ INIT : RPA
STUDER INTERNATIONAL AG	SC-4016 USER SOFTWARE / SOFTKEY MENUE			PAGE 1 OF 1
	MENUE 5 : SETUP RECORD, LOOP		4Q	1.328.960-20

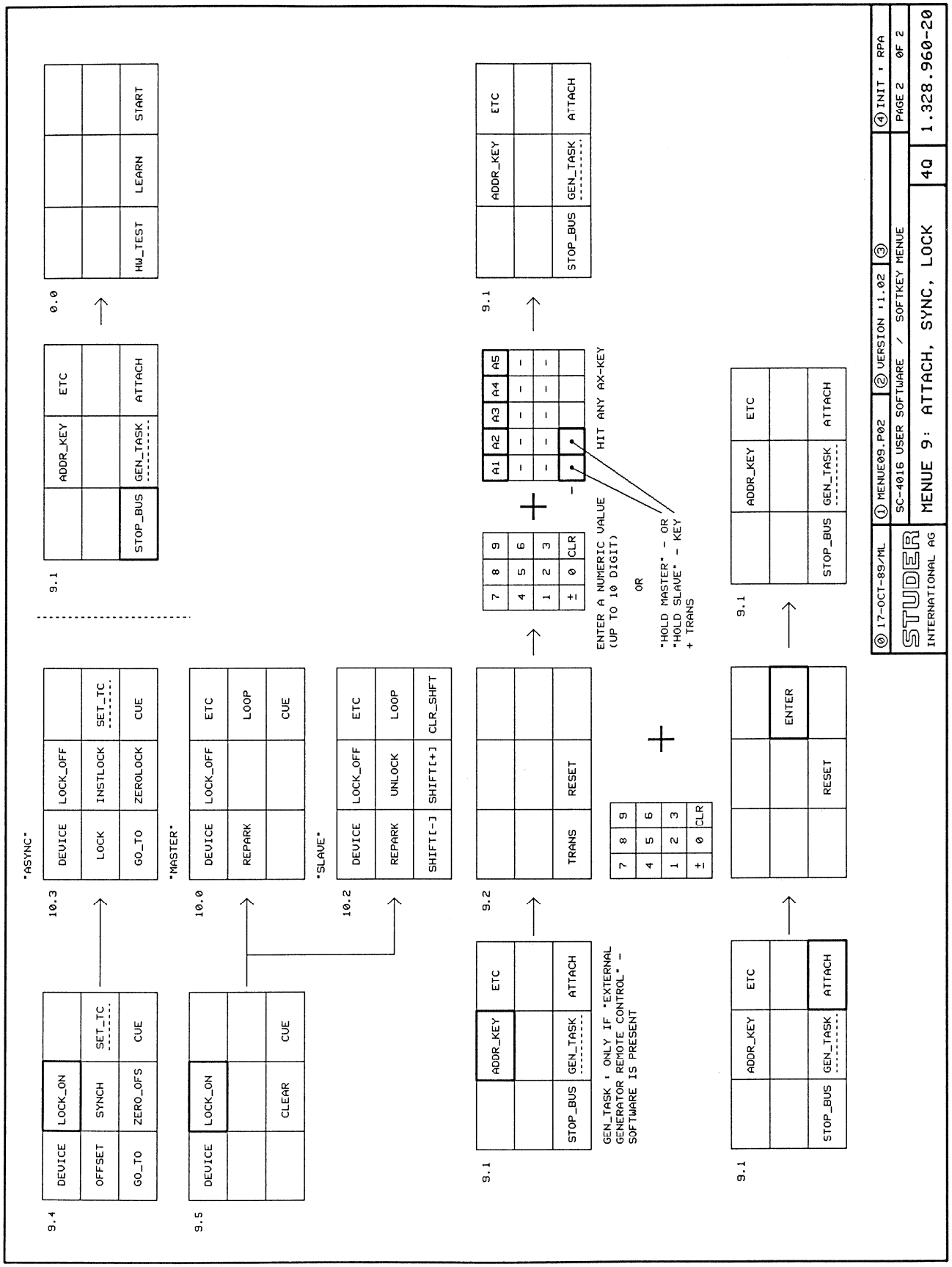

6.0
END
NO
YES
7.0
NO
YES
SC4016 LEARN MODE
MODIFY THE LOOP FUNCTIONS ?
SC4016 LEARN MODE
STORE NEW SETUP ?
7 8 9
4 5 6
1 2 3
± 0 CLR
6.0
END
NO
YES
6.1
END
NO
YES
SC4016 LEARN MODE
MODIFY THE LOOP FUNCTIONS ?
SC4016 LEARN MODE
MODIFY RECORD DELAY COMPENSATION ?
6.2
END
ENTER
SC4016 LEARN MODE
DEVICE DEPENDENT REC DELAY COMPENSATION
DEV. * 1: -000 MSEC
ENTER ANY VALUE BETWEEN 0 AND -999 MSEC
END OR
16TH ENTER
6.3
FILM
AUDIO
END
ENTER
SC4016 LEARN MODE
SELECT LOOP MODE : AUDIO
6.1
END
NO
YES
SC4016 LEARN MODE
MODIFY RECORD DELAY COMPENSATION ?
6.3
FILM
AUDIO
END
ENTER
SC4016 LEARN MODE
SELECT LOOP MODE : AUDIO
NOTE: PRESSING "END" ALWAYS EXITS TO MENU 7.0
WARNING: DATA CHANGES OF THE ACTUAL MENU STEP ARE LOST
⑨ 16-OCT-89/ML
① MENUE06.P01
② VERSION 1.02
③
④ INIT : RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 1 OF 1
MENUE 6 : SETUP RECORD, LOOP
4Q
1.328.960-20


6.3
FILM
END
AUDIO
ENTER
SC4016 LEARN MODE
SELECT LOOP MODE : AUDIO
6.4
FRAME
END
MSEC
ENTER
SC4016 LEARN MODE
RECIN VS. LOOPBEG. SHIFTING: 00 FRAMES
ANY VALUE BETWEEN 0 AND 2 SECONDS;
INPUT MAY BE IN FRAMES OR MSECS.
6.5
FRAME
END
MSEC
ENTER
SC4016 LEARN MODE
RECOUT VS. LOOPEND SHIFTING: 00 FRAMES
SEE MENU 6.4
6.6
OFF
END
ON
ENTER
SC4016 LEARN MODE
AUTO-APPEND MODE: OFF
7 8 9
4 5 6
1 2 3
± 0 CLR
7.0
NO
YES
SC4016 LEARN MODE
STORE NEW SETUP ?
1.0
READ
STORE
SETUP
EDIT_DIR
END
SC4016 LEARN MODE
FILE STORED
SC4016 LEARN MODE
AWAITING COMMAND
NOTE: PRESSING "END" ALWAYS EXITS TO MENU 7.0
WARNING: DATA CHANGES OF THE ACTUAL MENU STEP ARE LOST
⓪ 16-OCT-89/ML
① MENUE07.P01
② VERSION 1.02
③
④ INIT : RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 1 OF 1
MENUE 7 : SETUP LOOP
4Q
1.328.960-20

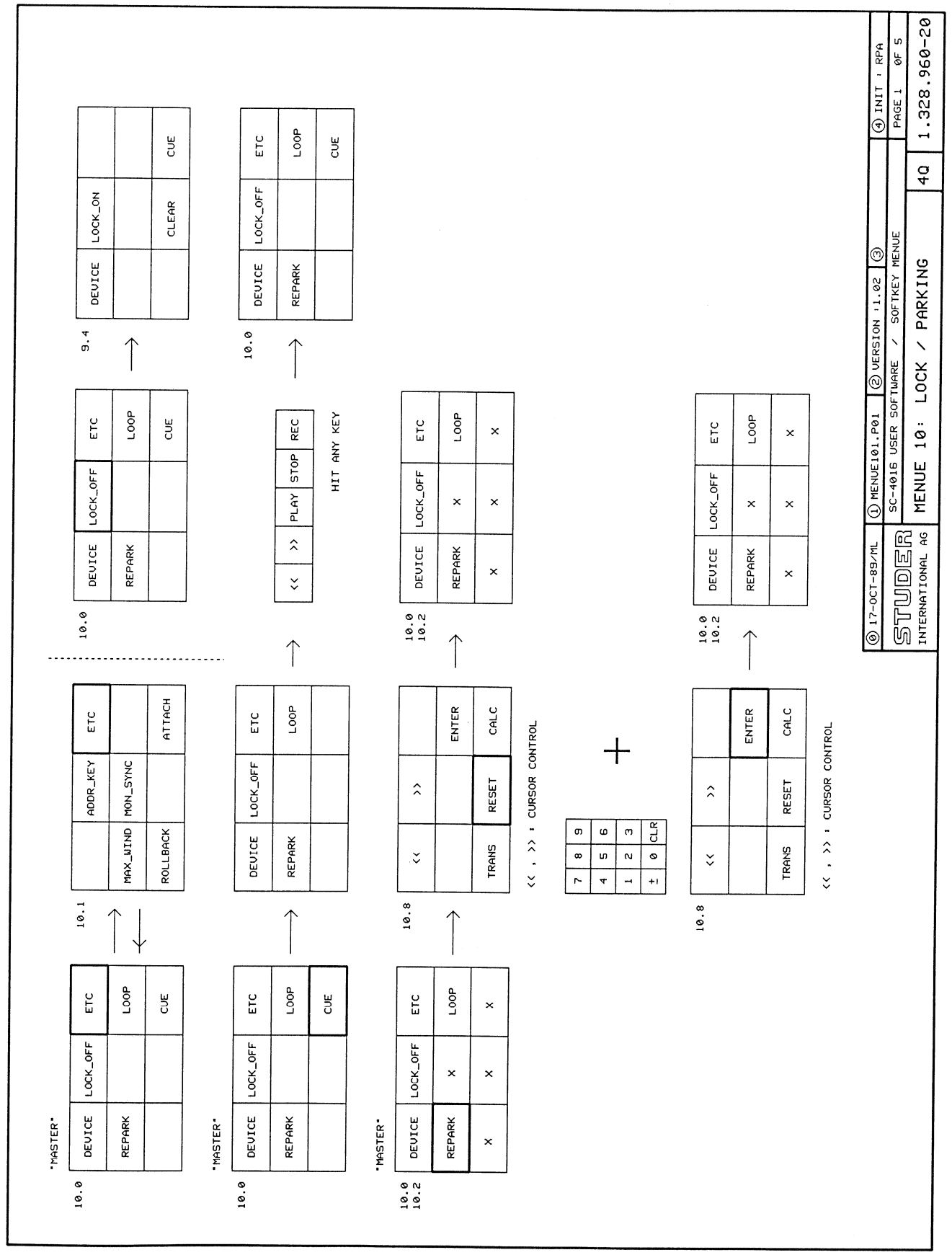

8.0
ENTER
END
ETC
RECALL
DOWN
UP
CLEAR
<<
>>
8.1
<ALPHA>
/
-
J
-
L
<<
>>
8.0
ENTER
END
ETC
RECALL
DOWN
UP
CLEAR
<<
>>
8.1
<ALPHA>
/
ETC
J
-
-
L
<<
>>
8.2
A
END
ETC
B
C
D
E
<<
>>
8.3
F
END
ETC
G
H
I
J
<<
>>
8.4
K
END
ETC
L
M
N
O
<<
>>
MENU 8.2 THRU 8.7, END ALWAYS EXITS TO MENU 8.0
8.4
K
END
ETC
L
M
N
O
<<
>>
8.5
P
END
ETC
Q
R
S
T
<<
>>
8.6
U
END
ETC
V
W
X
Y
<<
>>
8.7
Z
END
ETC
<SPACE>
&
-
+
<<
>>
MENU 8.2 THRU 8.7, END ALWAYS EXITS TO MENU 8.0
8.7
Z
END
ETC
<SPACE>
&
-
+
<<
>>
8.0
ENTER
END
ETC
RECALL
DOWN
UP
CLEAR
<<
>>
8.8
YES
NO
1.0
END
READ
STORE
SETUP
EDIT_DIR
"YES"
SC4016 LEARN MODE
FILE STORED
"NO"
SC4016 LEARN MODE
AWAITING COMMAND
SC4016 LEARN MODE
STORE DIRECTORY ?
⓪ 16-OCT-89/ML
① KURS08.P01
② VERSION '1.02
③
④ INIT : RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 1 OF 1
MENUE 8 : EDIT DIRECTORY
4Q
1.328.960-20

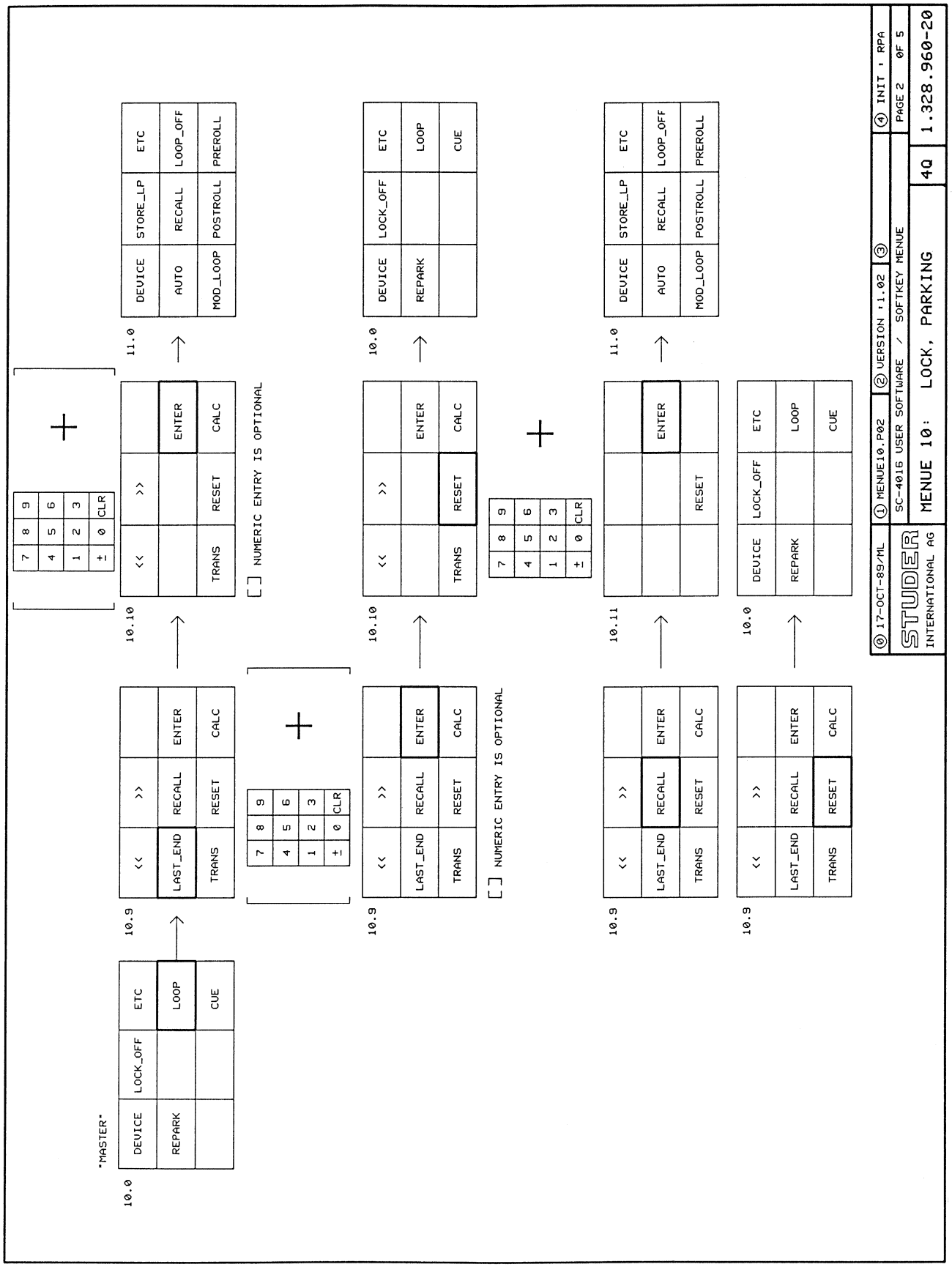
8.4 Start bus operation & single-deck mode

