SERVICE MANUAL

for the

KODAK EKTAPRO Slide Projector

Model 4020, 5020, 7020, 9020, (9020/CINE)

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ELECTROSTATIC DISCHARGE

CAUTION

This equipment includes parts and assemblies sensitive to damage from electrostatic discharge. Use caution to prevent damage during all service procedures.

Overview

Electrostatic discharge (ESD) is a primary source of

- product downtime
- lost productivity
- costly repair.

While we cannot feel a static charge of less than 3,500 volts, as few as 30 volts can damage or destroy essential components in the electronic equipment. As technology advances, these components will be even more vulnerable to ESD destruction.

Therefore, to maintain and increase productivity and profitability, you must observe ESD guidelines.

Effective ESD control requires the following things.

Awareness

Everyone in your organization should be aware of ESD because partial ESD control is no ESD control at all. Everyone needs to remember that:

- ESD is a primary source of equipment failures and intermittent malfunctions.
- ESD affects productivity and profitability.
- ESD can be controlled.

Action

Everyone from senior management to the evening security crew, must observe ESD guidelines.

- If you repair and maintain electronic equipment, always wear grounding straps and work at ESD protected sites.
- If you work around electronic equipment, keep static generators like plastic trash bags away from sensitive components.
- Observe ESD guidelines everyday. (See the following sections for special tips).
- Remember, effective ESD control is everyone’s responsibility:
Every Day

1. Keep trash away from static-sensitive equipment. Plastic materials, such as trash can liners and plastic foam cups, generate the static electricity that damages or destroys electronic components.

2. Look at the label. Static-sensitive components are marked with bright graphic labels. Follow the label directions.

3. Spray the carpet. ESD that is generated when you walk over carpet is a major cause of component destruction. In some cases, especially in low-humidity environments, you may need to periodically spray carpets with an anti-static spray that is available at local stores.

During Maintenance and Repair

1. Wear a grounding strap when you work with static-sensitive components. Always make certain that the clip is attached to a properly grounded, unpainted surface.

2. Use a portable grounding mat if you cannot repair components at an ESD-protected workstation. (Kodak’s Customer Equipment Services Division can help you in set up ESD-protected workstations.)

3. Use protective packaging when you transport components from one area to another. Transparent antistatic bags, available from a variety of manufacturers, shield the components from further damage.
1. GENERAL INFORMATION

Service Tools

Use the following tools to repair a KODAK EKTAPRO Slide Projector:

TORX Screw Driver size 206
TORX Screw Driver size 210
TORX Screw Driver size 215 or TORX bits TL-3255
TORX Screw Driver size 220

Logic Probe TTL/CMOS

Oscilloscope - only for checks on the AUTO FOCUS PCB.

Digital Multimeter

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage</td>
<td>5 to 240 V AC</td>
</tr>
<tr>
<td></td>
<td>0 to  50 V DC</td>
</tr>
<tr>
<td>Current</td>
<td>1 to 100 mA DC</td>
</tr>
<tr>
<td></td>
<td>0,1 to 2  A DC</td>
</tr>
<tr>
<td></td>
<td>0,1 to 5  A AC</td>
</tr>
<tr>
<td>Accuracy</td>
<td>1%</td>
</tr>
<tr>
<td>Accuracy RMS</td>
<td>1%</td>
</tr>
</tbody>
</table>

The multimeter should have RMS capability

Fixture Tool 622 0454

For Models 4020/5020/7020/9020/9020/CINE

PLCC Extractor Tool TL-4430
Service Computer 100% IBM compatible

Hard disk
CGA/EGA/VGA Monitor/Display
1 RS 232 Serial Interface
1 Centronics Printer Interface
1 720kB Floppy Disk Drive
1 9pin Serial Interface CORD

Diagnostic Software: TL-4575

Ejector Microcontroller G 990 3250
Safety Precaution

1. Do not operate or repair the projector without proper accessories. Add all COVERS before use to prevent mechanical hazards and electrical shock.

2. Before operating the projector, check the VOLTAGE SELECTOR. Make sure that the correct line voltage is selected.

3. Do not use a damaged POWER CORD. The damaged CORD can cause malfunctions and current leakage or electrical shock.

4. If there is any abnormal noise, smell or smoke during operation, deenergize the projector immediately and contact authorized personal for support.

5. Do not operate the projector in unsafe locations such as outdoors or in wet places. Do not allow liquids, gaseous or solid-state materials to enter the projector.

6. When doing electrical measurements, use an isolation transformer or a leakage current detector in the power line to avoid an electrical shock.

7. Use only original parts from the Parts List to repair the projector.

8. Make sure that the requirements of UL 122 - Splices and Connection - paragraph 13.10 and EN 60 950, section 4.39 are observed. When replacing AC primary components, such as wires, sockets or capacitors, wrap the ends of the wire completely around the terminal before soldering.
Safety Check

NOTE

Check the area around the repaired location.

Make sure that parts and wires have been returned to the correct positions.

Completely assemble the projector before doing an electrical safety test.

The safety tests:

Ground Continuity Test
Insulation Resistance Test
Equivalent Leakage Current Test

Use a safety tester that measures all 3 tests at one time.
Such a test device would be a Mini Tester 0701 N (Manufacturer: Gossen, Germany) or an equivalent device.

Details for safety standards can be found in the regulations:

IEC 380, 435, 950,
UL 478, 1012.

Prerequisites for measurements:

- The projector is energized
- FUSE with VOLTAGE SELECTOR insert
- COVERS in place
- LAMP MODULE installed

Test values for Mini Tester 0701N

- Ground Continuity Test ......< 300 mOHM
- Insulation Resistance Test ......< = 0,5 OHM
- Equivalent Leakage Current ......< = 7 mA

Interfaces

Models 7020 and 9020 have an accessory slot. The 7/12pin module from Kodak is safety tested, and has approval from VDE and other institutions. If an OEM module is installed, inform the customer:

- the OEM is responsible for the safety and function of the module.
- the module is not part of the repair order.
- the specifications and safety warnings for the accessory in the slot are found in the “Operator’s Manual”.

Kodak AG, Stuttgart
2. INTRODUCTION

The Kodak EKTAPRO Slide Projector series is a new family of Projectors that uses the latest mechanical and electronic technology.

The Projector is modular designed, and equipped with a modern 1-chip MICROCONTROLLER, STEPPER MOTORS, optical sensors, and digital and analog circuits. All functions and displays are controlled by the MICROCONTROLLER software.

Four models with different features and functions are available worldwide top 2 models can be attached to the old CAROUSEL and EKTAGRAPHIC family processors with optional ADAPTERS in the accessory slot. This new feature allows the future use of other equipment manufacturers Projector systems and accessories.

The Models 4020, 5020, 7020 and 9020 are equipped with an RS 232 interface (P-Bus). This bus allows communication with a computer and multi Projector shows in a new way. The P-Bus can also be used for Service Diagnostics.

The total amount of slide cycles for the models 7020 and 9020 can be read out with the Diagnostic Software TL-4575 (“SYSTEM REPORT” menu).

The modular design, the LAMP MODULE and the accessory slot for special MODULE’s are needed to adapt the Projector to future applications.

All models can be operated with 80 and 140 slide trays.

Compliance with international safety regulations has been approved.

All models are available in two versions:

a) for 120/220/230/240 V, 50/60 Hz

b) for 100/220V 50/60 Hz (Japan)
# Projector Models

## EKTAPRO Model 4020

![Projector Model 4020 Diagram](image)

## Features and Functions:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line voltages</td>
<td>120/220/230/240V or 100/220VAC can be select with an external VOLTAGE SELECTOR</td>
</tr>
<tr>
<td>Line frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>380 W</td>
</tr>
<tr>
<td>Dual Lamp Module</td>
<td>Extra Bright:</td>
</tr>
<tr>
<td></td>
<td>35h EXR 82V/300 W</td>
</tr>
<tr>
<td></td>
<td>70h FHS 82V/300W</td>
</tr>
<tr>
<td></td>
<td>200h EXY 82V/250W</td>
</tr>
<tr>
<td>Slide change time</td>
<td>approx. 0.9s (single step)</td>
</tr>
<tr>
<td></td>
<td>approx. up to 3s (random access)</td>
</tr>
<tr>
<td>Focus</td>
<td>Manual and electrically</td>
</tr>
<tr>
<td>Standby function</td>
<td>If the standby mode is activated the Keyboard will be disabled</td>
</tr>
<tr>
<td>Economy LAMP setting</td>
<td>75% light output</td>
</tr>
<tr>
<td>No SLIDE No LIGHT function</td>
<td>Using an IR REMOTE CONTROL the keycode 550* will disable this function, enter of the same keycode enables this function again</td>
</tr>
<tr>
<td>Slide Tray capability</td>
<td>80/140 slides</td>
</tr>
<tr>
<td>Slide Tray Switch</td>
<td>After changing the switch position the Projector is running automatically through a initialization procedure</td>
</tr>
</tbody>
</table>
# EKTAPRO Model 4020

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable Tray Motion</td>
<td>Tool PN 622 0454 has to be used on Projectors from SN 85 xxx and above</td>
</tr>
<tr>
<td>Manual elevator mechanism</td>
<td>Two height adjustment feet are attached on the front side of the Projector</td>
</tr>
<tr>
<td>Indicator LED on front</td>
<td>LED continuously on Projector O.K. If the LED is blinking fast, a slide jam occurs. In standby mode the LED is blinking short off and long on. If the LED is blinking continuously (on/off), a checksum error occurs (only during programming the processor)</td>
</tr>
<tr>
<td>Remote SOCKET</td>
<td>8 pin mini DIN</td>
</tr>
<tr>
<td>Slide change buttons</td>
<td>A single step will happen after pressing the “Forward” or the “Reverse” button less than 0.9s. Multiple steps will be done by pressing the “Forward” button more than 0.9s. A run into the “Zero” position will immediately be done after press and hold the “Reverse” button until the Slide Tray is in “Zero” position.</td>
</tr>
<tr>
<td>Last Lamp used</td>
<td>After switching on the Projector, the last used lamp will be selected (memory function). This memory function can be disabled by pressing the STANDBY button during switching on the projector.</td>
</tr>
<tr>
<td>Line up</td>
<td>Pressing both transport keys will enable the lamp to adjust the projector (green LED on the Backpanel is blinking). The Standby key will disable this function.</td>
</tr>
</tbody>
</table>

## NEW

In case of using an IR Remote Control, single steps are possible, independent of how long the button is pressed. By pressing the “Reverse” button on the IR Remote Control, random access is possible.

To select the Slide Tray capacity (80 or 140 slides), a ball point pen or a small screwdriver has to be used.

The Lamp Module no longer has a Heat Absorbing Glass installed. Due to the new mirror, the light output is increased up to 30%.

## NOTE

In case of changing the mirror, take care of the type (see NEWSLETTER #4).
EKTAPRO Model 5020

Features and Functions:

All features and functions of Model 4020

Additional:

AUTO FOCUS : Each slide will be focused, independent of the slide mount
Timer : Slide change can be set from 1 up to 60 sec.
EKTAPRO Model 7020

Features and Functions:

All features and functions as Model 4020.

Additional features:

- Application Slot: for Kodak and OEM ADAPTERS
- Bus CONNECTORS (RS232): IN (female) and OUT (male)
- Address Switch: 16 addresses can be selected
- Initializing procedure: After power on the Projector the SLIDE LIFTER and the RING DRIVE will be checked, the LAMP and the FAN will be switched off
- High Light: 20% more light output, lamp life time approx. 30% reduced

NEW (only on Models 7020/9020)

If the parallel Mode "970*" is set on the IR Remote Control it is possible to toggle with "666*" between two projectors to control the focus functions. These functions are only visible on the screen.
EKTAPRO Model 9020

Features and Functions:

This multi purpose Projector has all of the features of the EKTAPRO 7020.

Additional features include:

- AUTO-ZERO function: When the Projector senses an empty, gate the Projector automatically returns the tray to zero and begins the projection cycle again. This function can be deenergized.
- Timer: Slide change can be set from 1 up to 60 sec.
- AUTO FOCUS: Same as in EKTAPRO 5020
- High Light: 20% more light output, lamp life time approx. 30% reduced

**NOTE (new Model EKTAPRO 920/CINE)**

For special applications (cinema promotion) the Model EKTAPRO 920/CINE is available. This model has a build in memory function which knows the last projected slide after switching off the projector.

Switching the projector on again the slide tray will run into that position after the initialization procedure.

If the timer is switched on at that time a soft dissolve will be started immediately.

New parts (NAMEPLATE and MICROCONTROLLER) see Illustrated parts list.
# Overview

<table>
<thead>
<tr>
<th>FUNCTIONS/ACCESSORIES</th>
<th>4020</th>
<th>5020</th>
<th>7020</th>
<th>9020</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUAL LAMP MODULE (Extra BRIGHT)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>TIMER</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>AUTO-ZERO</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>ADDRESS SWITCH</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>APPLICATION SLOT</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>AUTO FOCUS</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>PRESENTATION BUS “IN”</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>PRESENTATION BUS “OUT”</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>RANDOM ACCESS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>EXTERNAL DIAGNOSTICS</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>12/7-PIN MODULE</td>
<td>-</td>
<td>-</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>SLIDE SYNCHRONIZER (1000Hz)</td>
<td>-</td>
<td>-</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>TWIN SOCKET</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>CABLE REMOTE</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>IR REMOTE SYSTEM RA</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>IR REMOTE SYSTEM RA/LP</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

X = Standard Feature  O = Accessory  - = not possible
**Accessories**

**DUAL LAMP MODULE**

CAT No. 718 4369

**CABLE REMOTE**

CAT No. 712 1080

**HEAT ABSORBING GLASS with CLIP**

(not installed in Model 3020)

CAT No. 717 7140 (6mm thick)
CAT No. 717 7157 (3mm thick)

see NEWSLETTER #3/MAY/1996 page 5
CONDENSER KIT 4X4 (with CLIP)

CAT No. 714 4967

IR REMOTE System RA (with Random Access)
CAT No. 712 1072
complete with RECEIVER and TRANSMITTER

RECEIVER

TRANSMITTER
IR REMOTE System RA/LP (Laser Pointer)

CAT No. 712 1064 complete with RECEIVER

TRANSMITTER

RECEIVER as use with IR REMOTE System RA.

12/7-PIN MODULE

CAT No. 712 5875

LENS SUPPORT

CAT No. 715 1335
12/7-PIN ADAPTER CABLE

CAT No. 712 5883

TWIN SOCKET ADAPTER

CAT No. 712 5909
see NEWSLETTER #3/MAY/1996 page 7
SLIDE SYNCHRONIZER

CAT No. 712 5891 (not available)

see page 16 OEM ACCESSORIES

LAMPS

<table>
<thead>
<tr>
<th>Catalog No.</th>
<th>Description</th>
<th>Lifetime</th>
</tr>
</thead>
<tbody>
<tr>
<td>145 2259</td>
<td>EXR 82V/300 W</td>
<td>life time about 35 hours</td>
</tr>
<tr>
<td>147 7678</td>
<td>EHS 82V/300 W</td>
<td>life time about 70 hours</td>
</tr>
<tr>
<td>145 2143</td>
<td>EXY 82V/250 W</td>
<td>life time about 200 hours</td>
</tr>
</tbody>
</table>
Specification

Electrical Supply : 120/220/230/240 V
: or 100/220 V
: 50/60 Hz
Power Consumption : 380 W
Dimensions : 310 x 355 x 145 mm max. (l/w/h) with tray and lens
: (12.2 x 14 x 5.7 in)
Weight : 6300 g (13.9 lb)
Slide size : 24 x 36 mm (0.9 x 1.4 in)
Slide change time : <0.8 s
Slide search time : <3 s
Slide temperature : 50°C (104°F) max. above room temperature
LAMP (standard) : EXR 82V/300W
Automatic LAMP change : 0.3 s
Operating temperature : 0°C to 40°C (32°F to 113°F)
Humidity : 20 to 85% r.H.
Air consumption : approx. 700 l/min. (20,000 cuft/min.)
Approvals : VDE, UL , CSA
Leveling : 0° to 18° with internal elevation mechanism 30° max. allowed

CONNECTORS

Remote SOCKET on Projector:

<table>
<thead>
<tr>
<th>PIN No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12 VDC</td>
</tr>
<tr>
<td>2</td>
<td>Gnd</td>
</tr>
<tr>
<td>3</td>
<td>Signal 1 (LSB)</td>
</tr>
<tr>
<td>4</td>
<td>Signal 2</td>
</tr>
<tr>
<td>5</td>
<td>Signal 3</td>
</tr>
<tr>
<td>6</td>
<td>Signal 4</td>
</tr>
<tr>
<td>7</td>
<td>Signal 5 (MSB)</td>
</tr>
<tr>
<td>8</td>
<td>Interrupt</td>
</tr>
</tbody>
</table>