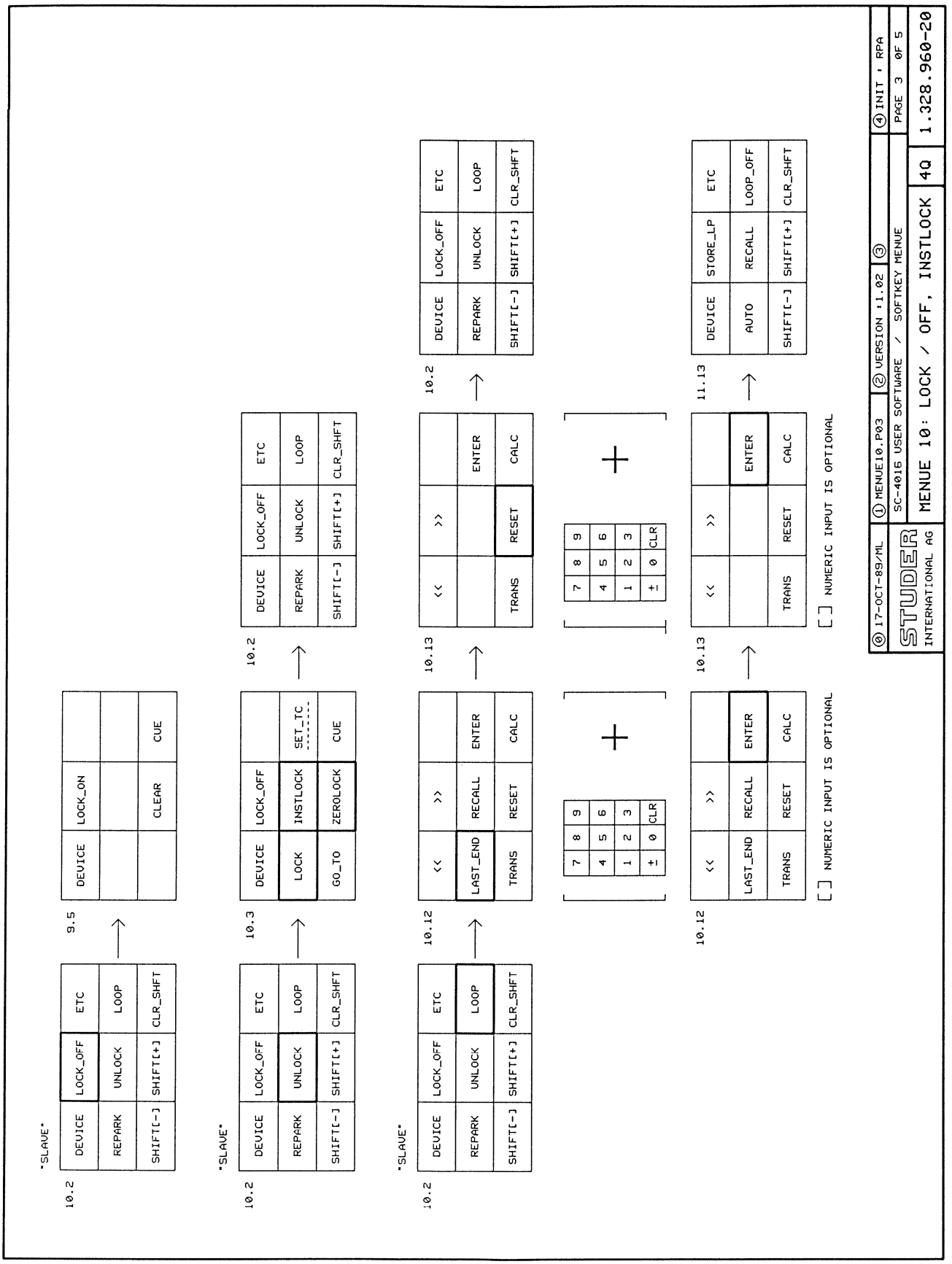


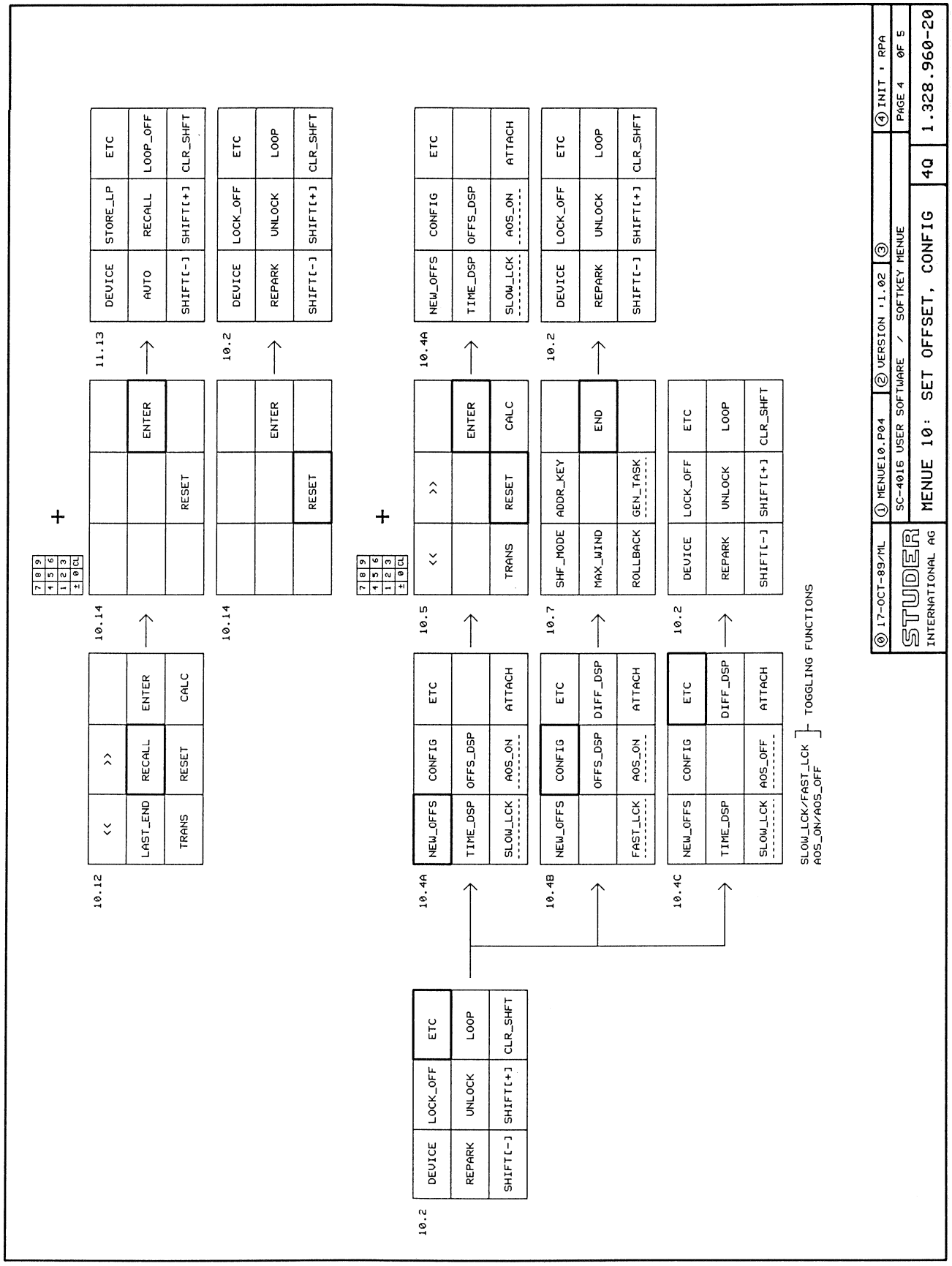

⓪ 17-OCT-89/ML
① MENUE09.P02
② VERSION 1.02
③
④ INIT : RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 2 OF 2
MENUE 9: ATTACH, SYNC, LOCK
4Q
1.328.960-20
"ASYNC"
"MASTER"
"SLAVE"
DEVICE
OFFSET
GO_TO
LOCK_ON
SYNCH
ZERO_OFS
LOCK_OFF
INSTLOCK
ZEROLOCK
SET_TC
CUE
CLEAR
REPARK
LOOP
UNLOCK
SHIFT[-]
SHIFT[+]
CLR_SHFT
ETC
LOCK
GO_TO
REPARK
TRANS
RESET
ENTER
ADDR_KEY
GEN_TASK
ATTACH
STOP_BUS
HW_TEST
LEARN
START
A1
A2
A3
A4
A5
ENTER A NUMERIC VALUE
(UP TO 10 DIGIT)
OR
HIT ANY AX-KEY
"HOLD MASTER" - OR
"HOLD SLAVE" - KEY
+ TRANS
GEN_TASK ' ONLY IF 'EXTERNAL
GENERATOR REMOTE CONTROL" -
SOFTWARE IS PRESENT

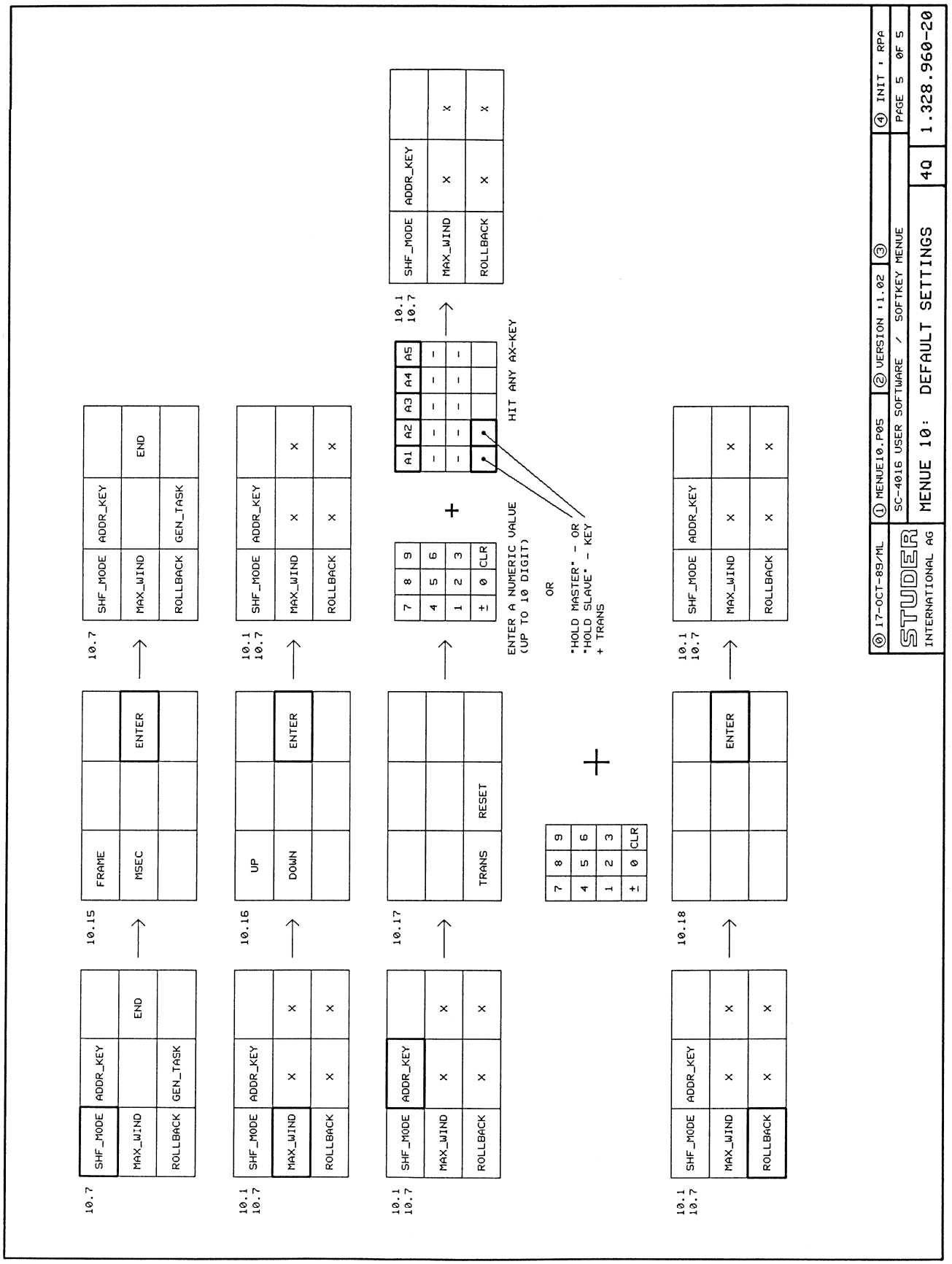
8.5 LOCK functions



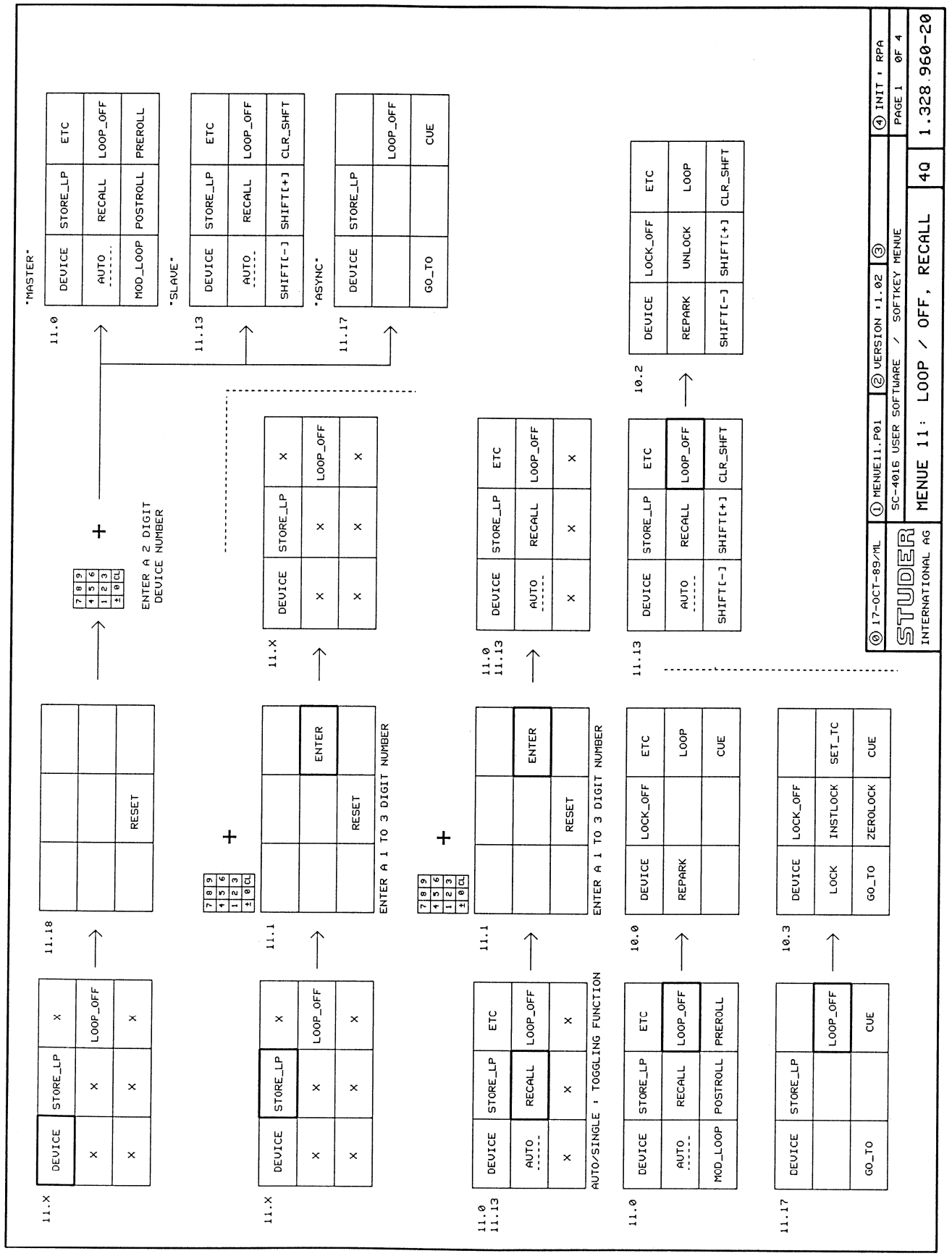

"MASTER"
10.0
DEVICE
LOCK_OFF
ETC
REPARK
LOOP
CUE
10.9
<<
>>
LAST_END
RECALL
ENTER
TRANS
RESET
CALC
10.10
<<
>>
ENTER
TRANS
RESET
CALC
11.0
DEVICE
STORE_LP
ETC
AUTO
RECALL
LOOP_OFF
MOD_LOOP
POSTROLL
PREROLL
10.0
DEVICE
LOCK_OFF
ETC
REPARK
LOOP
CUE
7 8 9
4 5 6
1 2 3
± 0 CLR
[ ] NUMERIC ENTRY IS OPTIONAL
10.11
10.0
⓪ 17-OCT-89/ML
① MENUE10.P02
② VERSION '1.02
③
④ INIT ' RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 2 0F 5
MENUE 10: LOCK, PARKING
4Q
1.328.960-20

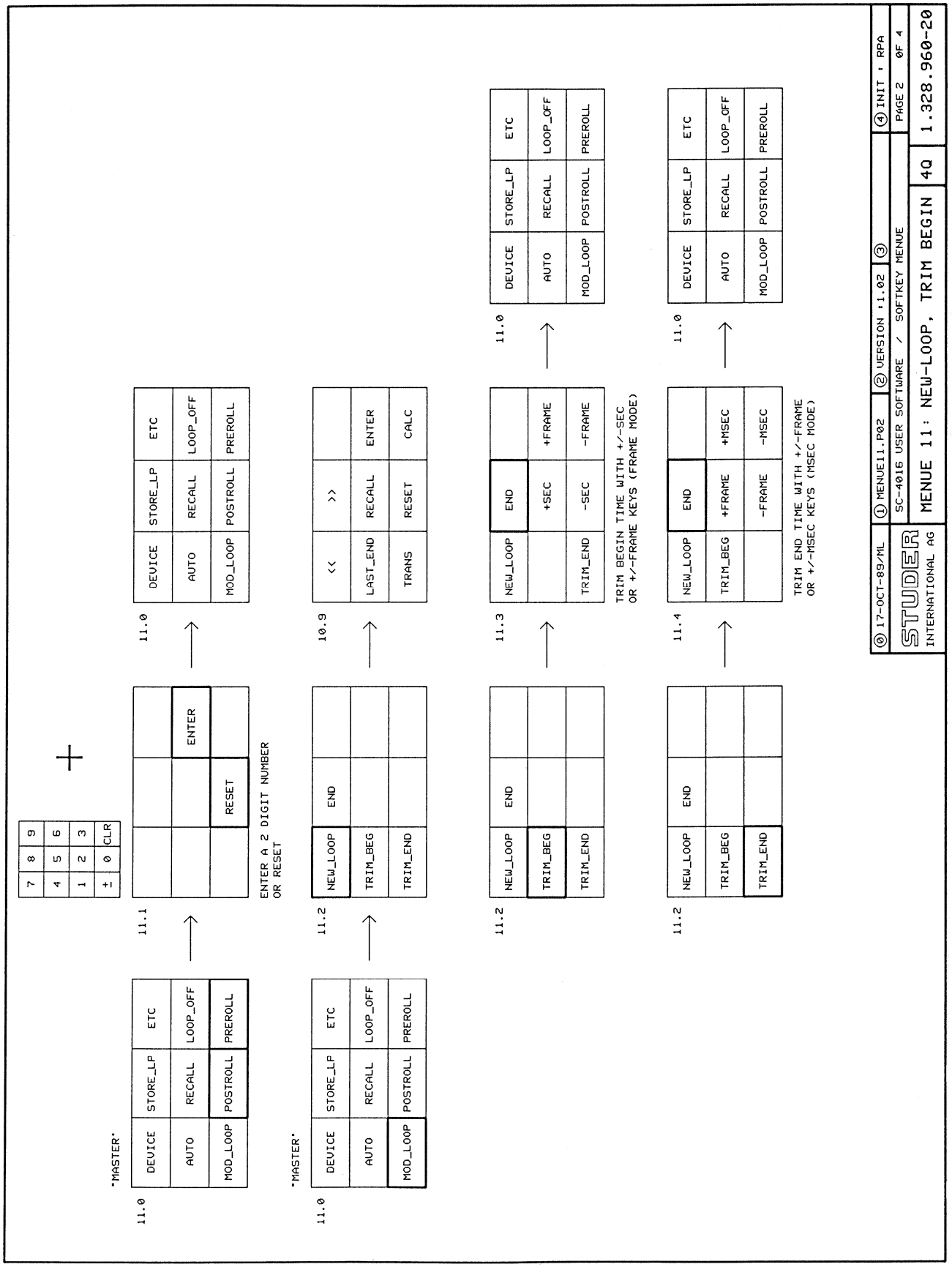

"SLAVE"
10.2
DEVICE
REPARK
SHIFT[-]
LOCK_OFF
UNLOCK
SHIFT[+]
ETC
LOOP
CLR_SHFT
9.5
DEVICE
LOCK_ON
CLEAR
CUE
"SLAVE"
10.2
DEVICE
REPARK
SHIFT[-]
LOCK_OFF
LOCK
GO_TO
INSTLOCK
ZEROLOCK
ETC
LOOP
CLR_SHFT
10.3
DEVICE
LOCK
GO_TO
LOCK_OFF
INSTLOCK
ZEROLOCK
SET_TC
CUE
10.2
DEVICE
REPARK
SHIFT[-]
LOCK_OFF
UNLOCK
SHIFT[+]
ETC
LOOP
CLR_SHFT
"SLAVE"
10.2
DEVICE
REPARK
SHIFT[-]
LOCK_OFF
UNLOCK
SHIFT[+]
ETC
LOOP
CLR_SHFT
10.12
LAST_END
TRANS
<<
>>
RECALL
RESET
ENTER
CALC
7 8 9
4 5 6
1 2 3
± 0 CLR
+
10.13
TRANS
<<
>>
RESET
ENTER
CALC
10.2
DEVICE
REPARK
SHIFT[-]
LOCK_OFF
UNLOCK
SHIFT[+]
ETC
LOOP
CLR_SHFT
[ ] NUMERIC INPUT IS OPTIONAL
10.12
LAST_END
TRANS
<<
>>
RECALL
RESET
ENTER
CALC
7 8 9
4 5 6
1 2 3
± 0 CLR
+
10.13
TRANS
<<
>>
RESET
ENTER
CALC
11.13
DEVICE
AUTO
SHIFT[-]
STORE_LP
RECALL
SHIFT[+]
ETC
LOOP_OFF
CLR_SHFT
[ ] NUMERIC INPUT IS OPTIONAL
⑥ 17-OCT-89/ML
① MENUE10.P03
② VERSION 1.02
③
④ INIT , RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 3 0F 5
MENUE 10: LOCK / OFF, INSTLOCK
4Q
1.328.960-20

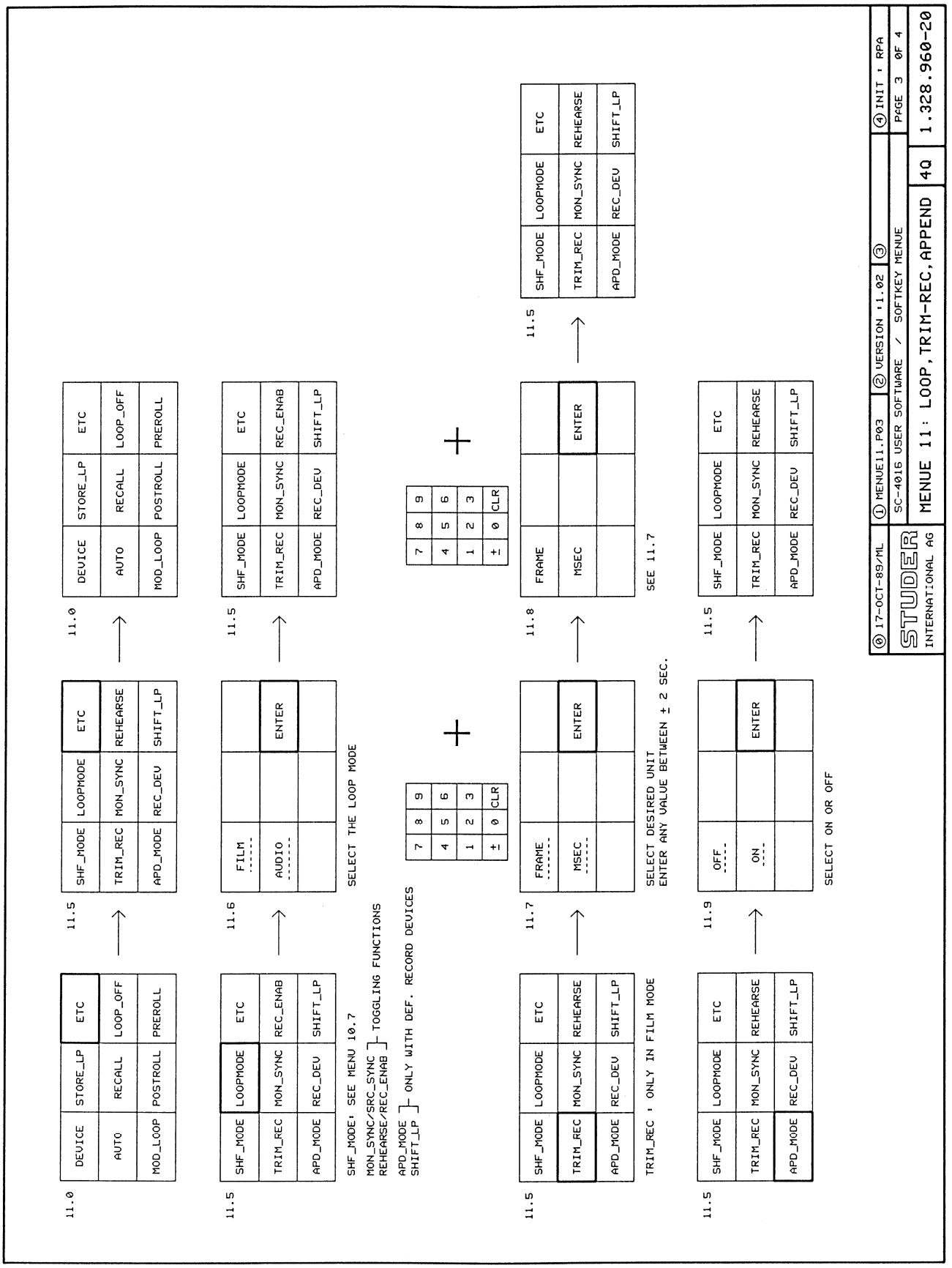

⑨ 17-OCT-89/ML
① MENU10.P04
② VERSION 1.02
③
④ INIT : RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 4 OF 5
MENUE 10: SET OFFSET, CONFIG
4Q
1.328.960-20
10.12
<< >>
LAST_END RECALL ENTER
TRANS RESET CALC
10.14
11.13
DEVICE STORE_LP ETC
AUTO RECALL LOOP_OFF
SHIFT[-] SHIFT[+] CLR_SHFT
10.2
DEVICE LOCK_OFF ETC
REPARK UNLOCK LOOP
SHIFT[-] SHIFT[+] CLR_SHFT
10.4A
NEW_OFFS CONFIG ETC
TIME_DSP OFFS_DSP
SLOW_LCK AOS_ON ATTACH
10.5
<< >>
ENTER
TRANS RESET CALC
10.4B
NEW_OFFS CONFIG ETC
OFFS_DSP DIFF_DSP
FAST_LCK AOS_ON ATTACH
10.7
SHF_MODE ADDR_KEY
MAX_WIND END
ROLLBACK GEN_TASK
10.4C
NEW_OFFS CONFIG ETC
TIME_DSP DIFF_DSP
SLOW_LCK AOS_OFF ATTACH
DEVICE LOCK_OFF ETC
REPARK UNLOCK LOOP
SHIFT[-] SHIFT[+] CLR_SHFT
SLOW_LCK/FAST_LCK
AOS_ON/AOS_OFF
TOGGLING FUNCTIONS