12 V DC = average value between 7.2 and 14.5 V DC
P-Bus / RS 232 “IN”

<table>
<thead>
<tr>
<th>PIN No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connected to 4 and 6</td>
</tr>
<tr>
<td>2</td>
<td>Receive Data (RxD)</td>
</tr>
<tr>
<td>3</td>
<td>Transmit Data (TxD)</td>
</tr>
<tr>
<td>4</td>
<td>Connected to 1 and 6</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>Connected to 1 and 4</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
</tr>
</tbody>
</table>

D–SUB 9-pin connector female

(viewsed from front)

figure 2-17

P-Bus / RS 232 “OUT”

<table>
<thead>
<tr>
<th>PIN No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connected to 4 and 6</td>
</tr>
<tr>
<td>2</td>
<td>Transmit Data (TxD)</td>
</tr>
<tr>
<td>3</td>
<td>Receive Data (RxD)</td>
</tr>
<tr>
<td>4</td>
<td>Connected to 1 and 6</td>
</tr>
<tr>
<td>5</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>6</td>
<td>Connected to 1 and 4</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>-</td>
</tr>
</tbody>
</table>

D–SUB 9-pin connector male

(viewsed from front)

figure 2-18
<table>
<thead>
<tr>
<th>PIN No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>a 1</td>
<td>SDA (I^2C Data)</td>
</tr>
<tr>
<td>a 2</td>
<td>I^2C_INT (Interrupt)</td>
</tr>
<tr>
<td>a 3</td>
<td>SLOT_232_R, TTL Level</td>
</tr>
<tr>
<td>a 4</td>
<td>not used</td>
</tr>
<tr>
<td>a 5</td>
<td>SLOT_A</td>
</tr>
<tr>
<td>a 6</td>
<td>SLOT_C</td>
</tr>
<tr>
<td>a 7</td>
<td>not used</td>
</tr>
<tr>
<td>a 8</td>
<td>12V DC 200mA max.</td>
</tr>
<tr>
<td>a 9</td>
<td>34V DC 750mA max.</td>
</tr>
<tr>
<td>a 10</td>
<td>26V AC_N 750mA max.</td>
</tr>
<tr>
<td>b 1</td>
<td>SLC (I^2C Clock)</td>
</tr>
<tr>
<td>b 2</td>
<td>PLL_DISS</td>
</tr>
<tr>
<td>b 3</td>
<td>SLOT_232_T (TTL-Level)</td>
</tr>
<tr>
<td>b 4</td>
<td>SLOT_DIS</td>
</tr>
<tr>
<td>b 5</td>
<td>SLOT_B</td>
</tr>
<tr>
<td>b 6</td>
<td>SL_DISS</td>
</tr>
<tr>
<td>b 7</td>
<td>not used</td>
</tr>
<tr>
<td>b 8</td>
<td>VSS 12 (Ground)</td>
</tr>
<tr>
<td>b 9</td>
<td>VSS 34 (Ground)</td>
</tr>
<tr>
<td>b 10</td>
<td>26V AC_L</td>
</tr>
</tbody>
</table>
OEM ACCESSORIES

COPYRIGHT

The adapter of this English company is only designed to use traditional AV cassette recorders. Cue pulses recorded on the tape trigger the interface unit to generate digital commands to advance the EKTAPRO Projector. It is an interesting feature that the adapter works either by plugging directly into the remote socket or works remotely by additional use of the EKTAPRO IR Receiver. In this case the system can simultaneously used with both the EKTAPRO IR Transmitter and the adapter. The adapter is powered by a 9 volt A PP3 battery.

The illustration (figure 2-20) shows both possibilities to run the Projectors.

IR-USE.
The advantage is that the Adapter and Projector can be separated. In addition, the use of the EKTAPRO Remote Transmitter is possible without disconnecting the Adapter.

CABLE USE
If no IR receiver is available the Adapter can be plugged with the fixed installed cable to the remote socket.
SLIDE SYNCHRONIZER ADAPTER by KODAK AUSTRALIA

Kodak Australia offers an own solution of a slide synchronizer adapter. This unit is built in the IR Receiver housing and is therefore directly to be plugged onto the remote socket. A 6pin socket is built into the housing. The system supports most of traditional AV cassette recorders. The S-AV cable remote can also be used with the possibility to give transport commands and to focus. Speaker desk (lecterns) installations can be fully used. The system is able to switch the Projector into the standby mode (press forward and reverse button simultaneously) or run to the Projector to the zero position (press and hold down forward and reverse button).

NOTE

The S-AV Timer does not work on this adapter!
**ADAPTER by MÜWO**

The German company offers a slide synchronizer adapter which is built into the EKTAPRO Cable Remote Control. A 6pin socket provides connection with external devices which are traditional AV cassette recorders, S-AV Timer and speaker desks. Even if any devices are connected, the remote still works.

---

**figure 2-22**
**ADAPTERS by MAYER & ZELLER**

The Swiss company Mayer & Zeller offers a 1000 Hz adapter which comes along in a small black plastic box with a standard 6pin female receptacle and an integrated cable with the new 8pin male connector for the EKTAPRO Projectors.

The adapter offers the possibility either to connect a traditional AV cassette recorder to advance the Projector or to connect the standard cable S-AV remote control or to use the cable already installed in the speakers desks.

The adapter is also offered in a special version which also enables the control of the focus via the remote control (or speakers desks).

![Diagram showing connection between S-AV Cable Remote Control and Professional AV Cassette Recorder](image)

**NOTE**

The S-AV Timer cannot be used because of the lack of a support voltage. But Mayer & Zeller offers a special Timer for controlling the EKTAPRO Projectors. The timer is built into the EKTAPRO Cable Remote Control. This a quite sophisticated solution and an interesting offer for those who intend buying a cable remote.

For further details contact the company.
ADDRESSES

CONTROL SYSTEMS

- ARION 701 South 7th Street Delano, MN 55328 USA
  Tel: (001) 612 972 3351
  Fax: (001) 612 972 3524

- Bässgen AV Technik GmbH Hauptstraße 58, 79104 Freiburg Germany
  Tel: (0049) 761 23953
  Fax: (0049) 761 35042

- Copyright Machines Limited 44/46 Sillwood Street Brighton, Sussex BN1 2PS UK
  Tel: (0044) 273 720 175
  Fax: (0044) 273 321 150

- Dataton AB Box 257 S-581 02 Linköping Schweden
  Tel: (0046) 131 14325
  Fax: (0046) 131 38445

- HEP Holland P.O.B. 33112, 3005 EC Rotterdam Niederlande
  Tel: (0031) 10 418 3689

- Mechanische Weberei GmbH Neuhäuser Weg 2, 33175 Bad Lippspringe Germany
  Tel: (0049) 52 522 70
  Fax: (0049) 52 522 7201

- Müwo electronic In den Maltwiesen 11, 72379 Hechingen-Stetten Germany
  Tel: (0049) 7471 15830

- RMF Products Inc. P.O.B. 520, 1275 Paramount PKWY Batavia II, 60510 USA
  Tel: (001) 708 879 0020
  Fax: (001) 708 879 6749

- Stumpfl Rudigierstraße 8, A-4701 Bad Schallerbach Austria
  Tel: (0043) 7249 2811
  Fax: (0043) 7249 2811 18

- Zygo Systems Limited 48 Fallowfields Bicester Oxon OX67Qs UK
  Tel: (0044) 869 248 261
  Fax: (0044) 869 248 260
SOFTWARE for direct PC CONTROL

- ARION 701 South 7th Street Delano, MN 55328 USA
  Tel: (001) 612 972 3351
  Fax: (001) 612 972 3524

- AVC Team Bieber Am Holling 3, 35649 Bischoffen Germany
  Tel: (0049) 6444 1027
  Fax: (0049) 6444 8527

- Martin Ballein Viktor Scheffel Straße 2, 74076 Heilbronn Germany
  Tel: (0049) 7131 165170
  Fax: (0049) 7131 52470

- Hilger & Bremen GbR Heinzenstraße 20, 52062 Aachen Germany
  Tel: (0049) 241 49797
  Fax: (0049) 241 49787

- Holidays Afloat Limited Schachterij 9920 Lovendegem Belgium
  Tel: (0032) 9372 8908
  Fax: (0032) 9233 5609

- Stumpf Rudigierstraße 8, A-4701 Bad Schallerbach Austria
  Tel: (0043) 7249 2811
  Fax: (0043) 7249 2811 18

- Peter Ziegler Van Gogh Platz 6, 53844 Troisdorf Germany
  Tel: (0049) 2241 46143

RACKS

- Chief Manufacturing Inc. 14310 Ewing Avenue South Burnsville MN 55337 USA

- Roha Projektionstechnik Bruno Jacoby Weg 11, 70597 Stuttgart Germany
  Tel: (0049) 711 723 621
  Fax: (0049) 711 23699

EXTERNAL TIMER

- Mayer & Zeller Wettsteinallee 15, 4058 Basel Switzerland
  Tel: (0041) 61681 4343
  Fax: (0041) 61681 3907

- Müwo electronic In den Maltwiesen 11, 72379 Hechingen-Stetten Germany
  Tel: (0049) 7471 15830

- Wintron GmbH Egilolfstraße 70, 70599 Stuttgart Germany
  Tel: (0049) 711 4567 258
  Fax: (0049) 711 4567 267
3. THEORY GUIDE

Block Diagram

All functions of the projector are controlled by the MICROCONTROLLER (MC68HC016B with 16k ROM) on the MASTER PCB.

The controlling software is loaded in the 16k ROM of the MICROCONTROLLER for Models 4020 - 9020 and 9020/CINE.

Located around the MICROCONTROLLER on the MASTER PCB there are the inputs, outputs and drivers for the sensors, LAMP, MOTOR’s and other functions.

The block diagram (figure 3-1) shows all of the functions of Model 7020 and 9020.

All model is equipped with the same MASTER PCB’s.

<table>
<thead>
<tr>
<th>MODEL</th>
<th>MASTERBOARD</th>
<th>MICROCONTROLLER</th>
</tr>
</thead>
<tbody>
<tr>
<td>4020</td>
<td>LAYOUT No.7</td>
<td>Version 4.8</td>
</tr>
<tr>
<td>5020</td>
<td>LAYOUT No.7</td>
<td>Version 4.8</td>
</tr>
<tr>
<td>7020</td>
<td>LAYOUT No.7</td>
<td>Version 4.8</td>
</tr>
<tr>
<td>9020</td>
<td>LAYOUT No.7</td>
<td>Version 4.8</td>
</tr>
<tr>
<td>9020/CINE</td>
<td>LAYOUT No.7</td>
<td>Version 4.9</td>
</tr>
</tbody>
</table>
**Microcontroller Unit**

The main device on the MASTER PCB is the 16-bit MICROCONTROLLER unit MC68HC05B16 from *MOTORola* for the models EKTAPRO 4020 - 9020 and 9029/CINE.

This MICROCONTROLLER has a microprocessor, timer, memory, analog/ digital converter and input/output ports on one chip. Compared to a standard processor, where for each item a peripheral IC is necessary.

This MICROCONTROLLER with its on-chip software controls all functions of the projector plus peripheral circuits.

The main features of the MICROCONTROLLER are:

- 24 bi-directional I/O lines
- 8 input-only lines
- serial communication interface system
- 8 channel A/D converter
- 15120 Bytes ROM (Models 4020 - 9020 and 9029/CINE)
- 2 channel timer

The following block diagram shows the internal MICROCONTROLLER functions.

---

**figure 3-2**
Description of Functions

Power Supply

The PROJECTOR POWER SYSTEM consists of a

- POWER INPUT ASSEMBLY with POWER ON/OFF SWITCH, PRIMARY FUSE HOLDER and VOLTAGE SELECTOR
- TRANSFORMER, SECONDARY FUSE HOLDER
- POWER REGULATION PCB

The TRANSFORMER supplies the following voltages:

Primary voltage outputs:

92/81 VAC LAMP voltage for Models 4020 - 9020 and 9020/CINE (SOFTWARE CONTROLLED LAMP CURVE)

Safety Extra Low Voltage outputs:
10 VAC for +5V DC and +12V DC
26 VAC for 36 VDC regulated and unregulated,

The POWER REGULATION PCB contains:

- line EMI filter
- rectifiers and regulators
- Triac LAMP Software Control Circuits (Models 4020 - 9020 and 9020/CINE)

The output voltages and signal are:

- 36 VDC unstabilized (36 VDC_12P) for slot interface
- 36 VDC capacitor- stabilized (36 VDC) for MOTOR´s, solenoid, fan
- 12 VDC unregulated for remote control and slot
- 5 VDC regulated for logic and MICROCONTROLLER
- 26 VAC for accessory slot
- Zero_cross signal for synchronization of the dissolve feature

Details can be obtained from circuit diagrams and the following block diagram.

IMPORTANT

Connect all the equipment to the same same power line, otherwise phase shifting will bring up problems!
Switch On / Initialize Procedure

Projector Status: Mechanic position is not known
Projector is energized

The MICROCONTROLLER starts the initialization routine:
- load the look-up tables
- look at the accessory slot and projector address
- sets the ECONOMY LAMP RELAY to 82V
- completes a Hardware reset

SLIDE LIFT MOTOR rotates clockwise (max. of 805 steps = one SLIDE LIFTER cycle).

If SENSOR SIGNAL changes from not actuated to actuated, the SLIDE LIFTER is in up position.
Yes = Start tray MOTION.
No = Begin a failure routine, after it has advanced 805 steps without sensor signal change.

slide tray moves forward about 3,5 slides (with software version above 4.2).

Details about tray motion can be obtain from page 3-9.

If the ZERO SENSOR is not actuated, the tray reverses

If the ZERO SENSOR is not actuated, the slide tray continues to advance.

The SLIDE LIFT MOTOR moves clockwise.

When the CAM SENSOR changes from actuated to not actuated, the LIFTER is in the down position.

If the SLIDE IN GATE SENSOR is actuated, the SHUTTER opens.
Slide Change Sequence

Projector Status:
- SLIDE LIFTER down
- SHUTTER is open
- SLIDE is in GATE
- LAMP is energized

Start: "Forward"/"Reverse" BUTTON is pressed.
Signal from: P-Bus, Remote Control or Timer

The SHUTTER SOLENOID is deenergized.

The SLIDE LIFT MOTOR rotates clockwise to move the SLIDE LIFTER up (max. 805 steps = one SLIDE LIFTER cycle).

The SLIDE LIFTER is in the up position when the CAM SENSOR signal changes from not actuated to actuated.

If no: the failure routine begins after 805 steps a without signal change.
If yes: Starts the tray Motion. See page 3-10.

For details see page 3-10.

The SLIDE LIFT MOTOR moves clockwise to move SLIDE LIFTER down. The MOTOR stops when signal changes from actuated to not actuated.

When a TIMER is in use, a slide advance forward is done each time after the selected interval is reached (Model’s 4020, 7020 external timer, Model 5020, 9020 and 9020/CINE internal timer).

The slide is projected.
Tray Motion

The STEPPER MOTOR is responsible for the slide tray movement. To move the tray one slide forward or reverse 47 steps are necessary in case a tray for 80 slides is used and 27 steps in case a tray for 140 slides is used.

The tray movement is controlled by the TRAY MOTION CONTROL PCB. This PCB contains two optical sensors, one for the code wheel and one for the Zero Position Gear.

This PCB is sending following feedback signals to the MICROCONTROLLER:

- Tray motion direction (forward or reverse)
- One pulse for each step of the STEPPER MOTOR
- Tray zero-position signal in case the tray is in the zero position

If the STEPPER MOTOR moves one step, a pulse will be send back from the TRY MOTION PCB to the MICROCONTROLLER after the step is done.

If these pulses are missing, the MICROCONTROLLER assumes that the tray is not able move. The transport stops immediately. A failure code is written into memory, the projector do not operate, the power LED is blinking

The projector must be deenergized. The jam must be cleared. As soon as the problem is solved, the projector should operate after switching on again.

The DIRECTION + STEP SENSOR is a special optical device which generates two independent output signals:

- step pulses (count signal for the MICROCONTROLLER to calculate the tray position)
- direction signal (low signal for forward steps and high signal for reverse steps)
Tray Motion Sequence:

a) Go To Zero Position

1. **Zero Button**

   - Close Shutter, Autofocus off, Move Slide LIFTER in up position

   - Shortest distance to Zero?