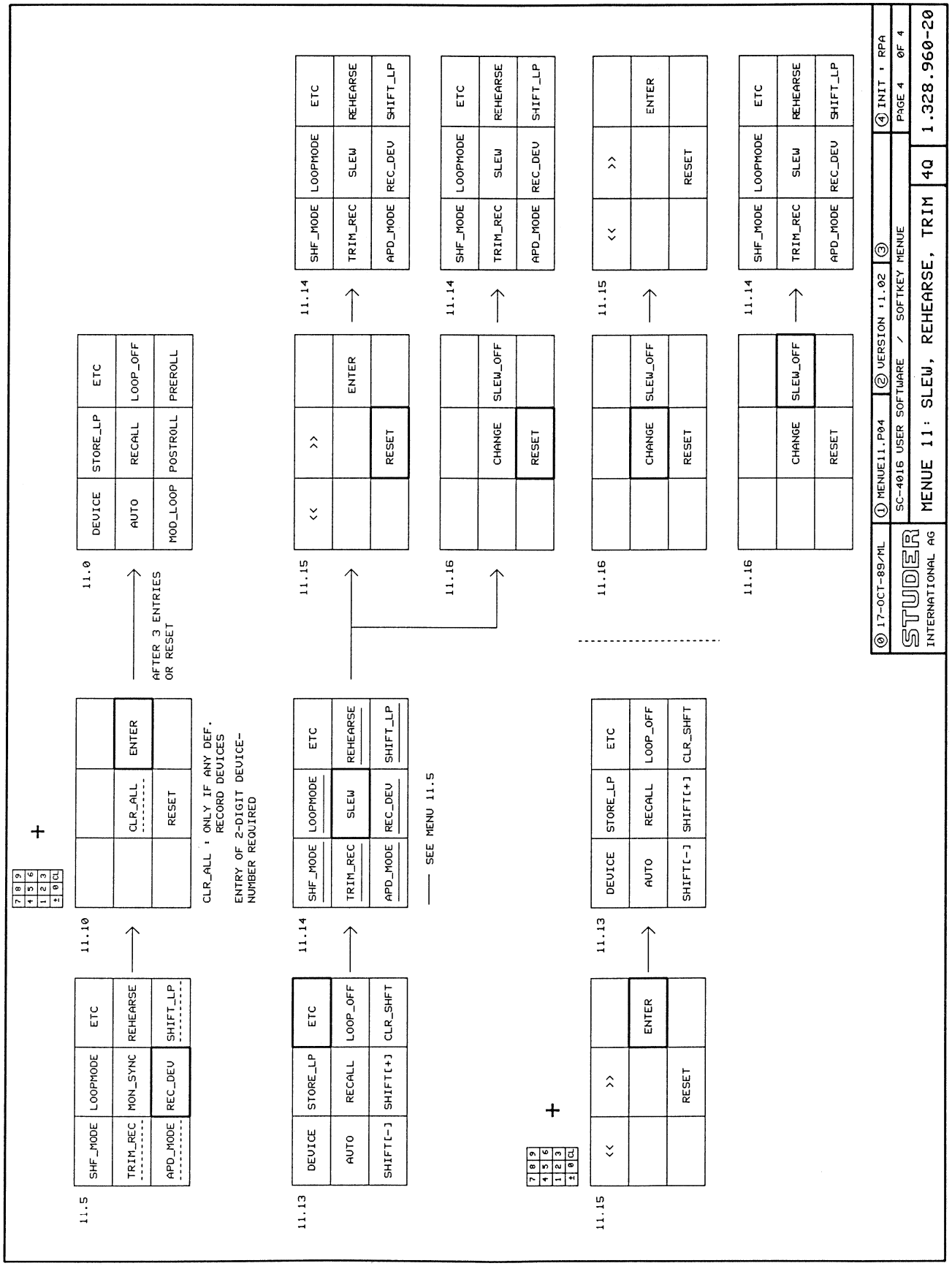

10.7
SHF_MODE
MAX_WIND
ROLLBACK
ADDR_KEY
END
GEN_TASK
10.15
FRAME
MSEC
ENTER
10.7
SHF_MODE
MAX_WIND
ROLLBACK
ADDR_KEY
END
GEN_TASK
10.1
10.7
SHF_MODE
MAX_WIND
ROLLBACK
ADDR_KEY
X
X
X
10.16
UP
DOWN
ENTER
10.1
10.7
SHF_MODE
MAX_WIND
ROLLBACK
ADDR_KEY
X
X
X
10.1
10.7
SHF_MODE
MAX_WIND
ROLLBACK
ADDR_KEY
X
X
X
10.17
TRANS
RESET
7 8 9
4 5 6
1 2 3
± 0 CLR
A1 A2 A3 A4 A5
ENTER A NUMERIC VALUE
(UP TO 10 DIGIT)
OR
"HOLD MASTER" - OR
"HOLD SLAVE" - KEY
+ TRANS
HIT ANY AX-KEY
10.1
10.7
SHF_MODE
MAX_WIND
ROLLBACK
ADDR_KEY
X
X
X
10.1
10.7
SHF_MODE
MAX_WIND
ROLLBACK
ADDR_KEY
X
X
X
10.18
ENTER
10.1
10.7
SHF_MODE
MAX_WIND
ROLLBACK
ADDR_KEY
X
X
X
⑥ 17-OCT-89/ML
① MENUE10.P05
② VERSION 1.02
③
④ INIT + RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 5 OF 5
MENUE 10: DEFAULT SETTINGS
4Q
1.328.960-20

8.6 LOOP & EDIT functions




7 8 9
4 5 6
1 2 3
± 0 CLR
"MASTER"
11.0
DEVICE
AUTO
MOD_LOOP
STORE_LP
RECALL
POSTROLL
ETC
LOOP_OFF
PREROLL
11.1
ENTER
RESET
ENTER A 2 DIGIT NUMBER
OR RESET
11.0
DEVICE
AUTO
MOD_LOOP
STORE_LP
RECALL
POSTROLL
ETC
LOOP_OFF
PREROLL
"MASTER"
11.0
DEVICE
AUTO
MOD_LOOP
STORE_LP
RECALL
POSTROLL
ETC
LOOP_OFF
PREROLL
11.2
NEW_LOOP
TRIM_BEG
TRIM_END
END
10.9
LAST_END
TRANS
<<
>>
RECALL
RESET
ENTER
CALC
11.2
NEW_LOOP
TRIM_BEG
TRIM_END
END
11.3
NEW_LOOP
TRIM_END
END
+SEC
-SEC
+FRAME
-FRAME
TRIM BEGIN TIME WITH +/-SEC
OR +/-FRAME KEYS (FRAME MODE)
11.0
DEVICE
AUTO
MOD_LOOP
STORE_LP
RECALL
POSTROLL
ETC
LOOP_OFF
PREROLL
11.2
NEW_LOOP
TRIM_BEG
TRIM_END
END
11.4
NEW_LOOP
TRIM_BEG
END
+FRAME
-FRAME
+MSEC
-MSEC
TRIM END TIME WITH +/-FRAME
OR +/-MSEC KEYS (MSEC MODE)
11.0
DEVICE
AUTO
MOD_LOOP
STORE_LP
RECALL
POSTROLL
ETC
LOOP_OFF
PREROLL
⑨ 17-OCT-89/ML
① MENUE11.P02
② VERSION 1.02
③
④ INIT · RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 2 OF 4
MENUE 11: NEW-LOOP, TRIM BEGIN
40
1.328.960-20


11.0
DEVICE
AUTO
MOD_LOOP
STORE_LP
RECALL
POSTROLL
ETC
LOOP_OFF
PREROLL
11.5
SHF_MODE
TRIM_REC
APD_MODE
LOOPMODE
MON_SYNC
REC_DEV
REHEARSE
SHIFT_LP
11.0
DEVICE
AUTO
MOD_LOOP
STORE_LP
RECALL
POSTROLL
ETC
LOOP_OFF
PREROLL
11.5
SHF_MODE
TRIM_REC
APD_MODE
LOOPMODE
MON_SYNC
REC_DEV
ETC
REC_ENAB
SHIFT_LP
11.6
FILM
AUDIO
ENTER
SELECT THE LOOP MODE
SHF_MODE: SEE MENU 10.7
MON_SYNC/SRC_SYNC
REHEARSE/REC_ENAB
TOGGLING FUNCTIONS
APD_MODE
SHIFT_LP
ONLY WITH DEF. RECORD DEVICES
7 8 9
4 5 6
1 2 3
± 0 CLR
11.5
SHF_MODE
TRIM_REC
APD_MODE
LOOPMODE
MON_SYNC
REC_DEV
ETC
REHEARSE
SHIFT_LP
11.7
FRAME
MSEC
ENTER
TRIM_REC : ONLY IN FILM MODE
SELECT DESIRED UNIT
ENTER ANY VALUE BETWEEN ± 2 SEC.
11.8
FRAME
MSEC
ENTER
SEE 11.7
11.5
SHF_MODE
TRIM_REC
APD_MODE
LOOPMODE
MON_SYNC
REC_DEV
ETC
REHEARSE
SHIFT_LP
11.5
SHF_MODE
TRIM_REC
APD_MODE
LOOPMODE
MON_SYNC
REC_DEV
ETC
REHEARSE
SHIFT_LP
11.9
OFF
ON
ENTER
SELECT ON OR OFF
11.5
SHF_MODE
TRIM_REC
APD_MODE
LOOPMODE
MON_SYNC
REC_DEV
ETC
REHEARSE
SHIFT_LP
⓪ 17-OCT-89/ML
① MENUE11.P03
② VERSION 1.02
③
④ INIT : RPA
STUDER
INTERNATIONAL AG
SC-4016 USER SOFTWARE / SOFTKEY MENUE
PAGE 3 OF 4
MENUE 11: LOOP, TRIM-REC, APPEND
4Q
1.328.960-20


11.5
SHF_MODE
LOOPMODE
ETC
TRIM_REC
MON_SYNC
REHEARSE
APD_MODE
REC_DEV
SHIFT_LP
11.10
CLR_ALL
ENTER
RESET
CLR_ALL : ONLY IF ANY DEF. RECORD DEVICES
ENTRY OF 2-DIGIT DEVICE-NUMBER REQUIRED
11.0
DEVICE
STORE_LP
ETC
AUTO
RECALL
LOOP_OFF
MOD_LOOP
POSTROLL
PREROLL
AFTER 3 ENTRIES OR RESET
11.13
DEVICE
STORE_LP
ETC
AUTO
RECALL
LOOP_OFF
SHIFT[-]
SHIFT[+]
CLR_SHFT
11.14
SHF_MODE
LOOPMODE
ETC
TRIM_REC
SLEW
REHEARSE
APD_MODE
REC_DEV
SHIFT_LP
SEE MENU 11.5
11.15
<<
>>
ENTER
RESET
11.16
CHANGE
SLEW_OFF
RESET
11.14
SHF_MODE
LOOPMODE
ETC
TRIM_REC
SLEW
REHEARSE
APD_MODE
REC_DEV
SHIFT_LP
11.15
<<
>>
ENTER
RESET
11.16
CHANGE
SLEW_OFF
RESET
11.14
SHF_MODE
LOOPMODE
ETC
TRIM_REC
SLEW
REHEARSE
APD_MODE
REC_DEV
SHIFT_LP
11.16
CHANGE
SLEW_OFF
RESET
11.15
<<
>>
ENTER
RESET
11.13
DEVICE
STORE_LP
ETC
AUTO
RECALL
LOOP_OFF
SHIFT[-]
SHIFT[+]
CLR_SHFT
11.14
SHF_MODE
LOOPMODE
ETC
TRIM_REC
SLEW
REHEARSE
APD_MODE
REC_DEV
SHIFT_LP

9. Control Unit

ESE = Electrostatically sensitive assembly

Contents

Softkey unit Blockdiagram		9/1
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Softkey Pushbutton Board	1.328.351.00	9/5
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Multiplexer Board Blockdiagram		9/21
Multiplexer Board	1.328.356.81	9/23
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Optional Keyboard Interface	1.328.379.00	9/29
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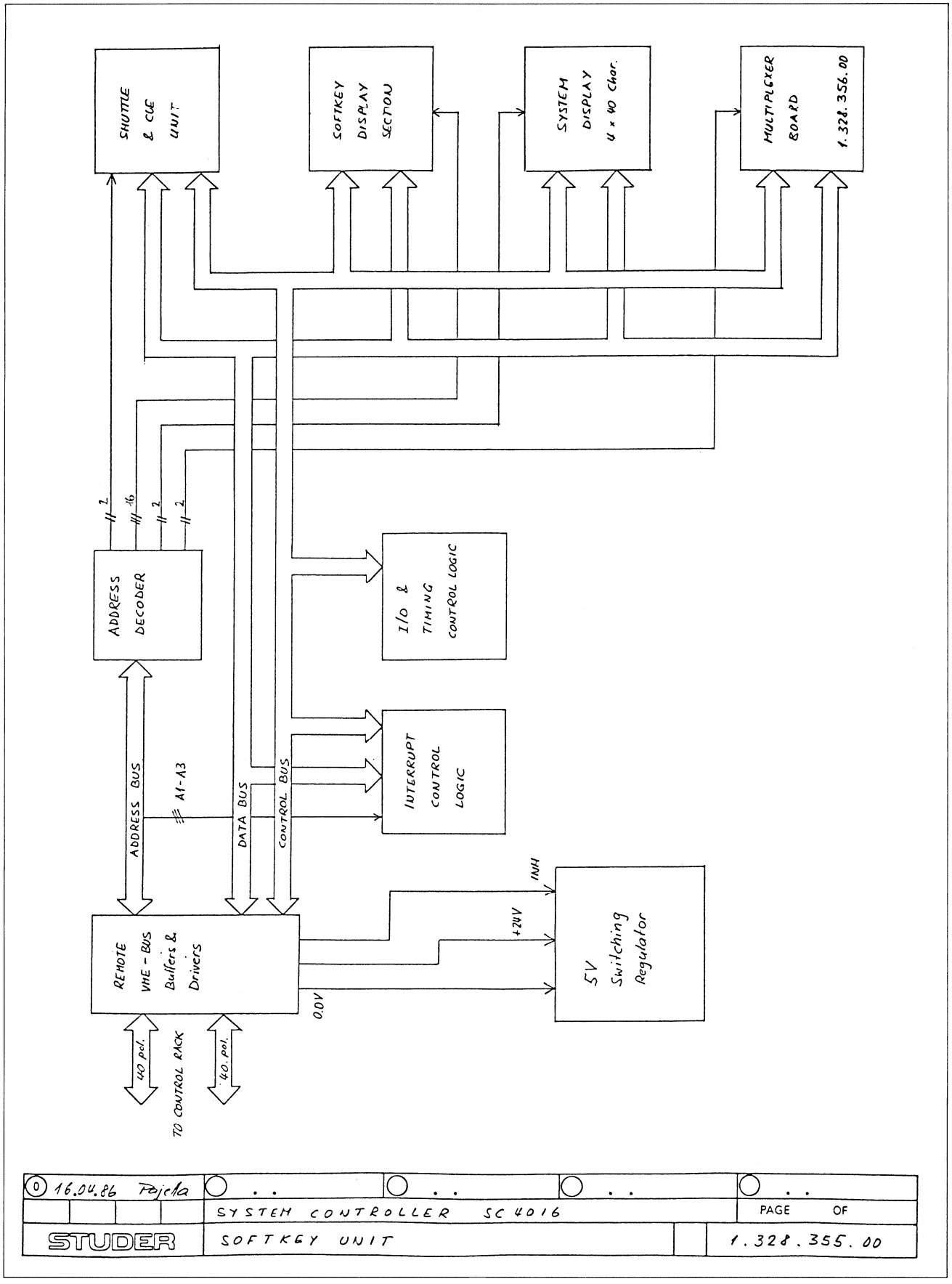
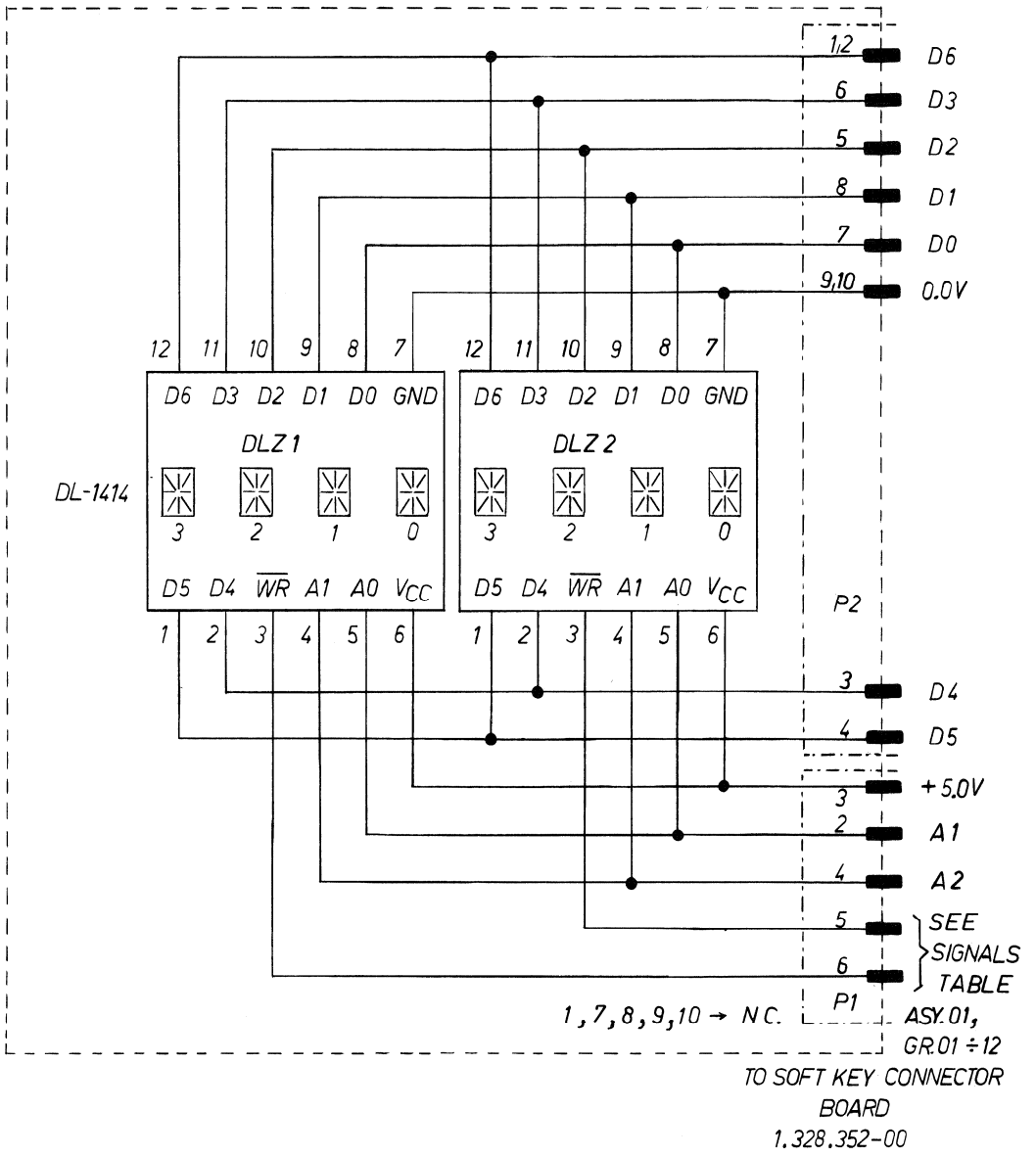
Cue Sensor Board	1.820.765.00	9/33
VFD Module Interface Board	1.328.357.00	9/35