   - Tray Motor On Forward
     - More than 4 Step Signals missed?
       - Yes
         - Transport Failure
       - No
         - Power LED Blinking
     - No
       - Zero Sensor actuated?
         - Yes
           - Stop Tray Motor Slide LIFTER Down
           - Set Tray Position to Zero
           - END
         - No
           - Tray Motor On Reverse
   - Projector Status: - Energized
   - Signal from: - P-Bus (Model’s 4020 and 5020 input only)
     - Auto Zero (Model 9020 and 9020/CINE)

   - The MICROCONTROLLER selects shortest distance to the zero position.

   - The TRAY MOTOR is energized.

   - The TRAY MOTION CONTROL delivers a step signal for each MOTOR step.

   - The ZERO SENSOR delivers a signal if the position is reached

   - Failure: A failure code is written into memory.
     - The power LED is blinking.

   - The position is reached. The TRAY POSITION in memory set to zero.
b) Go to next slide position

Projector Status: There is a slide in the gate and it is projected.

Start action: The forward or reverse BUTTON is actuated or next slide is selected with RANDOM ACCESS.

See Slide Change Sequence, page 3-7.

RANDOM ACCESS: The MICROCONTROLLER selects shortest distance to the next slide.

The MICROCONTROLLER energizes the TRAY MOTOR for 47 steps (80 tray) or 27 (140 tray) for each slide.

The MICROCONTROLLER checks feedback from tray MOTION CONTROL CIRCUIT. If more than 4 feedback pulses are missed, exit to the failure routine.

For RANDOM ACCESS: The TRAY MOTOR ON until the position is reached.

For FORWARD/REVERSE BUTTONS:
- tray moves only for one slide
- slide is projected
- if transport button is still pressed, a slide is lifted up and the tray moves until button is released but stops at the ZERO POSITION.

The MICROCONTROLLER sets the next position into memory.

The SLIDE LIFTER Down procedure starts.
For details, see Slide Change Sequence.
LAMP Control

a) Dual LAMP Operation

All Models are equipped with a DUAL LAMP MODULE (Extra Bright).

The POWER REGULATION PCB on all Models contains a LAMP current circuit that can detect if the active LAMP is on, indicated by a LED on the BACK PANEL.

If a LAMP fails, the MICROCONTROLLER receives the LAMP_CURR signal from the POWER REGULATION PCB. It activates the MIRROR MOTOR and moves the MIRROR to the second LAMP position. Then the relay K1 is energized and second LAMP is energized. The MICROCONTROLLER also energizes the LED for the second LAMP. The LED’s are located on the BACK PANEL.

The Models 4020 - 9020 and 9020/CINE have a memory. This memory is storing the current used lamp as long as the lamp is defective. That means the mirror of the DUAL LAMP MODULE do not change his position after a new lamp is inserted. This function can be disabled (see page 2-3).

The characteristic of the lamp curve is no longer generated by a PLL circuit on the MASTERBOARD. Up to now it is stored in the Software LAMP Control memory and the TRIAC will be triggered from the MICROCONTROLLER.
b) LAMP setting

Models 4020 - 9020 and 9020/CINE:

a) Through the LAMP SWITCH or P-Bus

The settings of the LAMP are change by using the LAMP dimming function through the TRIAC DISSOLVE LOGIC. The phase cut position for LOW is 75% of HIGH.

The LAMP supply voltage is 91 VAC only.

Resulting LAMP voltages:  
- Standard: 82V RMS
- Economy: 72V RMS

b) Via accessory slot

External units that are connected to the accessory slot cannot use the Standard/Economy LAMP setting with phase cut. Therefore, the LAMP supply voltage is switched with the ECONOMY SIGNAL and a relay to 82 VAC.

The functions of the STANDBY and Standard/Economy Buttons are disabled.

c) LAMP Protection

In the LAMP RETURN LINE on the POWER REGULATION PCB there is a small circuit that detects the actual LAMP current.

LAMPS can explode when they reach the end of their life. The melting filament can create a short circuit with a high current.

The high current is detected, and the LAMP is deenergized immediately by the TRIAC.

This procedure prevents the LAMP from exploding, and protects the TRIAC.

d) LAMP Voltage Control

All Models are equipped with a LAMP voltage regulation so that the LAMP voltage does not follow line voltage fluctuation. The 5V AC outlet of the POWER REGULATION PCB is used to create the VAC_Value signal on the MASTER PCB. This signal is fed to the MICROCONTROLLER (MC). The MC then selects a phase cut position of the LAMP voltage which results in a reasonable constant LAMP voltage. This function is disabled if an accessory is connected to the accessory slot. In this case the LAMP operates with 82 VAC.
e) Lamp Dimming

The LAMP DIMMING FUNCTION is installed in Model 4020 - 9020. It is used for dissolving for Economy and Standard LAMP settings. The main devices for dimming are the TRIAC, TRIAC CONTROL and Zero_Cross circuit on the POWER REGULATION PCB, the dissolve logic and the MICROCONTROLLER (MC) on the MASTER PCB.

The TRIAC FUNCTION is controlled by the MICROCONTROLLER and its software, it works according to phase cut principals.
The zero-cross circuit creates an impulse whenever the LAMP voltage crosses the zero line (LAMP voltage close to zero). See figure b.

Therefore, every 10ms for 50Hz or 8.3ms for 60Hz a signal change occurs. This signal is sent to the DISSOLVE LOGIC on the MASTER PCB. The DISSOLVE LOGIC generates a clock signal with 4096 pulses for the length of half a sine wave. This clock signal is triggered by the zero-cross signal. See figure c.

Through the DATA SIGNAL, the MICROCONTROLLER delivers a value between 3 and 3700 to the DISSOLVE LOGIC. Values of 0 to 4096 are possible, but these values would cause false phase cut positions because the zero-cross signal does not detect zero on the sine wave.

At the next zero-cross of the LAMP voltage, the DISSOLVE LOGIC reads the value in the MICROCONTROLLER. This value can range from 0 to 1000, and is counted by internally generated clock signal. The clock signal sends the TRIAC TRIGGER signal to the TRIAC CONTROL on the POWER CONTROL PCB.

The TRIAC is energized and the LAMP is energized for the rest of that half sine wave.

If the MICROCONTROLLER sends a new value, the next half would have a different phase cut position. If the value is not changed, the cut position leaves unchanged.

The LAMP dissolve function operates between zero and high with an accessory in the accessory slot or with RS232. High or low on the LAMP is controlled by the BRIGHTNESS SWITCH.

The dissolve range of zero to full brightness is divided into 1000 steps. These steps can be used to create a linear LAMP brightness change.

A lookup table is used in the MICROCONTROLLER software. This table contains the corresponding phase cut value for each one of the 1000 steps for a linear brightness setting.
Focus

There are different possibilities to get a crisp and clear focused image on the screen.

1. Use the FOCUS KNOB. In this case the LENS will be moved inside the LENS CARRIER, while the LENS CARRIER still keeps his position.
2. Use the FOCUSING BUTTONS either on the KEYBOARD of the PROJECTOR or on the REMOTE CONTROL. In this case the LENS and the LENS CARRIER are moving together. The focus range is limited, and depend on the ECCENTRIC of the FOCUS MOTOR (approx. 8mm / 0.3 in.).

figure 3-12
AUTO FOCUS

The AUTO FOCUS feature is installed in the EKTAPRO Model 5020, 9020 and 9020/CINE.

A “low” FOCUS EXT signal from the MICROCONTROLLER enables the AUTO FOCUS PCB while a “high” signal disables the AUTO FOCUS to ensure a sharpness correction for the projected slide. If a manual sharpness correction was necessary the AUTO FOCUS MOTOR moves back to its primary position after the next slide change. The AUTO FOCUS MOTOR is running until both receivers has the same light input. The FOCUS MOTOR stops at the time the light input on both Photo transistors is equal. The direction for the focus movement is defined by either receiver port 1 or port 2.

An electronic circuit will determine the operating voltage for the FOCUS MOTOR (running forwards or backwards) to ensure to have the same speed in both directions. This regulation is necessary because the LENS CARRIER is basic loaded with a spring in one direction.

To ensure that the AUTO FOCUS function works properly it is very important to use the same kind of slide frames. Mixing up glass slides with other slides will bring the projected image out of focus because there is only one reference point for the lens position to get a sharp and clear projected image on the screen.

If glassless slide frames are in use, it could be, that the borders of the projected image are out of focus. It depends on the IR-Beam which is only sensing the center of the slide.