BLOCK DIAGRAM SOFTKEY UNIT

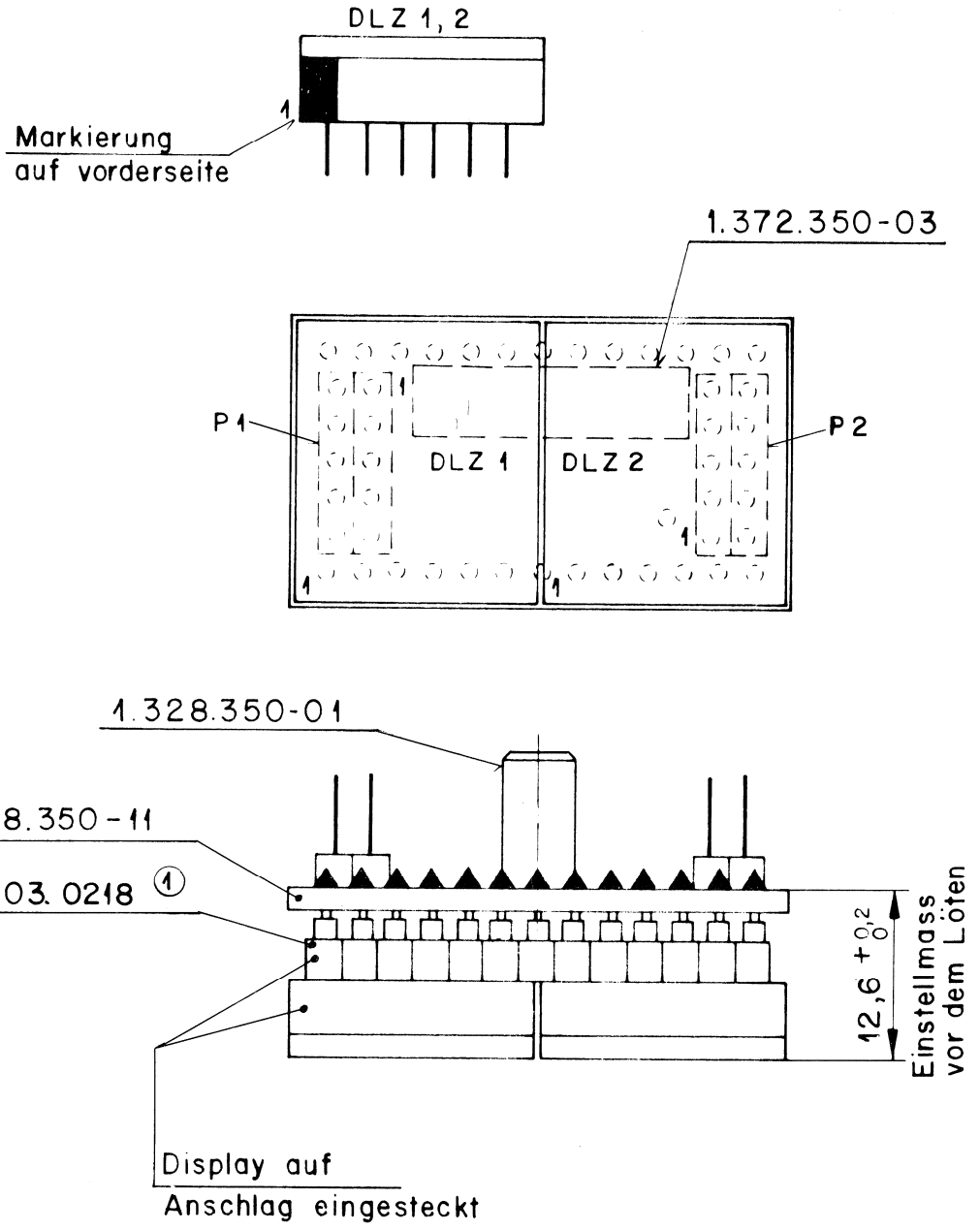


SOFTKEY DISPLAY BOARD 1.328.350.00

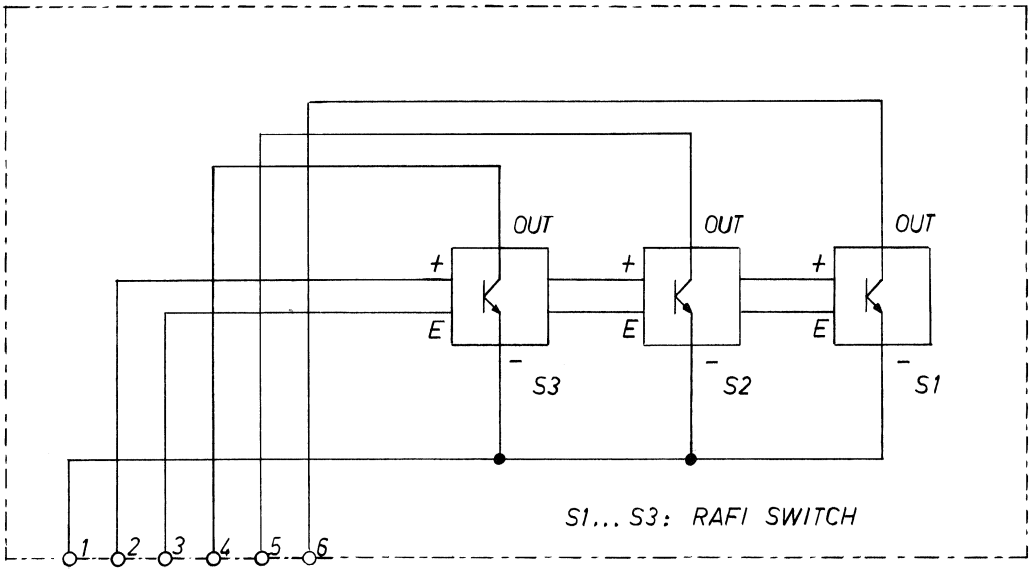


22.10.85	R.PAJETTA	SC 4016			
STUDER	SOFTKEY DISPLAY BOARD		SC	1.328.350.00	PAGE 1 OF 1

SOFTKEY DISPLAY BOATD 1.328.350.00



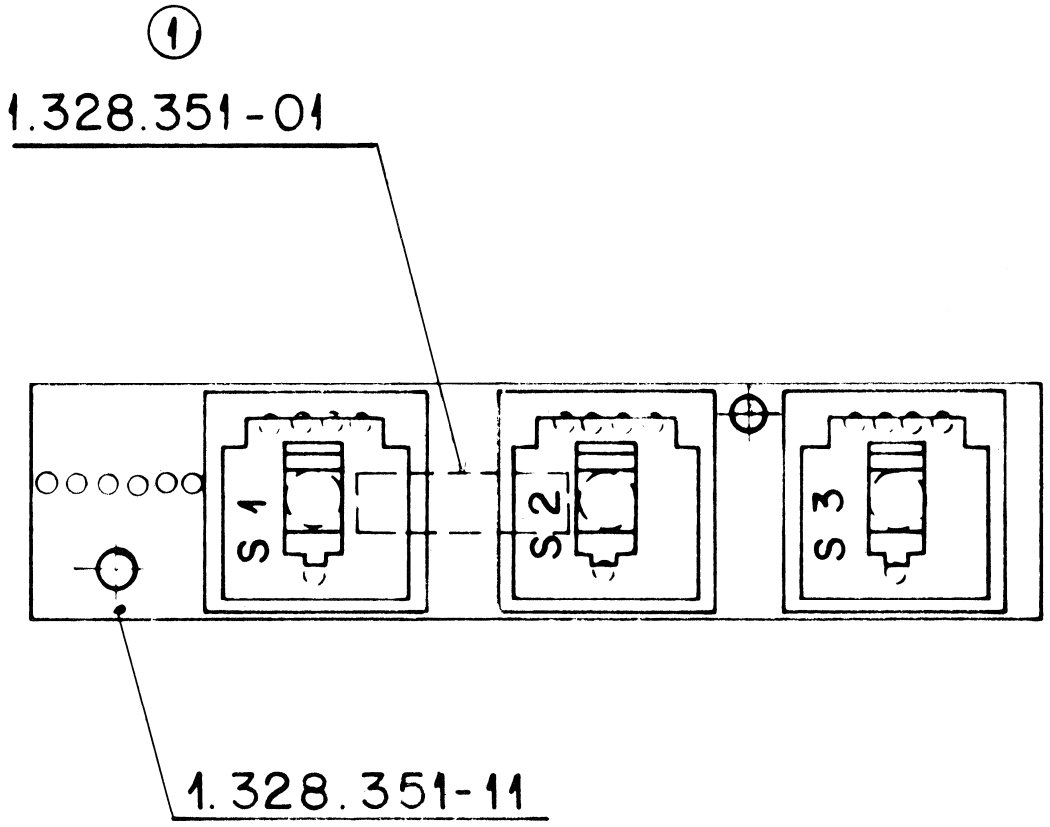
SOFTKEY PUSHBUTTON BOARD 1.328.351.00



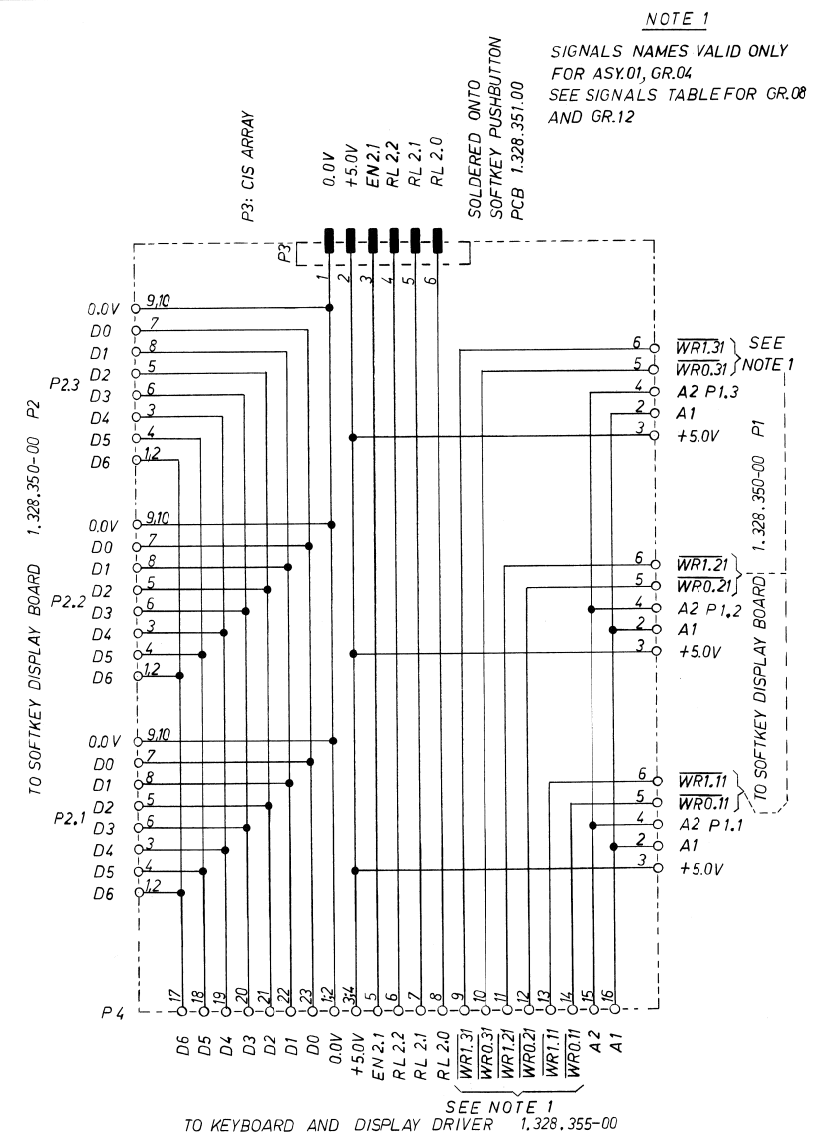
SOLDERED ONTO
SOFTKEY CONNECTOR PCB 1.328.352.00

	22.10.85	R. PAJETTA	SC 4016		
STUDER	SOFTKEY PUSHBUTTON BOARD		SC	1.328.351.00	PAGE 1 OF 1

SOFTKEY PUSHPUTTON BOARD 1.328.351.00

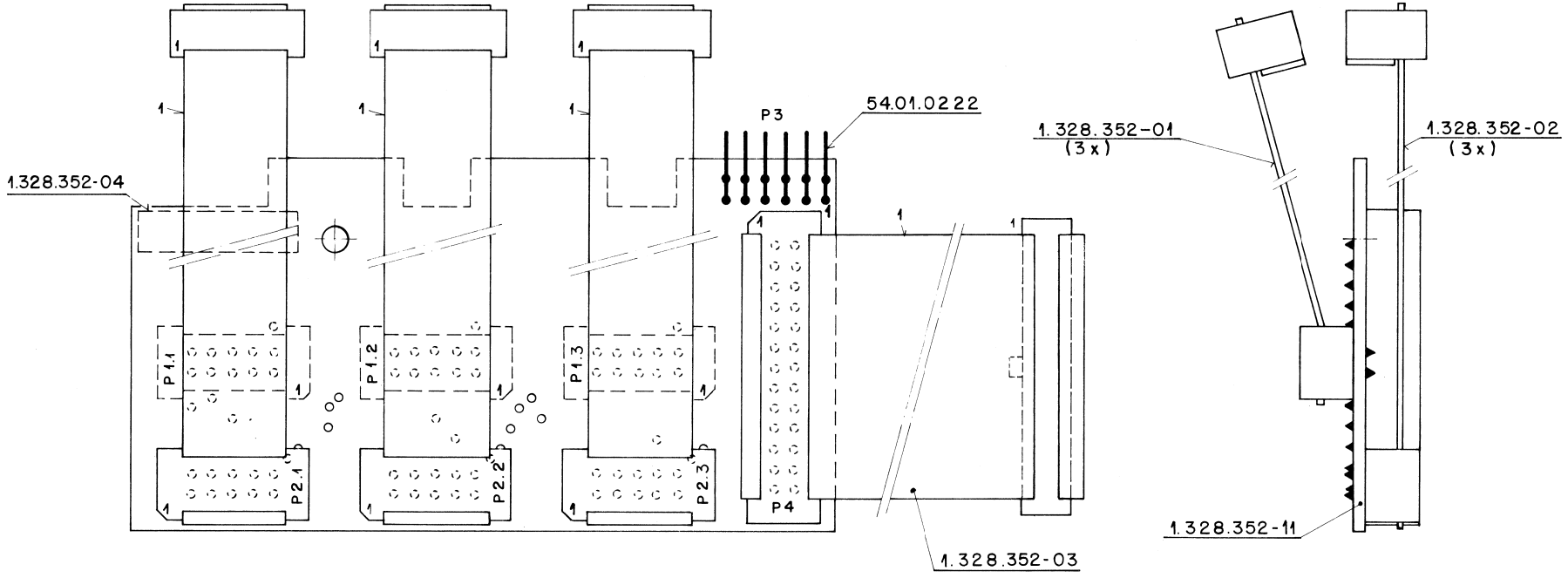


SOFTKEY CONNECTOR BOARD 1.328.352.00

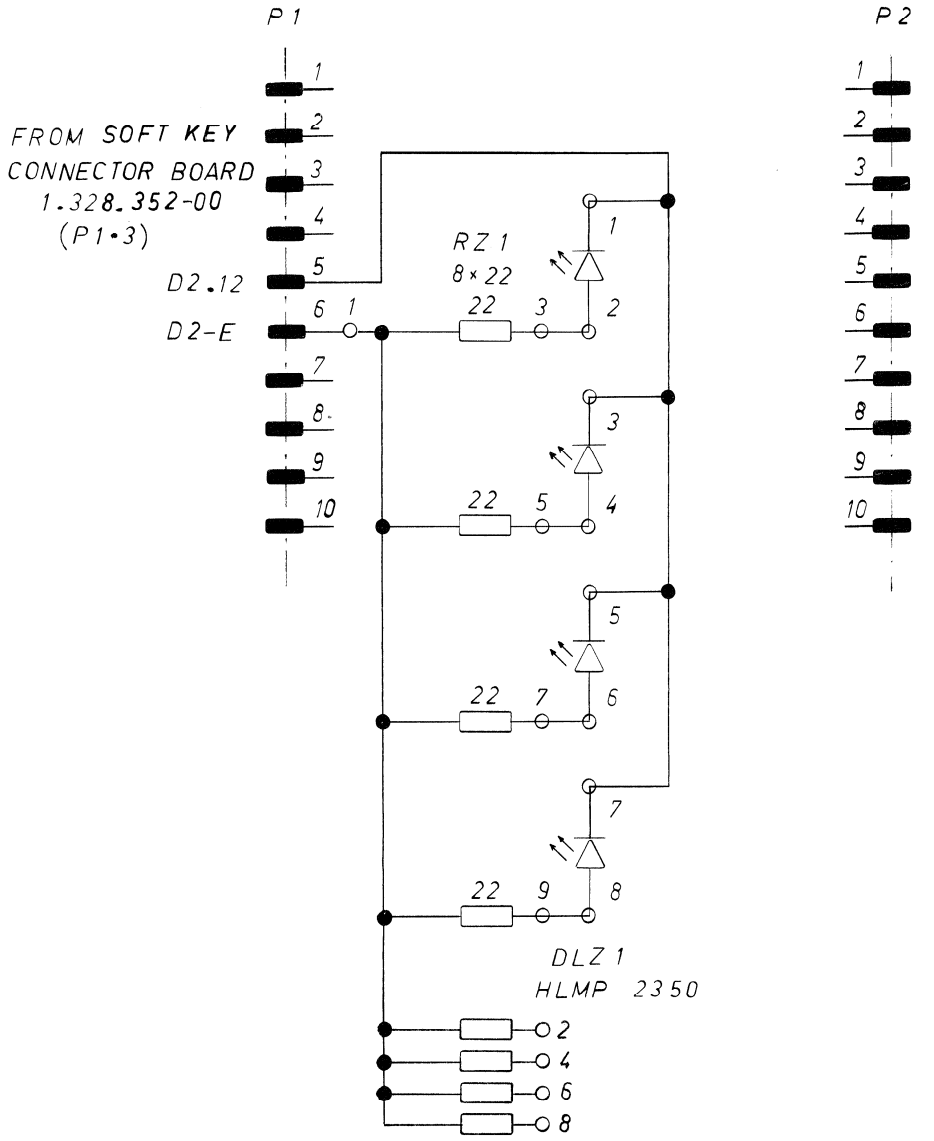


	22.10.85	R. PAJETTA	SC 4016		
STUDER	SOFTKEY CONNECTOR BOARD		SC	1.328.352.00	PAGE 1 OF 1

SOFTKEY CONNECTOR BOARD 1.328.352.00

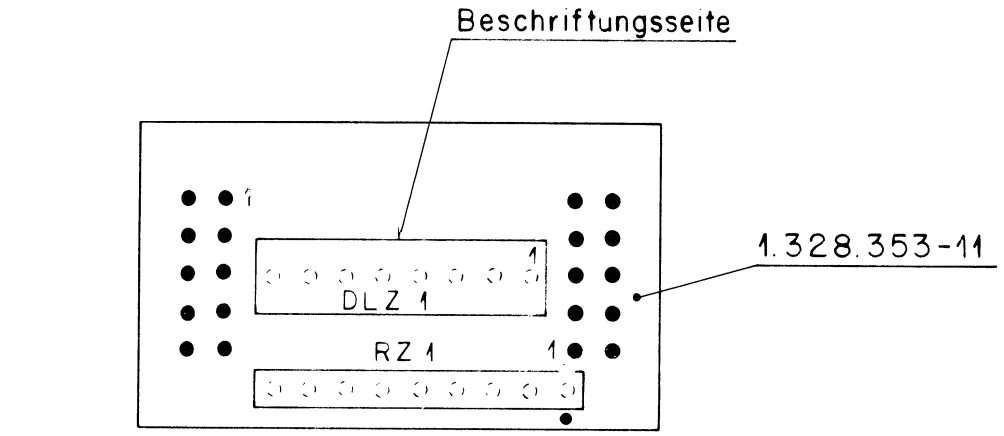


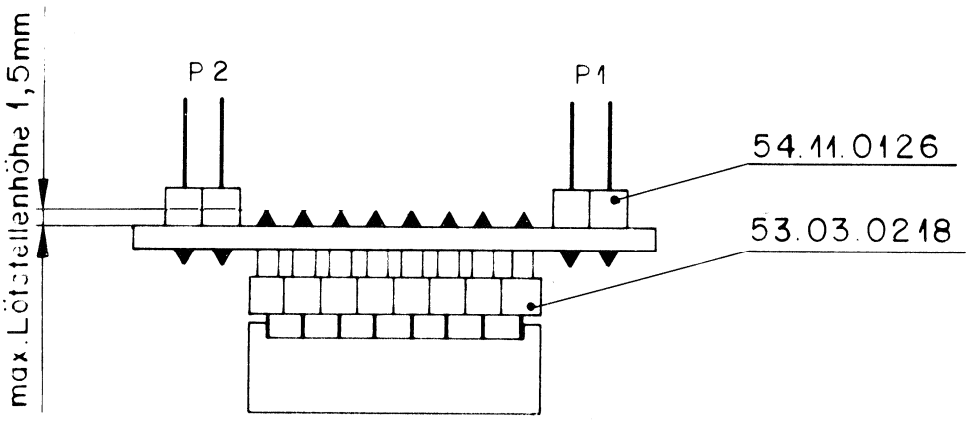
ETC. KEY 1.328.353.00



15.03.88				
	C. METZ			PAGE 1 OF 1
STUDER	SC 4016 ETC. KEY PCB		SC	1.328.353-00

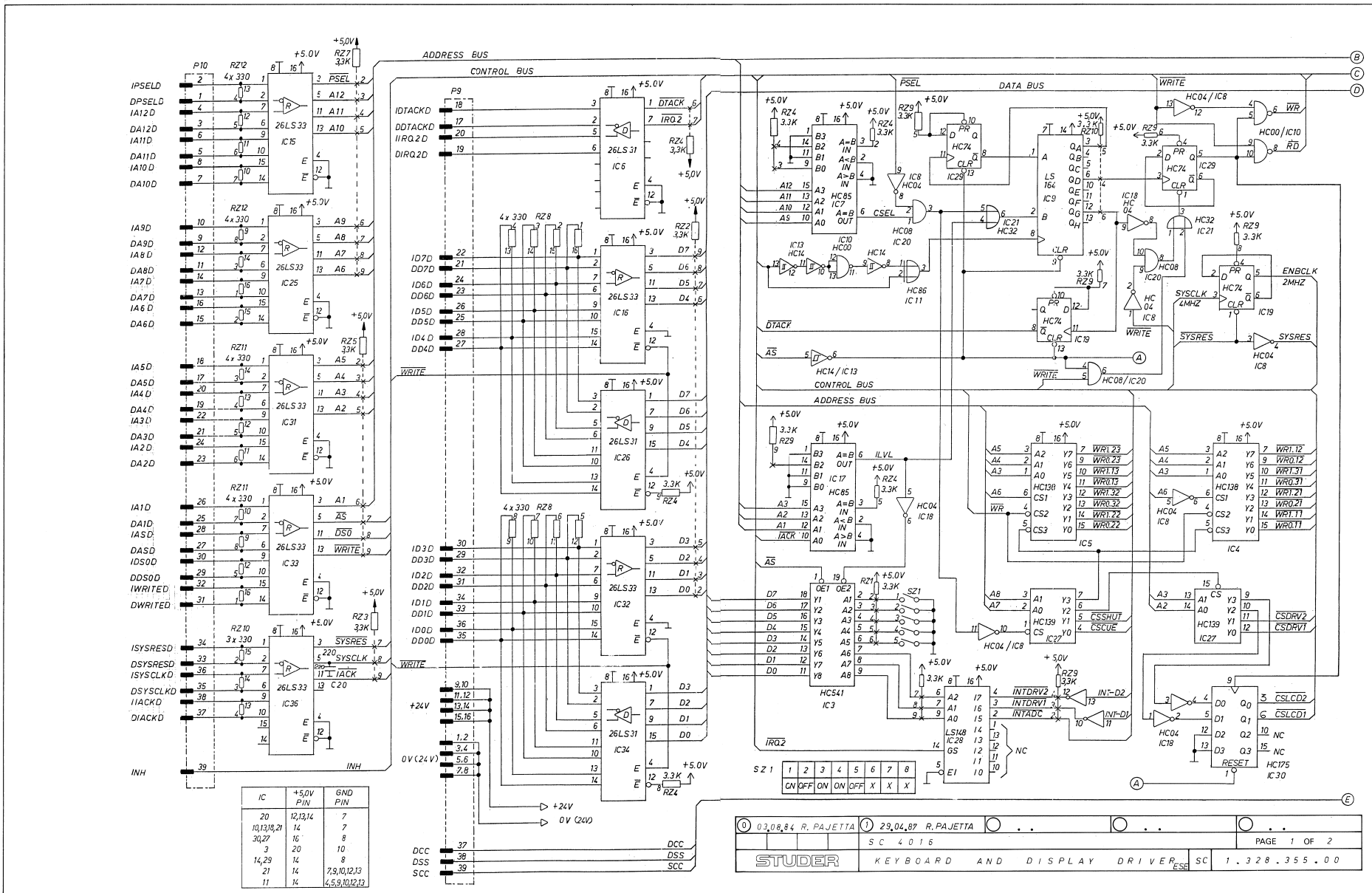
ETC. KEY 1.328.353.00



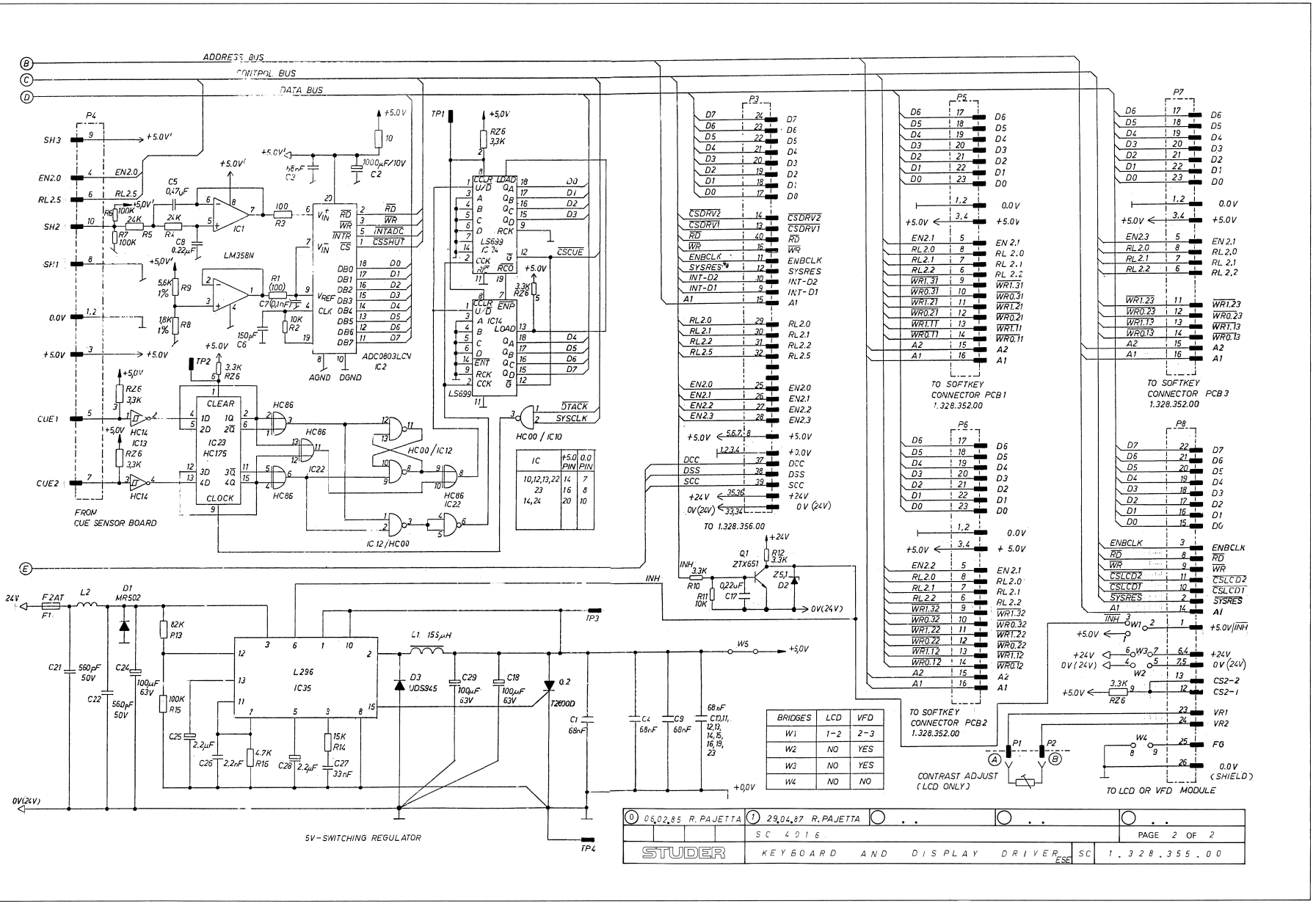


Schild 1.328.353-01
aufgeklebt nach Fabrikationsmuster.