![Diagram of EKTAPRO Model 5020, 9020 and 9020/CINE AUTO FOCUS system](image-url)
**P-BUS**

All the Models are equipped with the P-Bus feature.
The Models 4020 and 5020 has only an Input Bus, Models 7020 and 9020 and 9020/CINE an IN/OUT Bus.

The P-Bus (Presentation Bus) is a serial asynchronous data transmission interface which uses the RS 232 / V.24/ V.28 standard. This type of interface is used with Personal Computers for external communication.

![Diagram](image)

The purpose of the bus is to enable computer controlled projection with one or more slide projectors. Up to 16 different EKTAPRO 7020 or 9020 and 9020/CINE projectors can be addressed separately if they are connected through a daisy chain configuration. The projector addresses can be selected on the PROJECTORS ADDRESS SELECTOR SWITCH which is located above the P-Bus connectors.

The P-Bus interface configuration is initially set at:

- 1 Start bit
- 8 Data bit
- 1 Stop bit
- 9600 Baud rate
- No Parity

The signal levels must be equal to the RS232 specifications.

The signal lines are only “Transmit Data” and “Receive Data”. Bi-directional lines are not used.

The projector can be controlled by other control signals beside the P-Bus Interface. Details can be found in a special marketing publication.

The P-Bus is also used as Service Interface for the Diagnostic Software.
Command Structure

The Command Structure is binary coded with three consecutive 8-bit bytes. Synchronization is achieved by a break in the transmission of more than three byte times. The first five bit of each command specifies the address of the selected projector.

The 16 hardware addresses are 0-F (hex).

The address 1F (hex) is a global address that all connected projectors will accept. Several projectors can be combined in a group by assigning them a special group address of 10 - 19 hex with a software command. Note, global or group addresses are separate from the position that is selected on the address switch.

Three 8-bit bytes:

```
AAAAA MM 1 CCCC XXXD XXXXXXXD
```

- **AAAAA** address of projector
- **MM** selects command mode
- **CCCC** commands depending on selected mode
- **XXXX XXXX XXX** commands or information depending on selected mode

An example of command modes is:

- parameter mode 00
- set/reset mode 01
- direct mode 10
- status request mode 11

In this mode, the projector returns (10 bit) data. This mode can be used for diagnostics purposes.

Details can be obtained from special marketing literature.
Accessory slot

This slot was designed for EKTAPRO Models 7020, 9020 and 9020/CINE to receive certain professional dissolve units. The 12/7 PIN ADAPTER is a PCB with:

- an “Intern/Extern” switch for a check. Intern means “Lamp on” and Extern means “Projector is controlled by the dissolve unit”.

- connectors to connect the ADAPTER to the projector, and an ADAPTER CABLE for different dissolve units. The ADAPTER CABLE has a 25 PIN SUB-D connector to connect the PCB ADAPTER and a combination socket for 12 and 7 PINS.

Accessories that allow the EKTAPRO projectors to communicate with older dissolve equipment are available for the 12/7 PIN sockets.

The slot contains an Inter IC Communication Interface (I²C). The I²C bus is used in a modified way only for the 7/12 PIN Adapter. Typical I²C functions are not available.

a) Possible Control Functions

- P-Bus function in TTL Level through RS_232_R and RS232_T lines
- LAMP dissolve through SL_DISS line
- I²C Communication through SDA, I²C_INT and SLC lines
- Voltage Supply for accessory slot modules. See 2.4 CONNECTORS.
- Special Control lines SLOT_A, SLOT_B, SLOT_C
  All lines are connected to ground means 12/7 PIN adapter present, PROJECTOR LAMP off, waiting for dissolve pulses on SL_DISS line
- all high, no ACCESSORY installed
Remote Control

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12 VDC</td>
</tr>
<tr>
<td>2</td>
<td>Gnd</td>
</tr>
<tr>
<td>3</td>
<td>Signal 1 (LSB)</td>
</tr>
<tr>
<td>4</td>
<td>Signal 2</td>
</tr>
<tr>
<td>5</td>
<td>Signal 3</td>
</tr>
<tr>
<td>6</td>
<td>Signal 4</td>
</tr>
<tr>
<td>7</td>
<td>Signal 5 (MSB)</td>
</tr>
<tr>
<td>8</td>
<td>Interrupt</td>
</tr>
</tbody>
</table>

Because of the microprocessor, the REMOTE CONTROL also works with digital signals on the TTL level. RANDOM ACCESS is also available through a REMOTE CONTROL receptacle.

The data is sent parallel as a 5 bit code from the CABLE REMOTE or the IR RECEIVER to the projector (Keyboard PCB) with an interrupt signal.

The example shows the binary code 10000. The code 10000 is for FORWARD.

When a button on the REMOTE CONTROL is pressed, the INT signal is low with a maximum value of 1 µs. Then it becomes high again. After that the data transmission begins.

While the focus and tray motion signal consist of only one 5 bit data record. The slide position values are always sent as three successive 5 bit data.

For example:

Slide No. 3 = decimal 20 20 23, binary 10100 10100 10111
Slide No. 140 = decimal 21 24 20, binary 10101 11000 10100
List of Remote Control Commands:

<table>
<thead>
<tr>
<th>Key/Function</th>
<th>Command decimal</th>
<th>Command binary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slide forward</td>
<td>16</td>
<td>1 0 0 0 0</td>
</tr>
<tr>
<td>Slide backwards</td>
<td>8</td>
<td>0 1 0 0 0</td>
</tr>
<tr>
<td>Focus forward</td>
<td>4</td>
<td>0 0 1 0 0</td>
</tr>
<tr>
<td>Focus backwards</td>
<td>2</td>
<td>0 0 0 1 0</td>
</tr>
<tr>
<td>Standby</td>
<td>1</td>
<td>0 0 0 0 1</td>
</tr>
<tr>
<td>Key 1</td>
<td>21</td>
<td>1 0 1 0 1</td>
</tr>
<tr>
<td>Key 2</td>
<td>22</td>
<td>1 0 1 1 0</td>
</tr>
<tr>
<td>Key 3</td>
<td>23</td>
<td>1 0 1 1 1</td>
</tr>
<tr>
<td>Key 4</td>
<td>24</td>
<td>1 1 0 0 0</td>
</tr>
<tr>
<td>Key 5</td>
<td>25</td>
<td>1 1 0 0 1</td>
</tr>
<tr>
<td>Key 6</td>
<td>26</td>
<td>1 1 0 1 0</td>
</tr>
<tr>
<td>Key 7</td>
<td>27</td>
<td>1 1 0 1 1</td>
</tr>
<tr>
<td>Key 8</td>
<td>28</td>
<td>1 1 1 0 0</td>
</tr>
<tr>
<td>Key 9</td>
<td>29</td>
<td>1 1 1 0 1</td>
</tr>
<tr>
<td>Key 0</td>
<td>20</td>
<td>1 0 1 0 0</td>
</tr>
<tr>
<td>Clear</td>
<td>Internal</td>
<td></td>
</tr>
<tr>
<td>Enter</td>
<td>3 words internal</td>
<td></td>
</tr>
</tbody>
</table>
4. DISASSEMBLY/ASSEMBLY

UPPER HOUSING

1. Remove the LAMP MODULE.

2. Remove the KNOB.

3. Remove the 4 SCREWS.

4. Remove the UPPER HOUSING.
**BUTTONS and COVER PLATES**

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the 3 BUTTONS.

3. Remove the small COVER PLATE.

4. Loosen the HOLDING CLIP and remove the large COVER PLATE.

5. If needed, change the 5 BUTTONS.

6. If necessary, replace the WINDOW and/or MODEL LABEL.
NOTE

Please note the positions of the 3 BUTTONS and the SWITCH on the KEYBOARD PCB.

figure 4-4

figure 4-5
**CENTER HOUSING**

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the FOCUS INDICATOR.

3. Release the HOLDING CLIP at the KEYBOARD and remove the PCB.

4. Release the HOLDING CLIP at the TRAY MOTION PCB and remove the PCB.

5. Remove the SPRING and the ZERO LEVER. See figure 4-7.

6. Remove the 8 RETAINERS and 8 ROLLERS. See figure 4-7.

7. Remove the DRIVE RING. See figure 4-7.

8. Remove the 3 SHAFT ROLLERS and the 3 BEARING ROLLERS. See figure 4-7.
9. Remove the CODER DISK and 2 GEAR WHEELS.

10. Remove the 4 SCREWS.

11. Remove the CENTER HOUSING.

12. Remove the 2 SCREWS and the MOTOR.

13. Remove the SCREW and the LATCH
14. During disassembly and assembly of the CENTER HOUSING, place the TRAY RELEASE LEVER into the position as shown below.