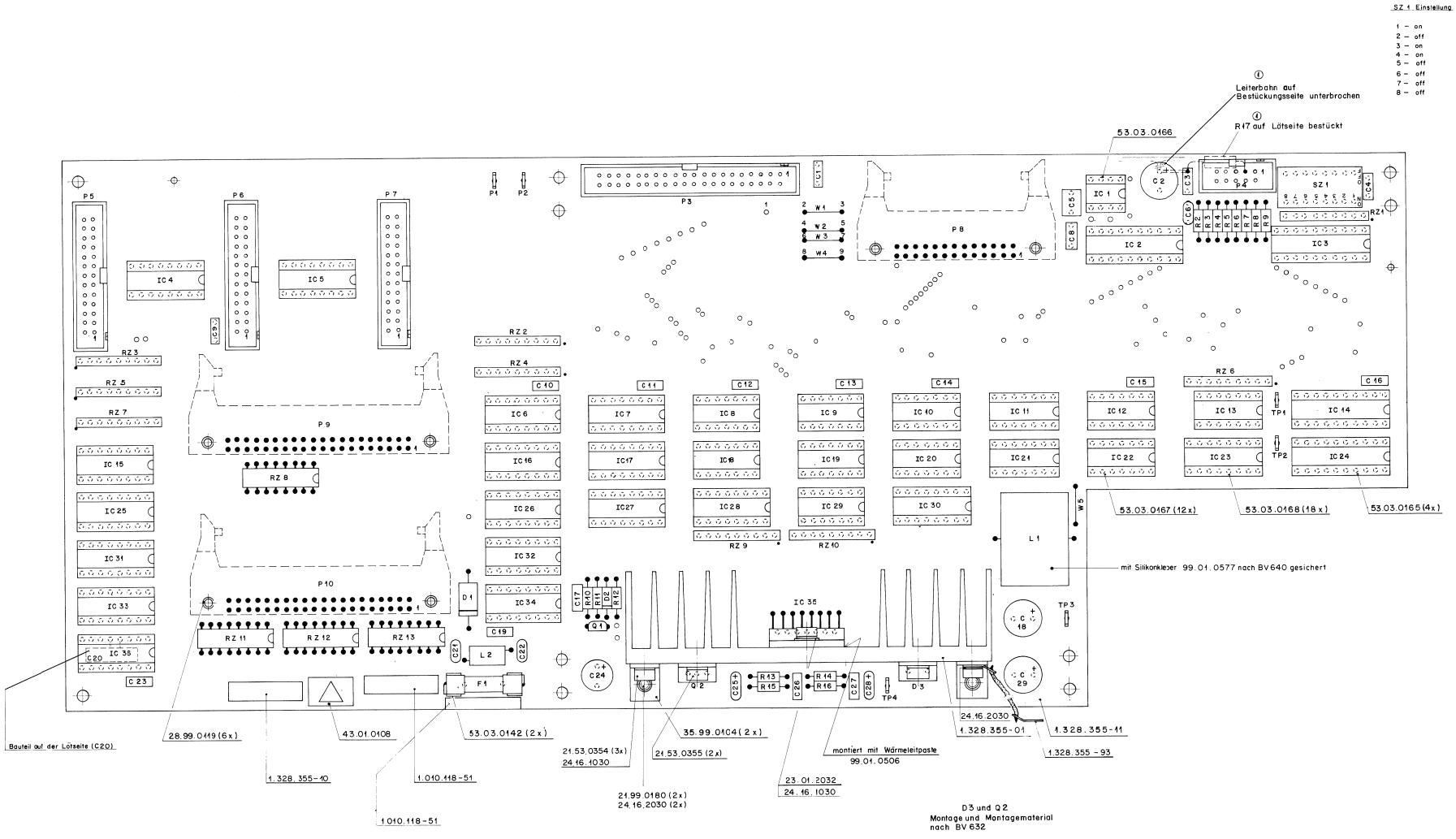
KEYBOARD DISPLAY DRIVER 1.328.355.00



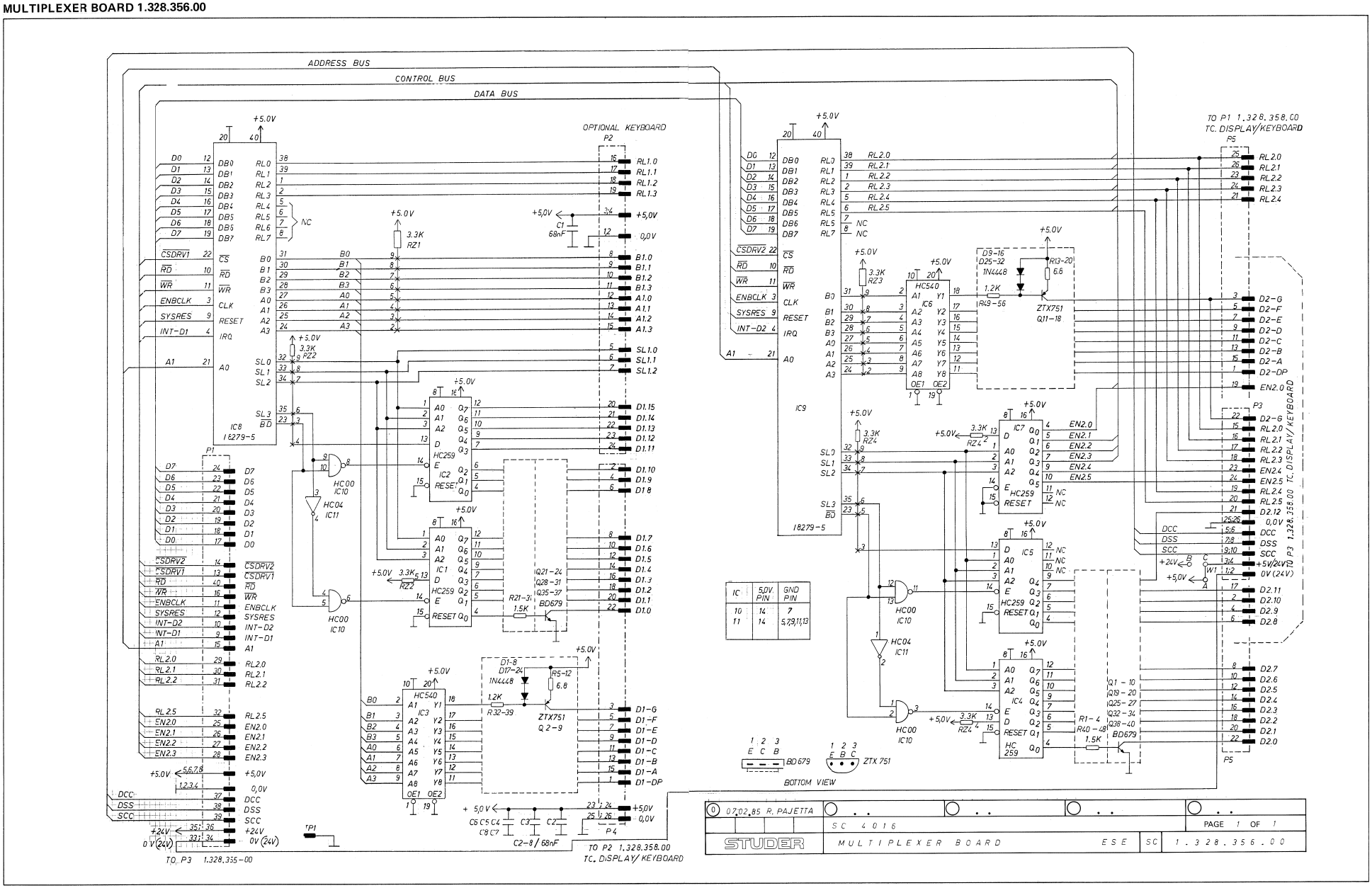
KEYBOARD DISPLAY DRIVER 1.328.355.00



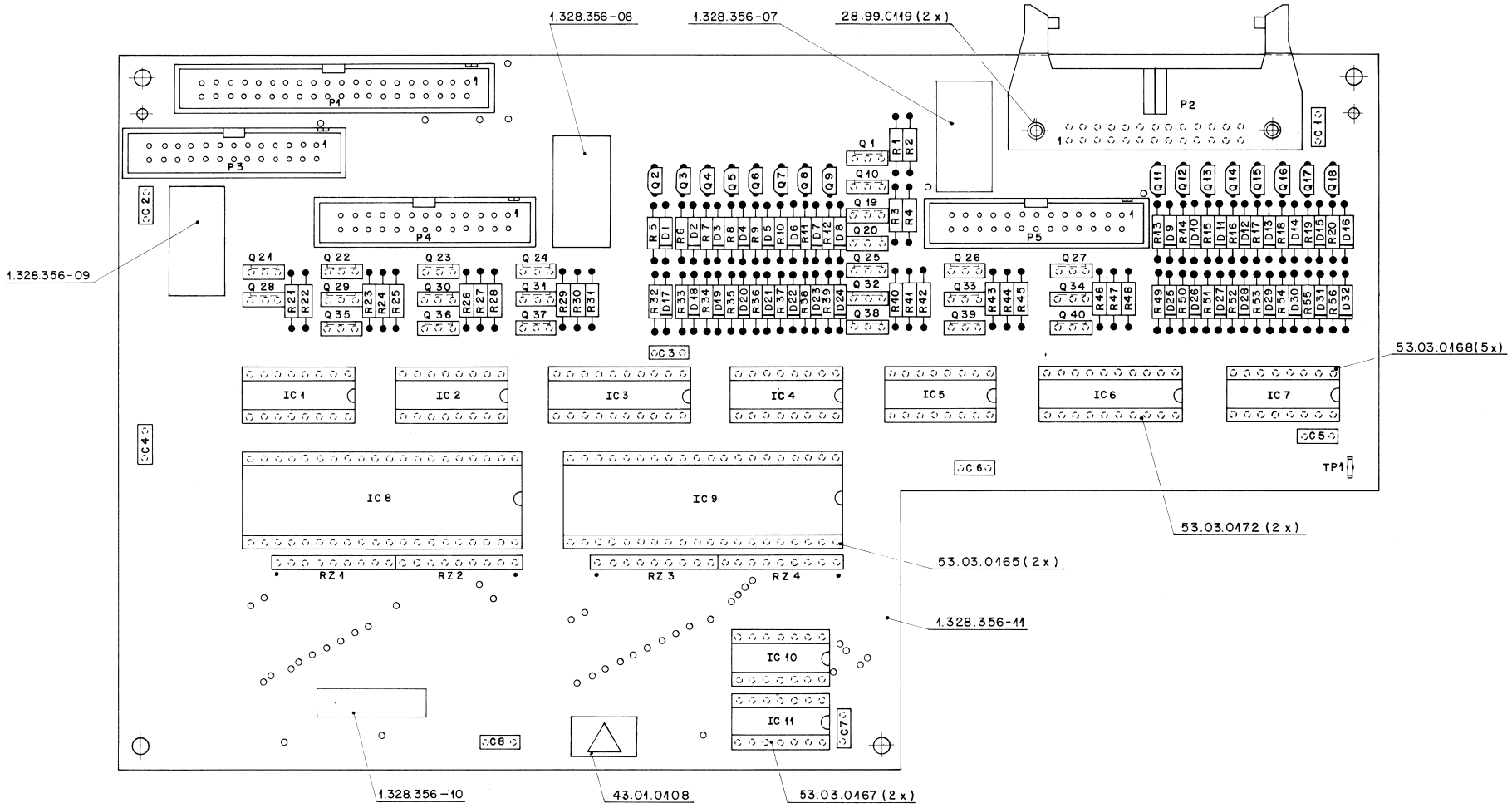
KEYBOARD DISPLAY DRIVER 1.328.355.00



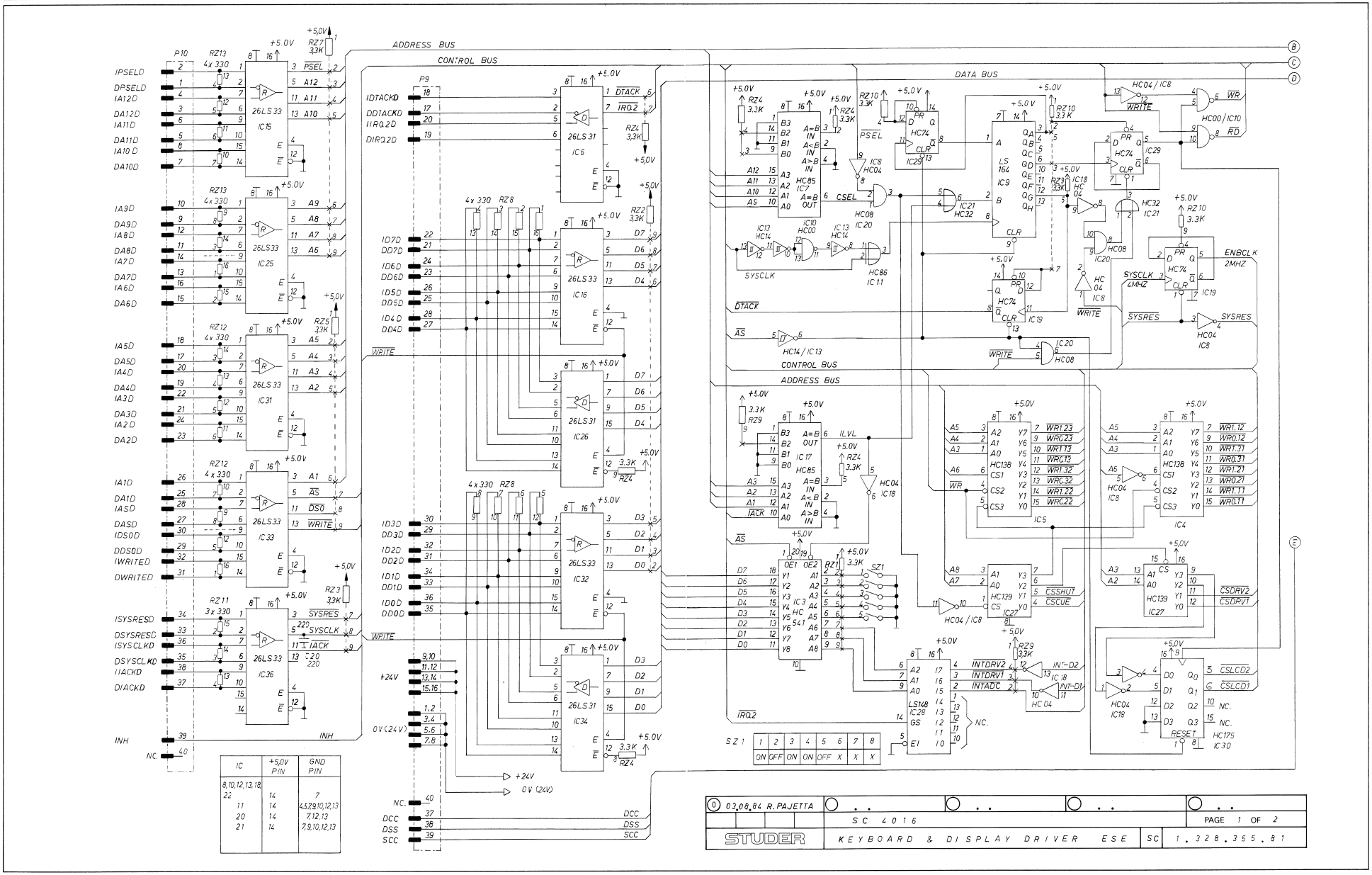
MULTIPLEXER BOARD 1.328.356.00



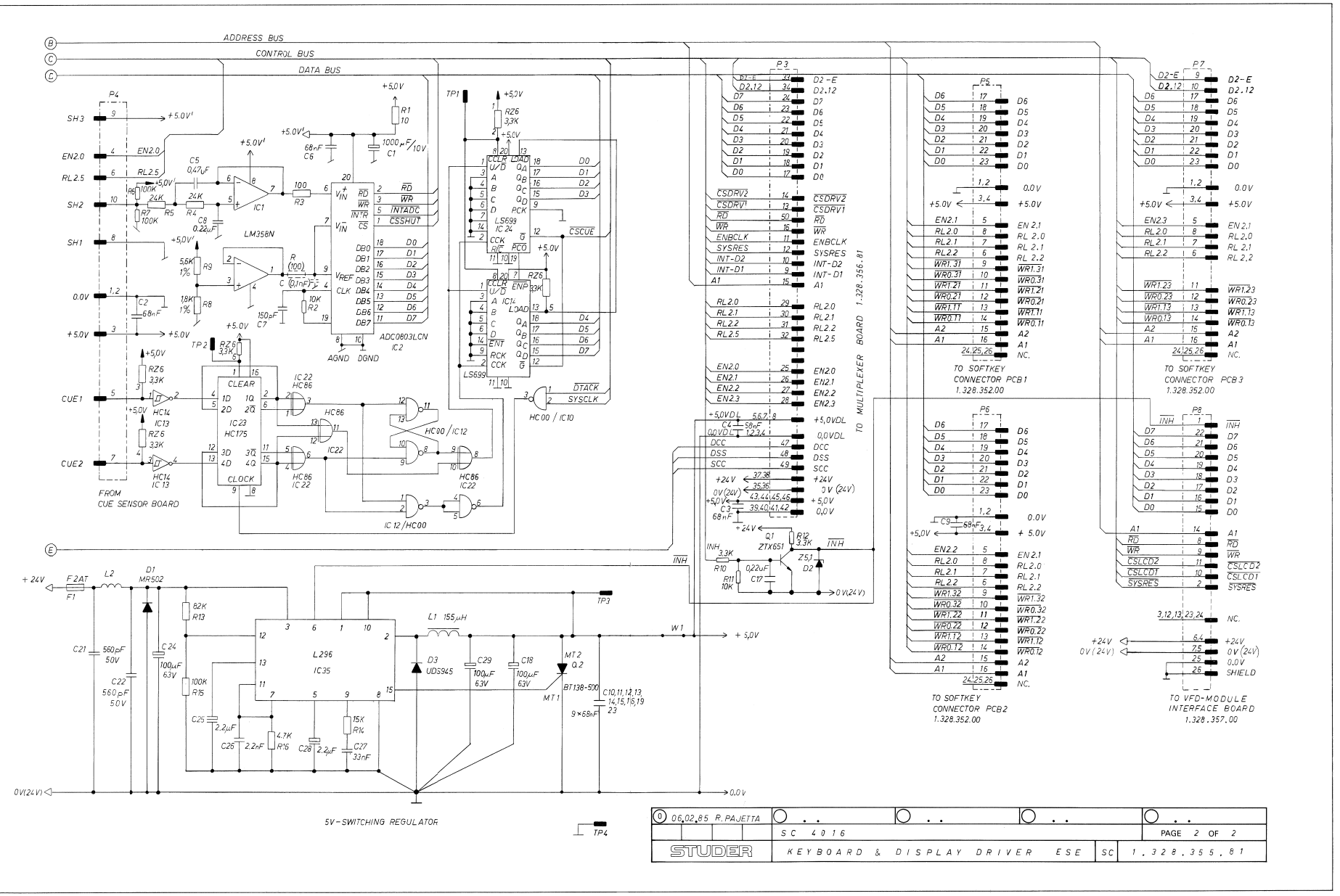
MULTIPLEXER BOARD 1.328.356.00



KEYBOARD DISPLAY DRIVER 1.328.355.81

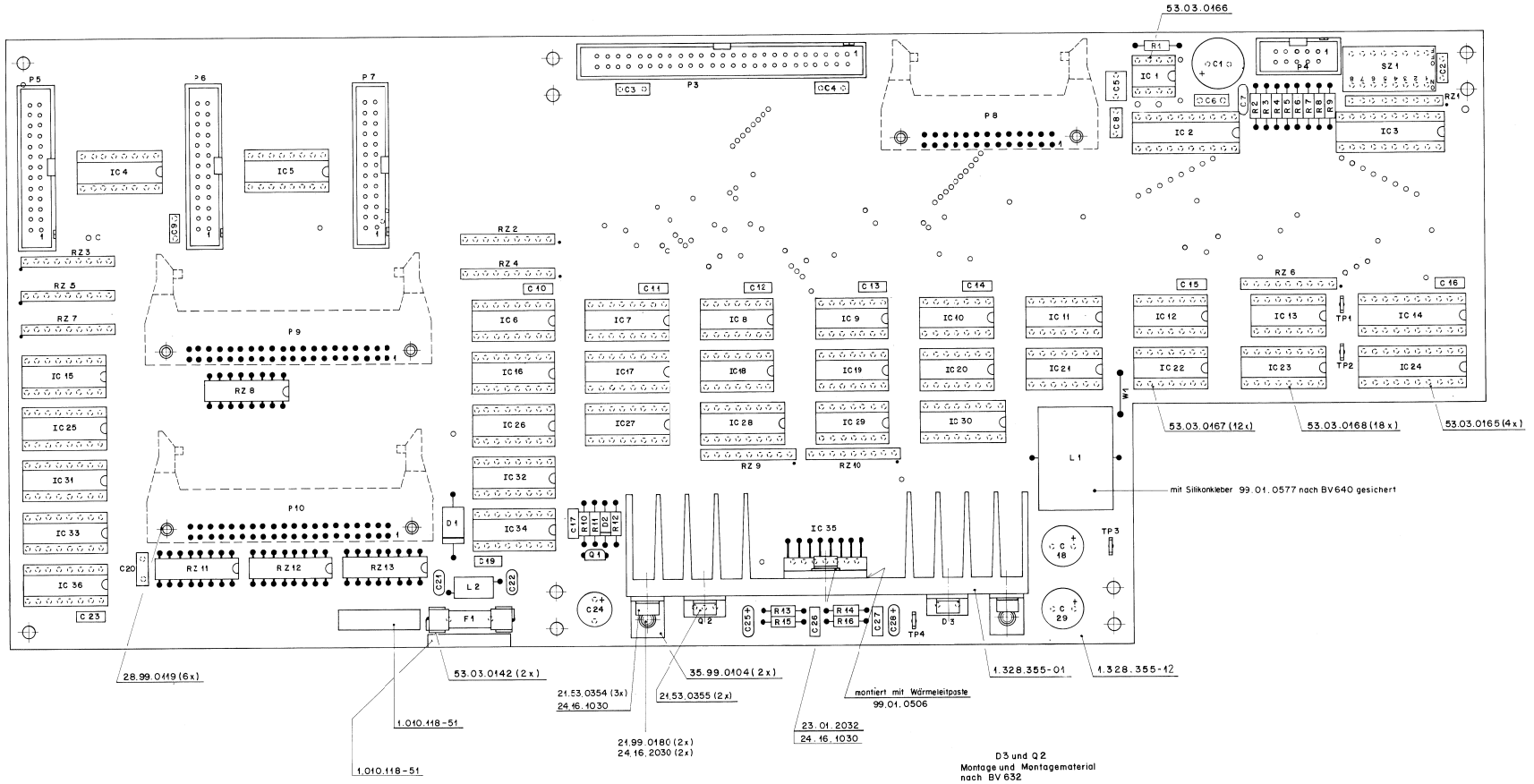


KEYBOARD DISPLAY DRIVER 1.328.355.81

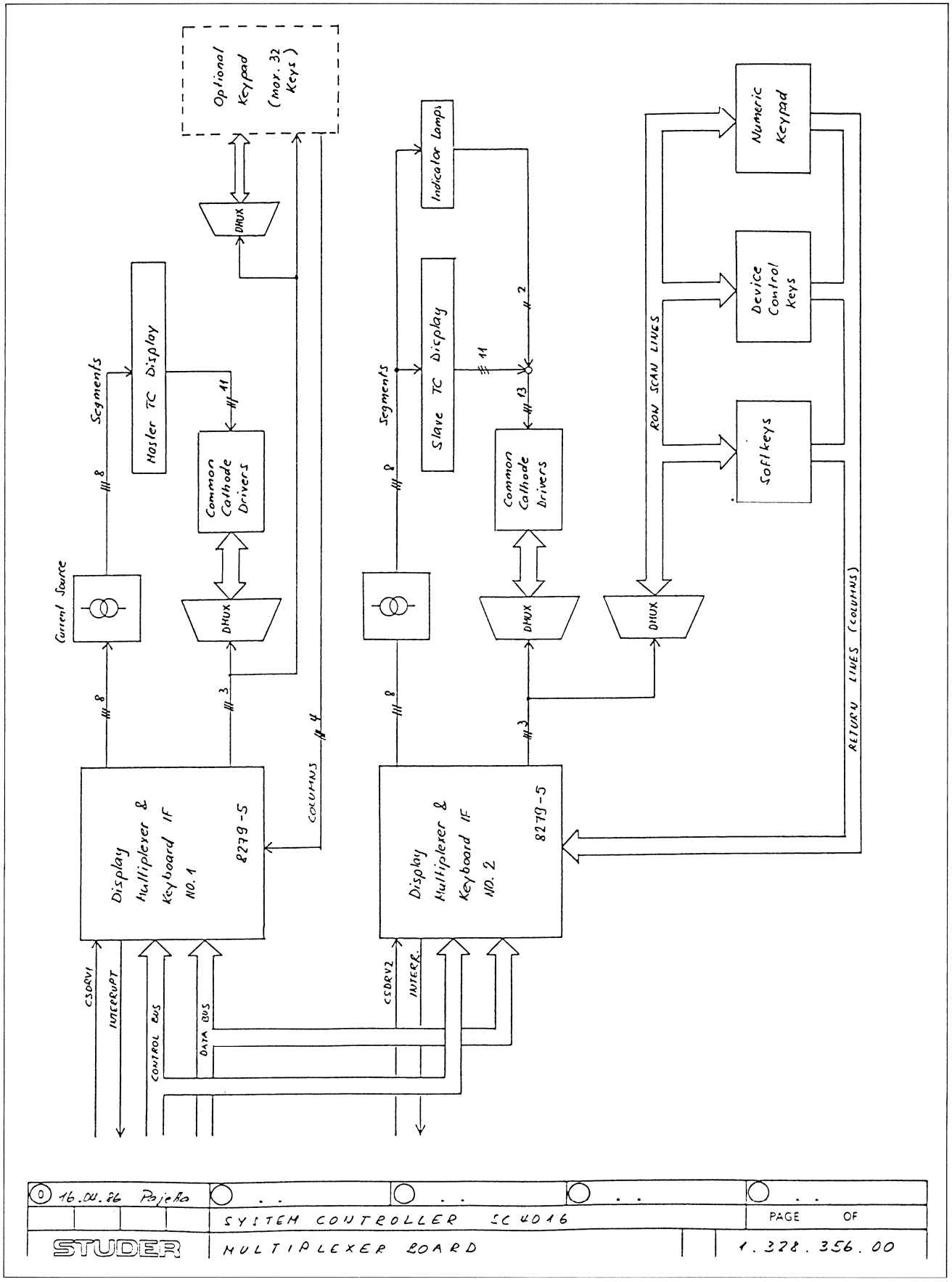


0 06.02.85 R.PAJETTA				
	SC 4016			PAGE 2 OF 2
STUDER	KEYBOARD & DISPLAY DRIVER ESE		SC	1.328.355.81

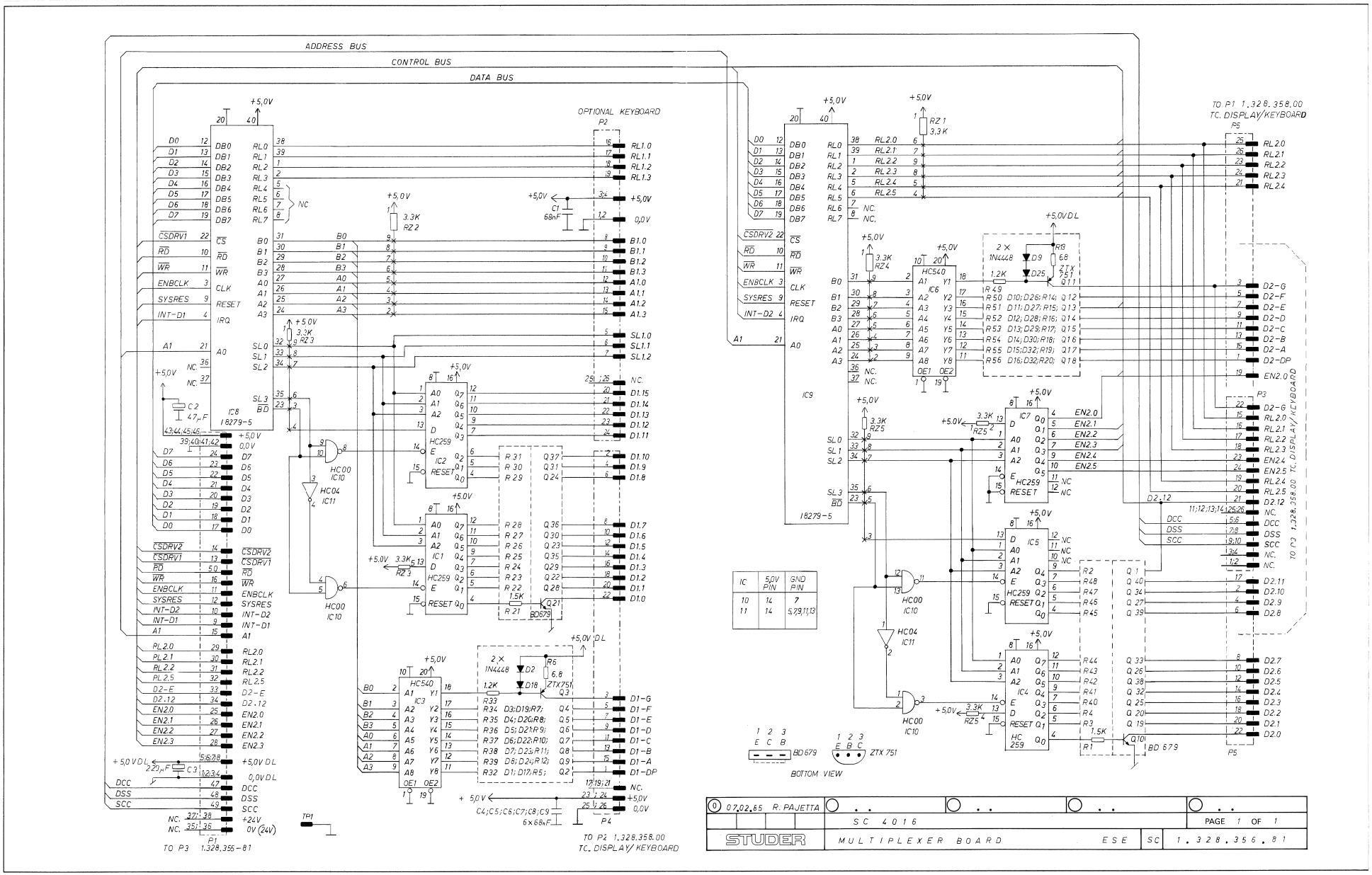
KEYBOARD DISPLAY DRIVER 1.328.355.81



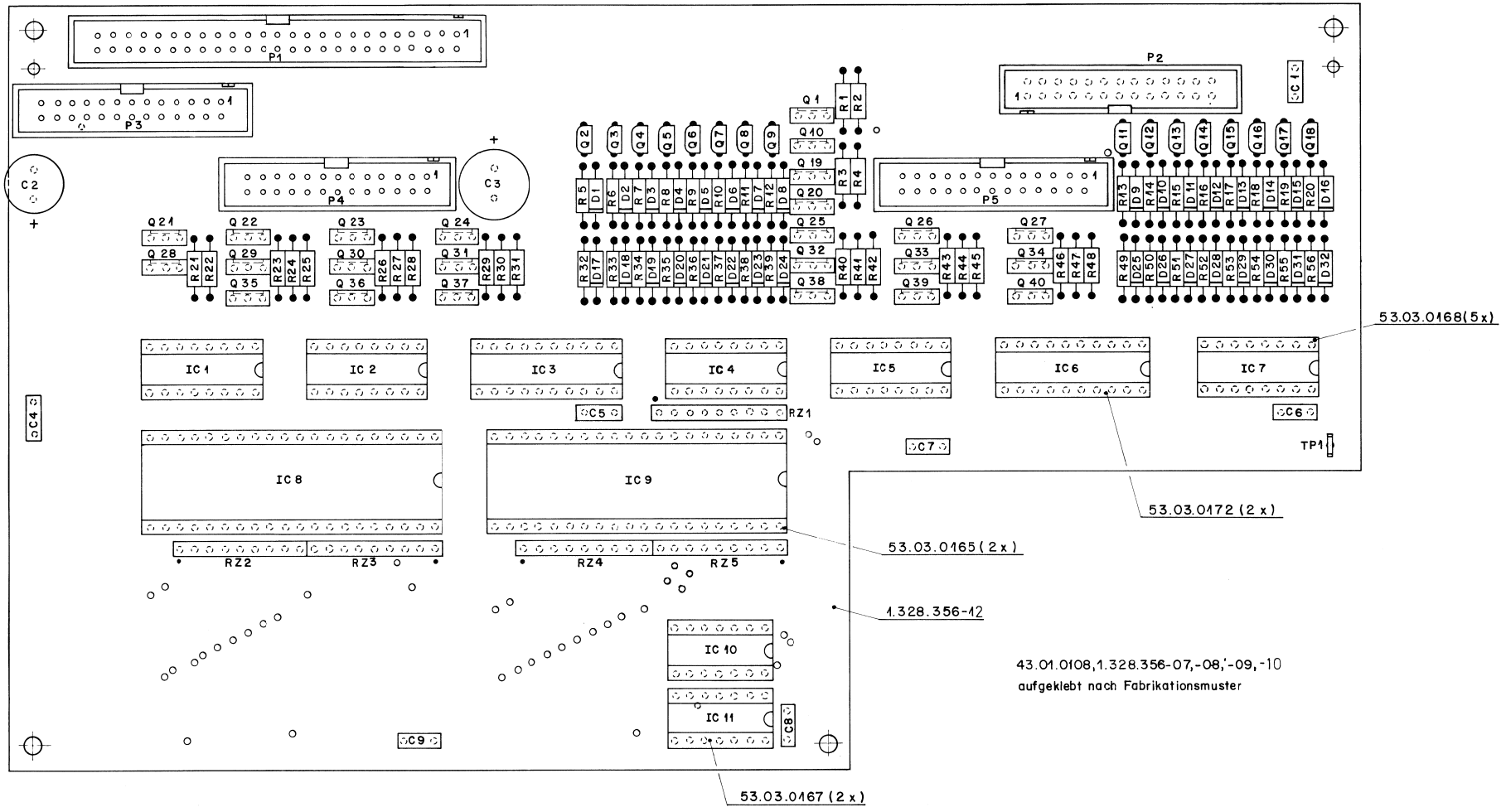
BLOCK DIAGRAM MULTIPLEXER BOARD



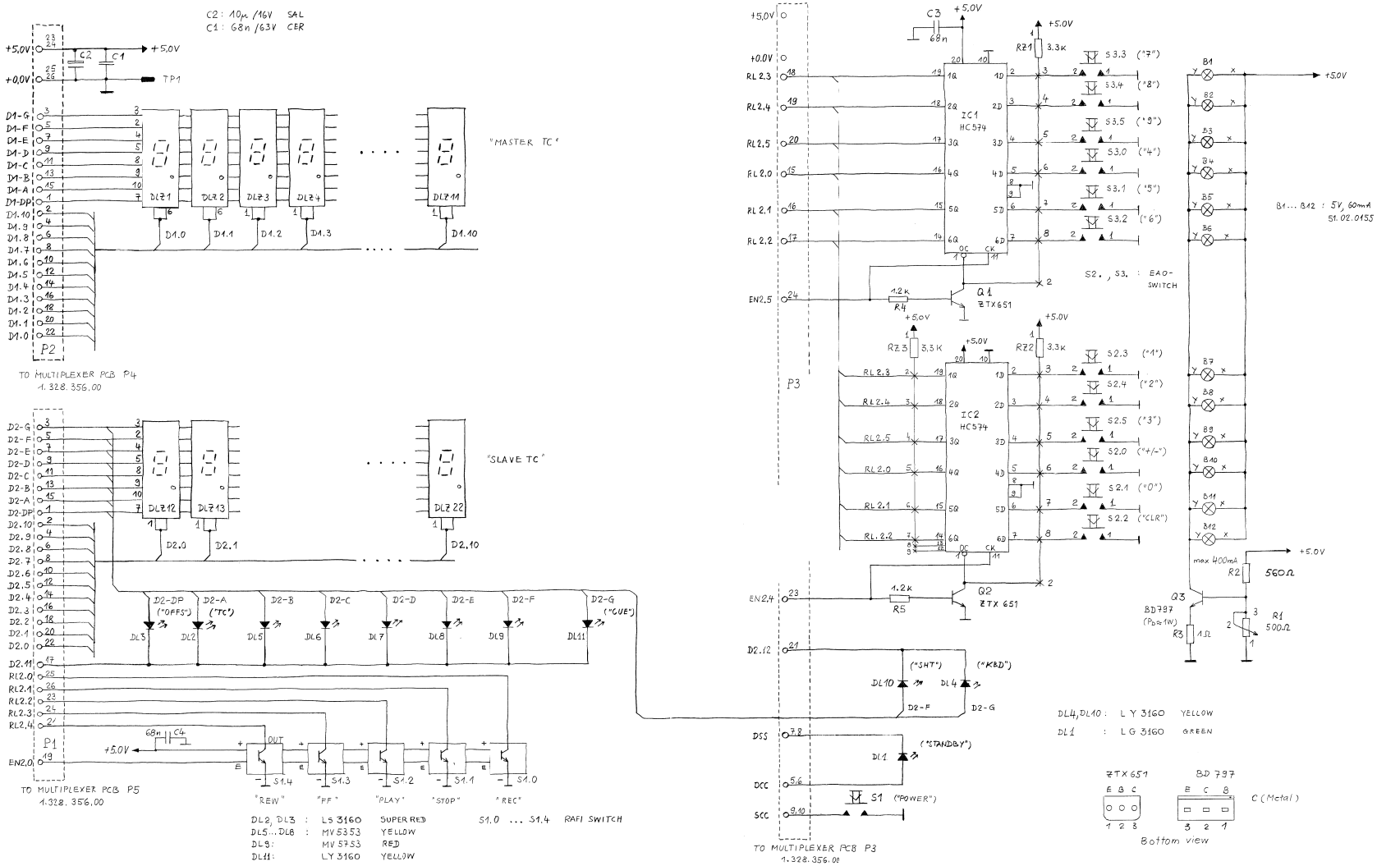
MULTIPLEXER BOARD 1.328.356.81



MULTIPLEXER BOARD 1.328.356.81

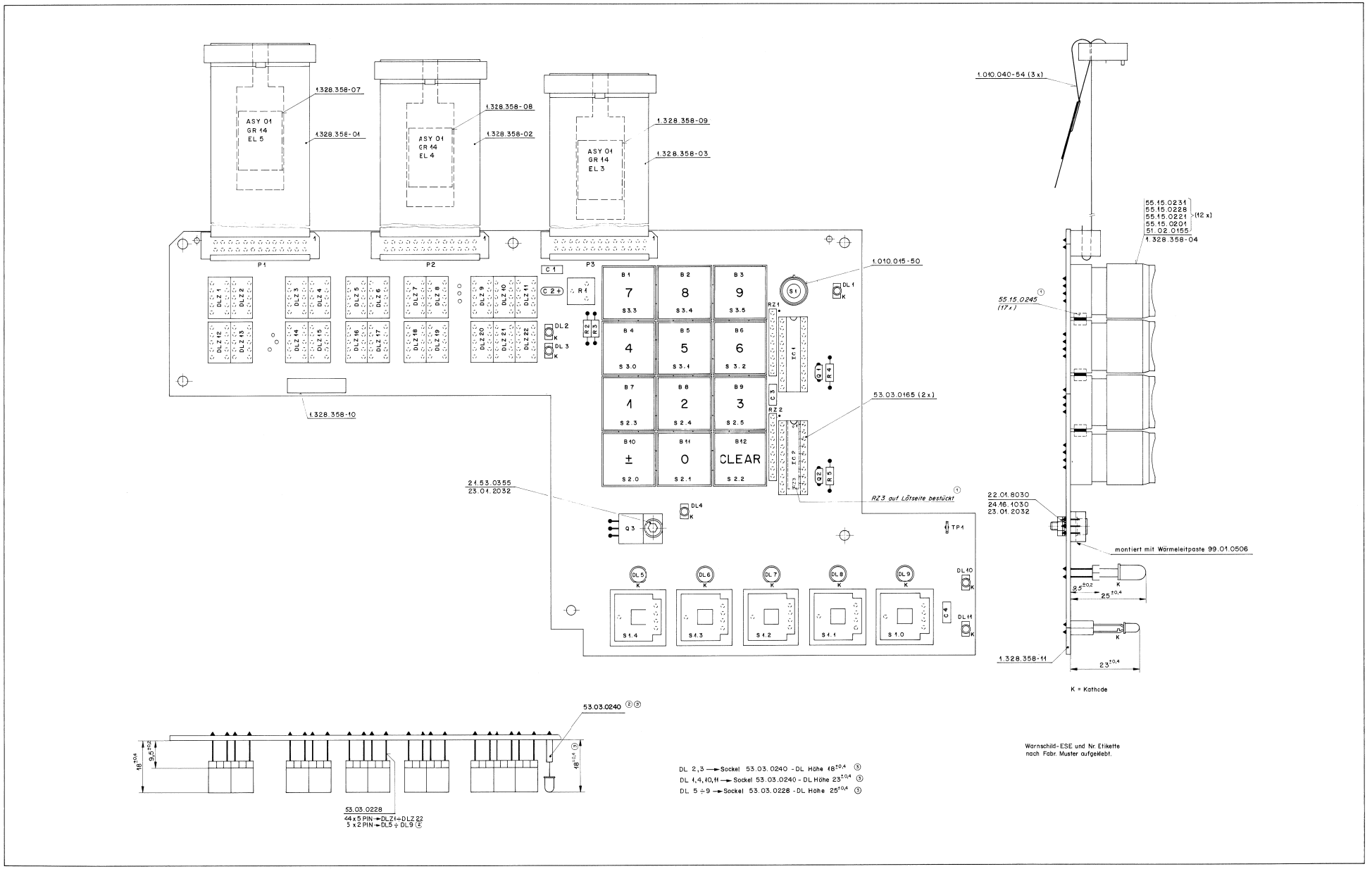


TC DISPLAY / KEYBOARD BOARD 1.328.358.00

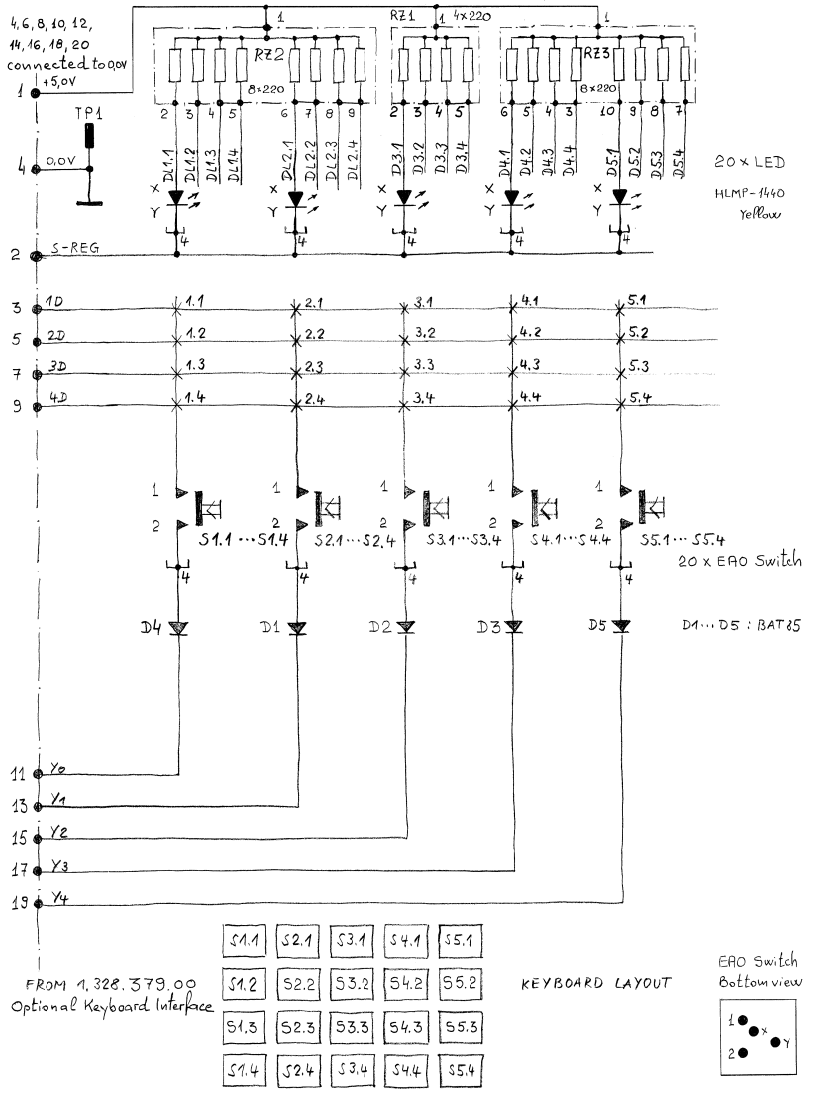


0 14.01.86	1 26.03.87	. .	. .	. .
	SC4016			PAGE 1 OF 1
STUDER	TC DISPLAY/KEYBOARD PCB		SC	1.328.358.00

TC DISPLAY / KEYBOARD BOARD 1.328.358.00

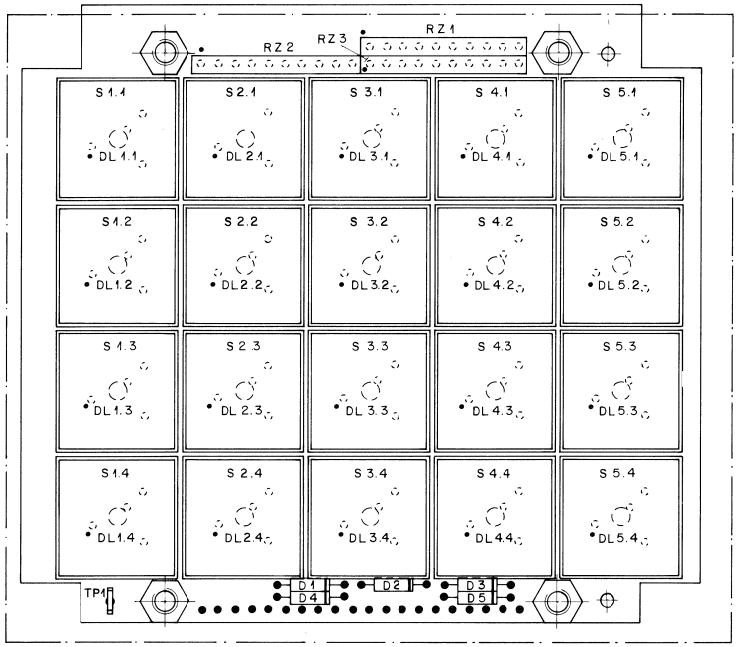


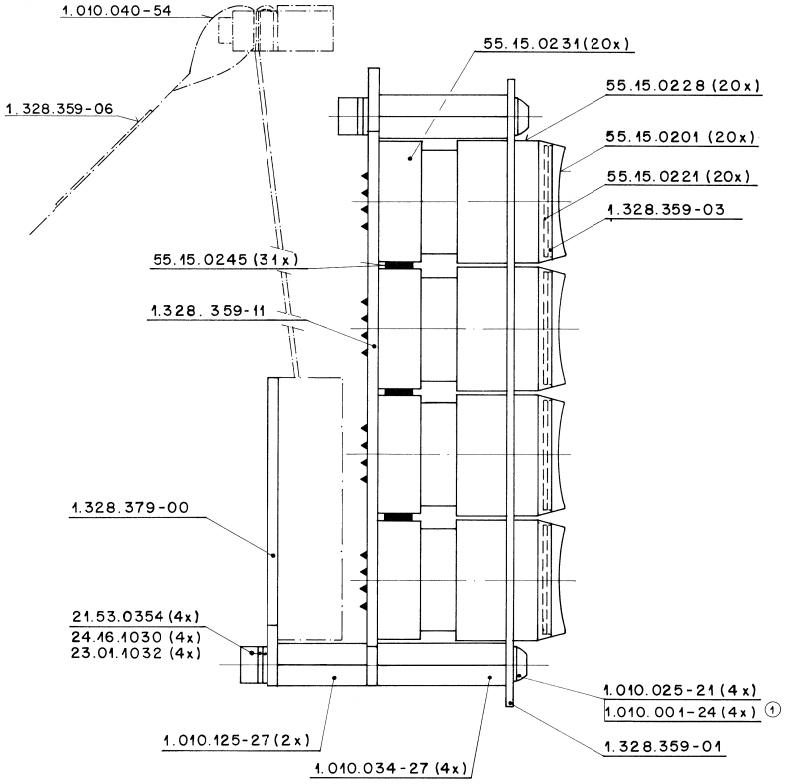
OPTIONAL KEYBOARD 1.328.359.00

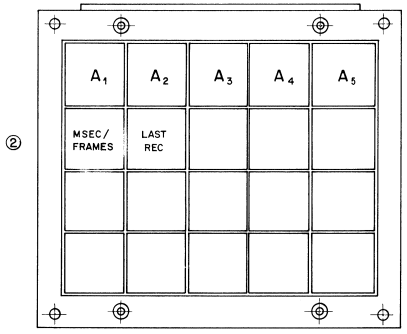


0 10.06.86	. .	. .	. .	. .
	SC 4016			PAGE 1 OF 1
STUDER	OPTIONAL KEYBOARD		SC	1.328.359.00

OPTIONAL KEYBOARD 1.328.359.00



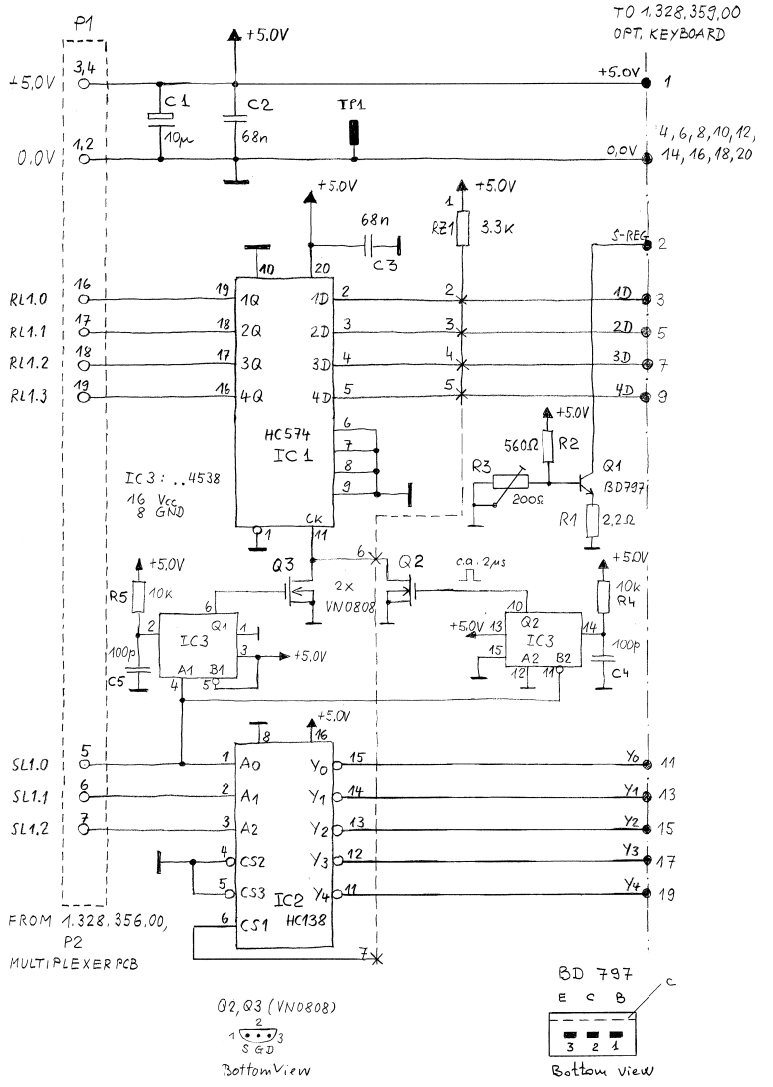




② M 1:1

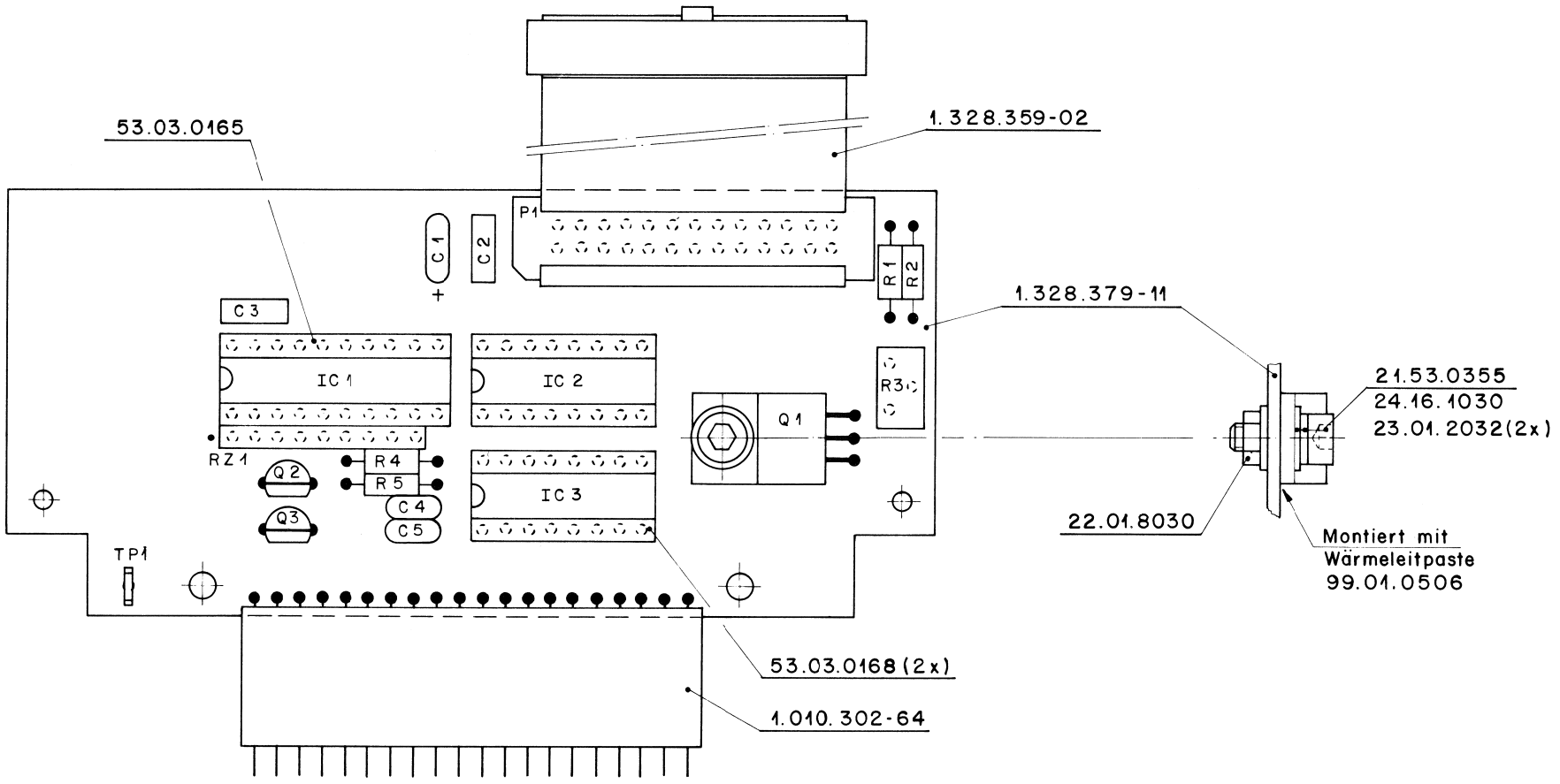
Schilder 1.328.359-04 / 1.328.359-06
aufgeklebt nach Fabrikationsmuster