**IMPORTANT:**
Take care of this positions! Incorrect positioning can cause transport failures.

figure 4-9
15. At the accessory slot, insert the ADAPTER into the GUIDE of the CENTER HOUSING.

16. Check that the POWER SUPPLY PCB is positioned in the GUIDE of the CENTER HOUSING.
FAN, KEYBOARD PCB and TRAY MOTION PCB

1. Remove the UPPER HOUSING. See page 4-1.
2. Remove the CENTER HOUSING. See page 4-4.
3. Disconnect the FAN MOTORS.
4. Remove the FAN.
5. Disconnect the KEYBOARD PCB.
6. Disconnect the TRAY MOTION PCB.

NOTE:
Do not clean the FAN with compressed air because the rotary wings would be damaged!
NOTE

When placing the FAN in the LOWER HOUSING, insert the FAN as shown in figure 4-13.

---

figure 4-13

---

figure 4-14
BACK PANEL PCB

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the FAN. See page 4-9.

4. Remove the BACK PANEL PCB.

figure 4-15
TRANSFORMER, POWER SUPPLY PCB and BACK PLATE ASSEMBLY

NOTE
It is easier to remove the complete TRANSFORMER, POWER SUPPLY PCB and BACK PANEL ASSEMBLY at the same time, to avoid needless removals.

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the 4 SCREWS from the TRANSFORMER

4. Remove the CONNECTOR P3 from the POWER SUPPLY PCB.

5. Remove the NEUTRAL WIRE at the MECHANISM FRAME and the LAMP HOUSING ASSEMBLY.

6. Disconnect POWER SUPPLY PCB from the MASTER BOARD PCB. Remove the TRANSFORMER and the BACK PLATE ASSEMBLY.

7. If needed, install new assemblies.

---

figure 4-16
MECHANISM FRAME and LENS MOUNT

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the 4 SCREWS and the TRANSFORMER. See page 4-11.

4. Remove the SCREW and disconnect the NEUTRAL WIRE.

5. For Model 5020, 9020 and 9020/CINE remove the SCREW, the AF PCB and the 2 CONNECTORS from the AF PCB.

LENS MOUNT

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the 4 SCREWS and the TRANSFORMER. See page 4-11.

4. Remove the MECHANISM FRAME and LENS MOUNT. See page 4-12.

5. Remove the SPRING.

6. Remove the LENS MOUNT from the MECHANISM FRAME.
7. Remove the SCREW, PLATE and the SHAFT.

8. Remove the SCREW, SHUTTER and the SHOCK ABSORBER.

9. Remove the SCREW and the MAGNET.

10. Remove the 3 SCREWS, the AUTO FOCUS RETAINER and the SPRING.

figure 4-19
If the SHUTTER has to be replaced and the COVER MECHANISM FRAME is provided with the small recess, the SHUTTER has to be bent first. Otherwise it might touch the COVER MECHANISM FRAME.

figure 4-20
RETAINER AF ASSEMBLY

Model 5020, 9020 and 9020/CINE

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the 4 SCREWS and the TRANSFORMER. See page 4-11.

4. Remove the MECHANISM FRAME and LENS MOUNT. See page 4-12.

5. Remove the SPRING and the LENS MOUNT from the MECHANISM FRAME. See page 4-13.

6. Remove the SCREW, SHUTTER and the SHOCK ABSORBER. See page 4-14.

7. Rotate the LEVER for the SHUTTER out at the MAGNET.

8. Remove the 3 SCREWS, the RETAINER AF ASSEMBLY, and the SPRING. See page 4-14.

9. Remove the 2 PRISM COVER and the 2 PRISMS.

---

figure 4-21
10. Remove the SCREW, the TRANSMITTER PCB, and the TRANSMITTER COVER.

11. Remove the 2 SCREWS and the RECEIVER PCB.
MECHANISM FRAME

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the 4 SCREWS and the TRANSFORMER. See page 4-11.

4. Remove the MECHANISM FRAME and LENS MOUNT. See page 4-12.

5. Remove the SPRING and LENS MOUNT. See page 4-13.

6. Remove the 2 SCREWS, 2 WASHERS and the COVER MECHANISM FRAME.

---

**figure 4-23**
7. Remove the TRAY RELEASE LEVER. See figure 4-24.

8. Remove the LEVER, SLIDE LIFTER and the 2 SPRINGS.

9. Remove the SPRING, SLIDE REGULATION LEVER and the CAM.

**NOTE**

After the assembly of the parts, align the CAM so that the SLIDE LIFTER is in the lowest position.
10. Remove the LEVER and the SPRING.

11. Remove the SPRING and the PRESSURE PAD.

12. Remove the 2 SCREWS, the CAM and the SHUTTER SENSOR ASSEMBLY.

13. Remove the 2 SCREWS and the MOTOR.
AUTO FOCUS PCB and FOCUS MOTOR

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the FAN, KEYBOARD PCB, and TRAY MOTION PCB. See page 4-9.

4. Remove the 4 SCREWS and the TRANSFORMER. See page 4-11.

5. Remove the MECHANISM FRAME and LENS MOUNT. See page 4-12.

6. Remove the SPRING, the FOCUS MOTOR and the RUBBER PAD.

figure 4-27
Master Board PCB

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the FAN, KEYBOARD PCB and the TRAY MOTION PCB. See page 4-9.

4. Remove TRANSFORMER, POWER SUPPLY PCB and BACK PANEL ASSEMBLY. See page 4-11.

5. Remove the MECHANISM FRAME and LENS MOUNT. See page 4-12.

6. Disconnect all CONNECTORS from the MASTER PCB. See page 4-23.

7. Remove the SCREW and the COVER.

8. Remove the MASTER PCB.
Master Board PCB Connectors

CAUTION

During the assembly take care that all CONNECTORS are correctly plugged in!
MICROCONTROLLER

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the SCREW and the COVER.

4. Use a PLCC EXTRACTOR TOOL (TL 4430) to remove the MICROCONTROLLER from the MASTER PCB.

5. When assembling note the beveled edge of the MICROCONTROLLER and the PLCC/PIN-GRID SOCKET. Install these edges together.

NOTE

The MICROCONTROLLER is installed in a PLCC-Socket.
LOWER HOUSING

1. Remove the UPPER HOUSING. See page 4-1.

2. Remove the CENTER HOUSING. See page 4-4.

3. Remove the FAN, KEYBOARD PCB and TRAY MOTION PCB. See page 4-9

4. Remove the TRANSFORMER, POWER SUPPLY PCB and BACK PANEL ASSEMBLY. See page 4-11.

5. Remove the MECHANISM FRAME and LENS MOUNT. See page 4-13.

6. Disconnect all CONNECTORS from MASTER PCB. See page 4-23:

7. Remove the 2 SCREWS and the LAMP HOUSING ASSEMBLY.

8. Remove the HANDLE.

9. Remove the 2 ELEVATOR RETAINERS, the right and left ELEVATOR KNOB, the right and left ELEVATOR and the 2 RUBBER FEET.

---

LAMP HOUSING ASSEMBLY

SCREW (2)

ELEVATOR RETAINER (2)

HANDLE

ELEVATOR KNOB (2)

ELEVATOR (2)

RUBBER FOOT (2)

figure 4-29

Kodak AG, Stuttgart 4-25 03/98
DUAL LAMP MODULE (Extra Bright)

1. Remove the LAMP MODULE from the PROJECTOR.

2. Lift the EJECTOR LEVER. The defective LAMP will eject from the LAMP SOCKET ASSEMBLY.

3. Remove the CLIP and the CONDENSER LENS.
4. Remove the 3 SCREWS, the 2 WASHERS and the LAMP HOUSING.

5. Remove the GRILL PLATE, the AIR EXHAUST PLATE, the HOOK, the SPRING and the LAMP MODULE LABEL.
6. Remove the 2 EJECTORS.