OPTIONAL KEYBOARD INTERFACE 1.328.379.00



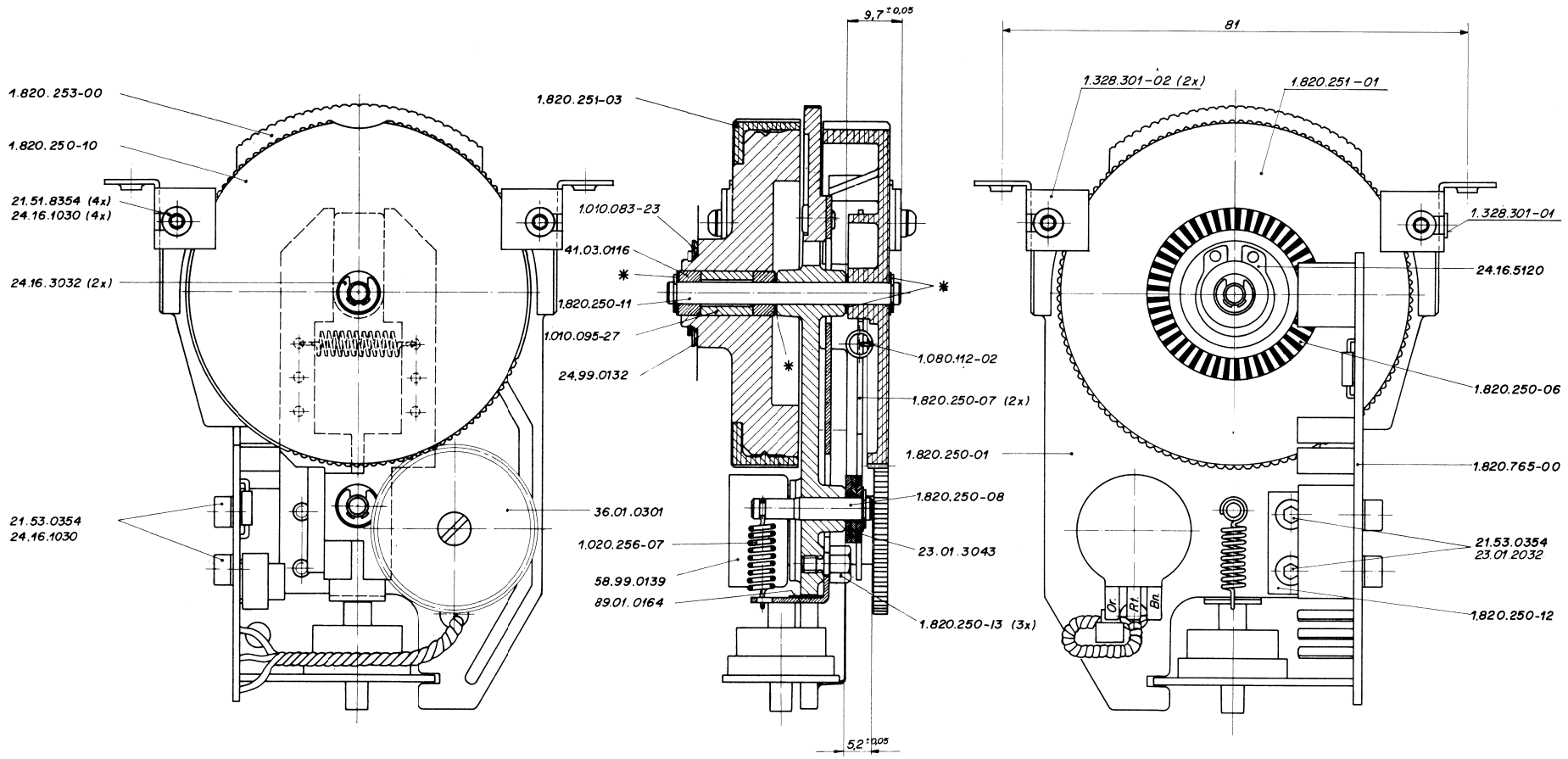
0 10.06.86				
	SC 4016			PAGE 1 OF 1
STUDER	OPTIONAL KEYBOARD INTERFACE	SC	1.328.379.00	

OPTIONAL KEYBOARD INTERFACE 1.328.379.00



Schilder 1.328.379-01/ 43.01.0108
aufgeklebt nach Fabrikationsmuster

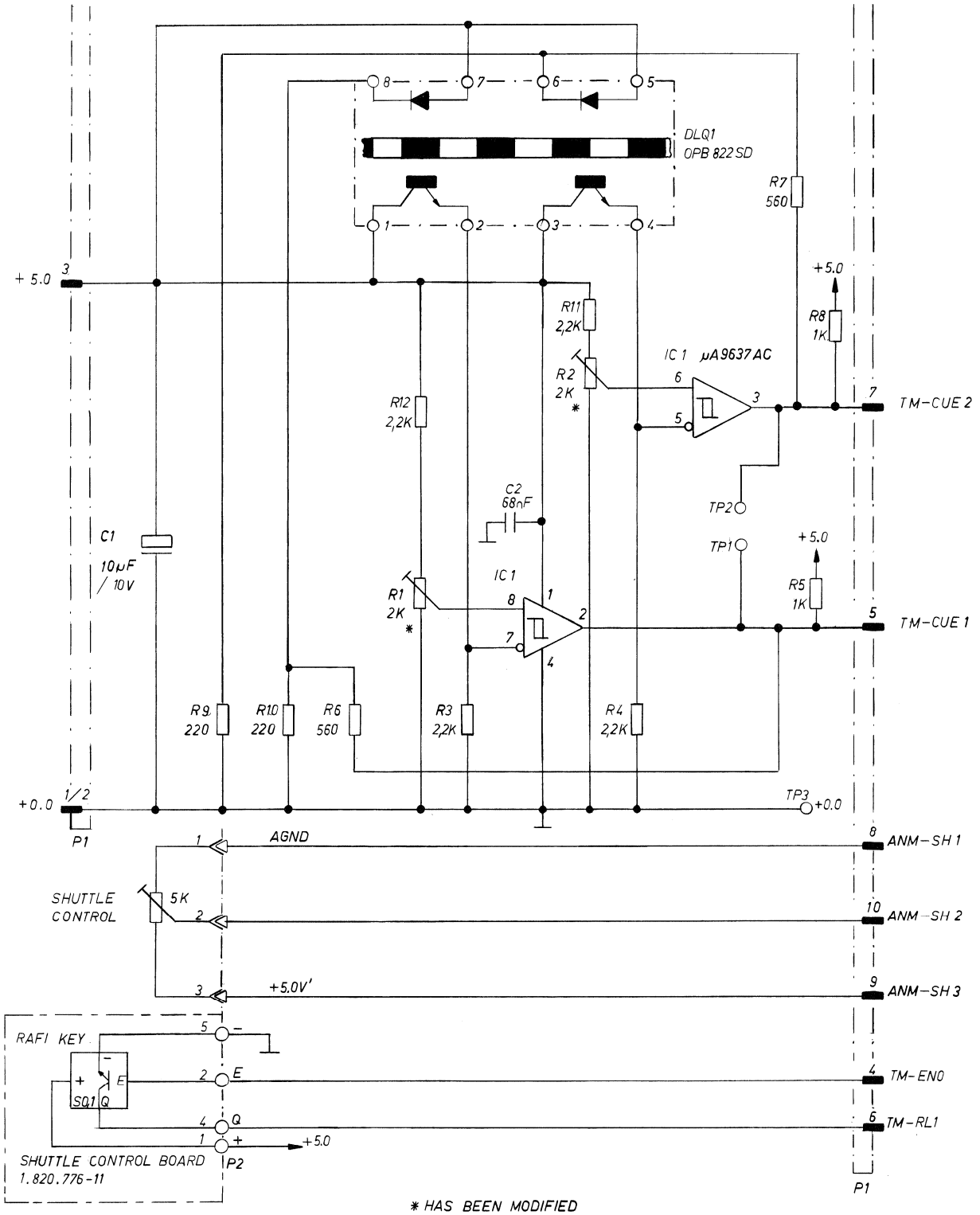
EDIT AGGREGAT 1.328.301.00



*
1.067.180-14
1.062.210-08
1.062.210-09

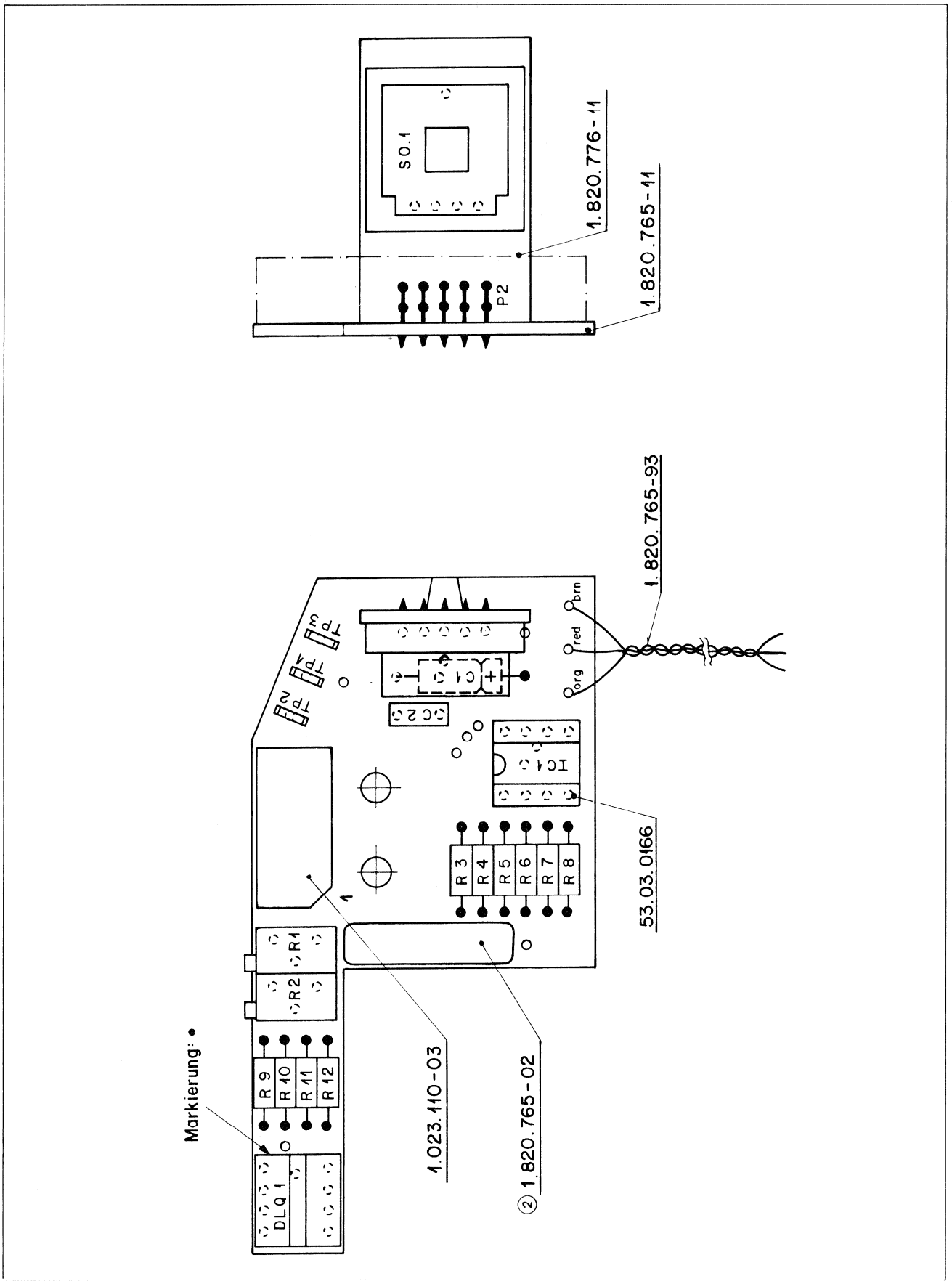
Spiel 0,03 ÷ 0,05mm
mit Scheiben einstellen

CUE SENSOR BOARD 1.820.765.00

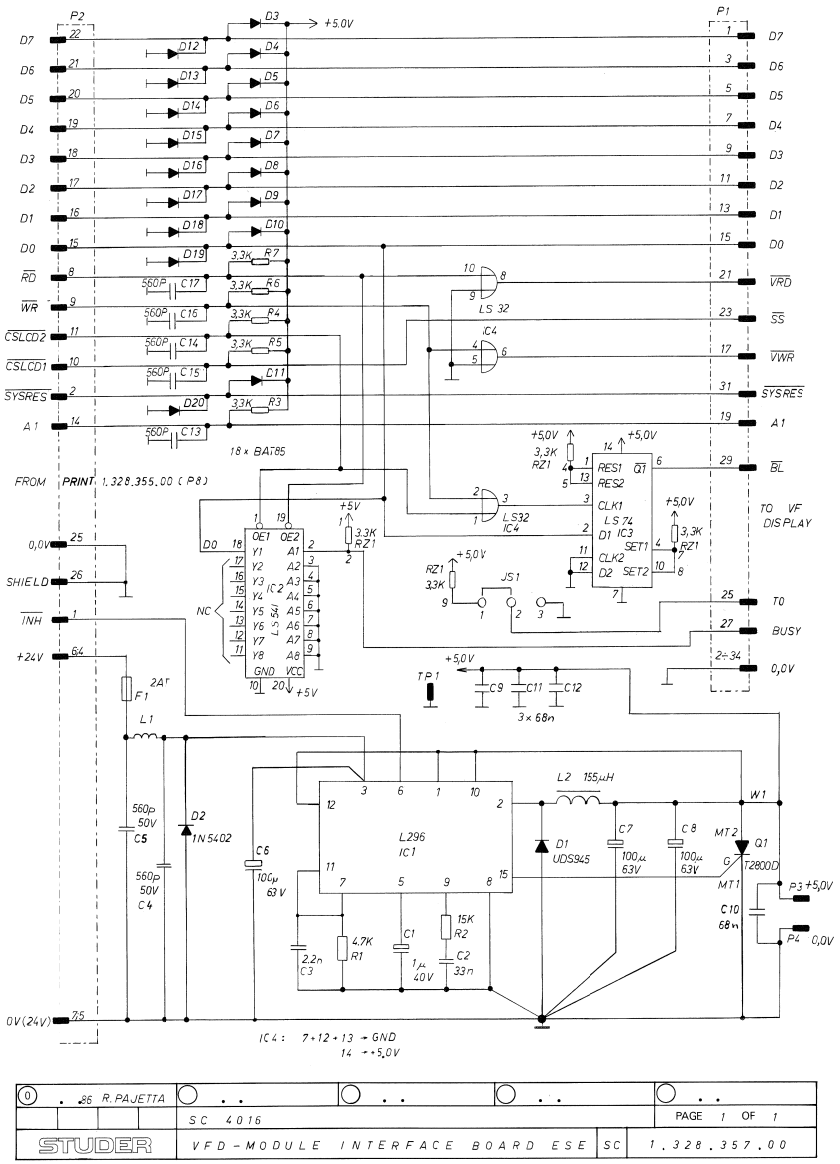
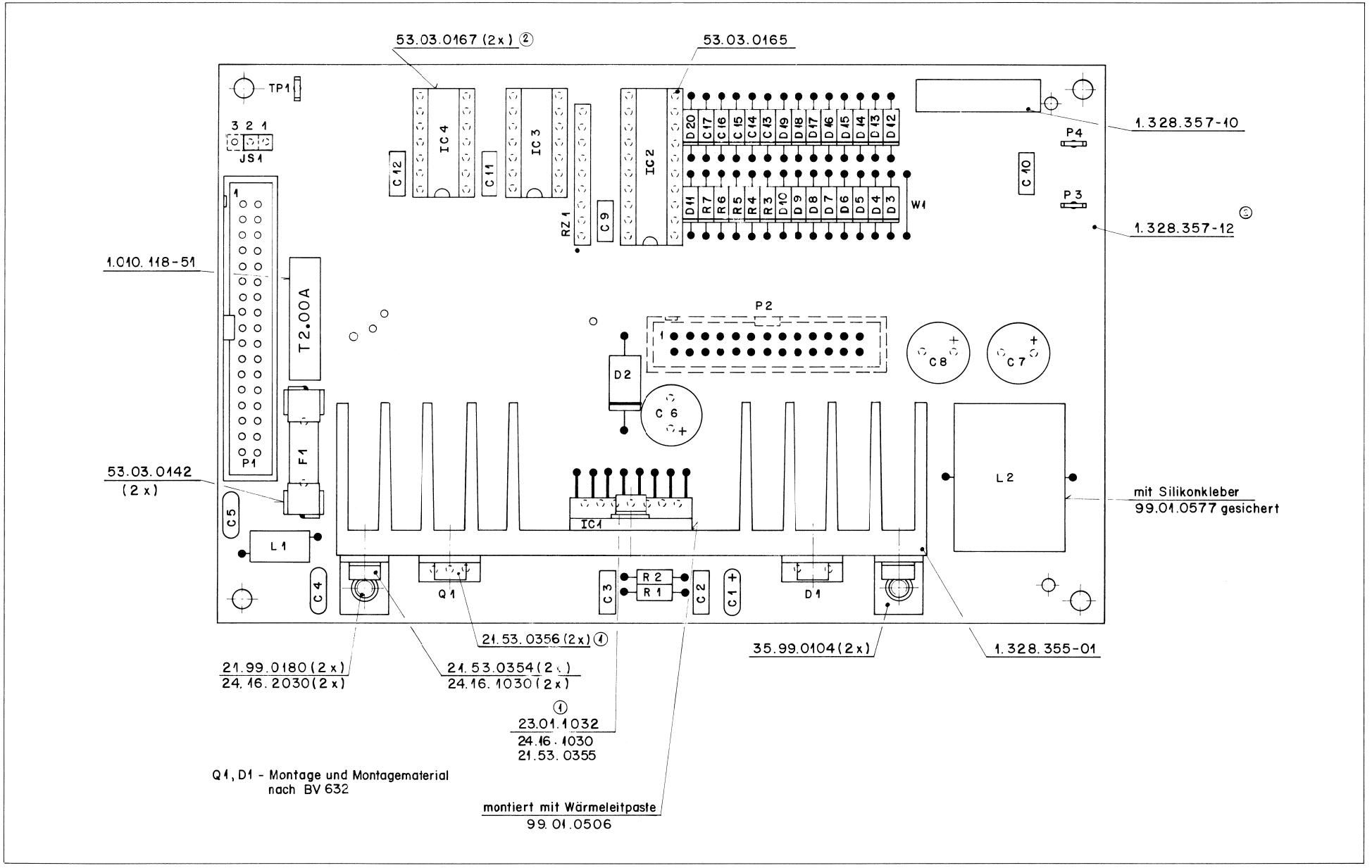


0 4.12.84 CHE	1 21.01.85 CHE	A 820 Command Section		
STUDER	Cue sensor board	SC	1.820.765-00	PAGE 1 OF 1

CUE SENSOR BOARD 1.820.765.00



VFD MODULE INTERFACE BOARD 1.328.357.00



VFD MODULE INTERFACE BOARD 1.328.357.00