7. Remove the SPRING - Model 4020, 5020, 7020, 9020 and 9020/CINE.

8. Remove the MIRROR, the SPRING and the MIRROR HOLDER.

9. Remove the MOTOR, the CIRCLIP and the SINGLE or DUAL LAMP SOCKET ASSEMBLY from the PLUG.

figure 4-33
DUAL LAMP MODULE

NOTE
The SPRING in the DUAL LAMP MODULE has to be mounted without tension between the MIRROR and the MOTOR.

figure 4-34

Lubrication

Use the lubricant BARRIERTA L 25 DL (50g) No. 558 1960. Grease all arrow marked spots.

figure 4-35
5. DIAGNOSTICS

Diagnostic Overview EKTAPRO 4020/5020/7020/9020 and 9020/CINE

- **PREPARATION**
  - Page 5-3

- **NO FUNCTION**
  - Page 5-4
  - = Power LED deenergized
  - = FAN not operating
  - = LAMP deenergized

- **Switch On Procedure Problems**
  - Page 5-9

- **Lamp Problems**
  - 4020, 5020, 7020, 9020, 9020/CINE
  - Page 5-12

- **Switch On Procedure**
  - Page 5-18

- **No Function with Remote Control**
  - Page 5-20

- **IR Remote**
  - Page 5-20

- **Cable Remote**
  - Page 5-23

- **No Slide transport forward/reverse**
  - Page 5-24

- **Wrong transport step by 80/140 Slide Tray**
  - Page 5-30

- **No Focus actuation**
  - Page 5-32

- **No Stand-by Function**
  - Page 5-34
<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Trouble 4020 - 9020 and 9020/CINE</td>
<td>5-35</td>
</tr>
<tr>
<td>Autofocus 5020/9020/9029/CINE : No Autofocus Function</td>
<td>5-38</td>
</tr>
<tr>
<td>Accessory Slot 7020/9020</td>
<td>5-40</td>
</tr>
</tbody>
</table>
Preparation

Conditions:

- Ensure that line voltage does not vary more than +/- 5 % from the selected value on the projector.
- Insert a LAMP MODULE with a proper LAMP.
- Slide tray (80/140) with slide
- LENS (standard)
- Personal Computer / Lap top
- Interface Cable 9 PIN (Plug / socket)
No Function

= Power LED deenergized
= FAN not operating
= LAMP deenergized

- check primary fuse
  - not o.k. -> replace fuse
  - o.k. -> check power switch
    - not o.k. -> replace power switch
    - o.k. -> check connector P2/J2 with wires from line socket to Power Regulation Board
      - not o.k. -> insert connector fasten wires
      - o.k. -> Switch On Procedure o.k. -> o.k.

2
check Connector P4/J4 from Power Regulation PCB to the transformer

not o.k. → check wires and connect Plug P4 correctly

o.k. → Switch On Procedure o.k.

no → replace Power Regulation PCB

measure line voltage on transformer taps

not o.k. → replace Power Regulation PCB

o.k. → Switch On Procedure o.k.

no → Switch On Procedure o.k.

measure secondary (extra low) voltage 5 V DC see figure on page 28

voltage present?

yes → o.k.

no → o.k.
check fuse F1 1.25 A, fuse holder and wires

Switch On Procedure o.k.?

F1

measure secondary (extra low) voltage 34 V DC

see figure on page 28
replace Lamp Holder with thermoswitch and wires

is Lamp on?

no

check terminal jacks and wires from connector J in Lamp Housing for function, and check the connection J3/P3 to Power Regulation PCB for correct function

is Lamp energized?

no

measure 72 VAC across the transformer taps 7 and 6, and 81 VAC for 7 and 5

is there AC voltage?

no

change Transformer

yes

*change Power Regulation Board

End

* If the Power Board has been already changed in earlier steps, this procedure is not necessary.
Switch on Procedure Problems

Condition:

Slide Lifter Lever turns one revolution and stops (Power LED is flashing)

- check connector from Tray Transport Motor to the Master PCB
  - not o.k.: connect P9 correctly to Master PCB
  - o.k.: measure resistance of Tray Transport Motor Solenoid
    - not o.k.: replace Tray Transport Motor
    - o.k.: Switch On Procedure o.k.?
      - yes: o.k.
      - no: check connector P3 from Lift Lever Sensor on Master PCB
        - not o.k.: connect P3 correctly to Master PCB
        - o.k.: 2

approx. 9 OHM
Service Manual SM 2547-1

03/98 5-10 Kodak AG, Stuttgart

Switch On Procedure o.k.? yes → o.k.

not o.k. → replace Shutter

Switch On Procedure o.k.? yes → o.k.

check connector from Tray Transport Motor to the Master PCB

measure on Master PCB the 34 V DC voltage
U24 (Pin 1 and Pin 15)
U25 (Pin 1 and Pin 15)

If there is no voltage present, replace Master PCB

Multimeter Range 2MΩ

blue, red, blue, yellow ≤ 0.4MΩ ≤ 0.05MΩ

Ohm

common

3 4 Catho red
An

1 yellow 2 blue

Ohm

common

If there is no voltage present, replace Master PCB

If there is no voltage present, replace Master PCB

If there is no voltage present, replace Master PCB
**Condition:**

Slide Lift Lever stops in up position but Tray Transport motor does not stop at "zero"

- **check connector P6 from Tray Motion PCB for correct connection on Master PCB**
  - o.k.
  - connect P6 correctly to Master PCB
  - o.k.
  - does Tray Transport Motor stop at "zero"?
    - no
    - measure with a Logic Pen the signal change from high to low at "zero"
      - no
      - replace Tray Motion PCB
        - yes
        - o.k.
      - yes
      - replace Microcontroller and/or change Master PCB
  - yes
    - o.k.
  - no
  - no
    - replace Tray Motion PCB
      - yes
      - o.k.
    - yes
      - o.k.
Lamp Problems 4020/5020/7020/9020 and 9020/CINE

Condition:

No "Lamp On" Function
Lamp LEDs on Backplate = ON

Check Dual Lamp Module

At Lamphouse Connector measure the Resistance of the Lamps see below

DUAL LAMP MODULE

LAMPHOUSE CONNECTOR

is Resistance $\leq$ 1.5 Ohm ?

YES Lamphouse OK.

NO
2

Check Lampholder and replace the Harness and Thermoswitch.

does the Lamp operate?  

YES  Lamphouse OK.

NO  

Connect a Logic Pen to Testpoints ZC (Zero-Cross) and TR (Trigger Pulse).  
For Details refer to SM (figure 3-11 and page 5-28) 

are Pulses present?

YES

NO  Replace Master PCB  

does the Lamp operate?  

YES  Lamp Circuit OK

NO
Measure the two Lamp Voltages 81V AC and 92V AC from the Transformer to J4 of the Power Regulation PCB. See below.

2 - 3 Low Lamp 81 V AC
2 - 4 Lamp 92 V AC

AC Voltage present?

Check Transformer and Wiring to the Power Regulation PCB

AC Voltage present?
Check regulated Lamp Voltage at J3 of Power Regulation PCB. See below.

1 - 3 LAMP 1
1 - 4 LAMP 2
Check Connectors and Wires from Power Regulation PCB to the Lamp Module. Replace defective parts if necessary.
Mirror Position

In the Service Software TL-4575 there is an option in the menu “Lamp toggle” to check the MIRROR FUNCTION and change the “lamp on” option. For the correct function in the projector, set the MIRROR to position 1 when Lamp 1 is active, or reset the projector.

If the MIRROR does not move by the software command, check the resistance of the MIRROR DC MOTOR (see figure) and measure the 34 VDC voltage on the MASTER PCB if necessary.

Brightness Test

Use the option “Adjust Brightness” from the Service Software TL-4575 to dim the PROJECTOR LAMP. There is a range from “0” (dark) to “1000” (bright), in steps of 10 units. With the “Reset” command in the main menu the original brightness can be reset.
Switch On Procedure

POWER ON

Power LED energized
Fan operating
Lamp energized

Slide Lift Lever is in the up position

Tray Transport Ring moves 3 steps counterclockwise, and then returns to *Zero* position

Slide Lift Lever operates to down position

End
Switch On Procedure complete - No Keyboard Function

Projector does not accept a command from the keys:
- Transport Forward
- Transport Reverse
- Focus Forward
- Focus Reverse

check the keys

measure with a logic pen the signal change from high to low by pressing a button on Keyboard PCB. There are 4 different testpoints:
- TP 2 Transport \(\uparrow\)
- TP 1 Transport \(\downarrow\)
- TP 4 Focus \(\uparrow\)
- TP 3 Focus \(\downarrow\)

is there a signal change?

yes

for more details see chapter: Lamp Problems

no

replace Microcontroller and/or Master PCB

replace the Keyboard PCB

see section:
- No Slide Transport
- No Focus actuation
- No Standby function

Key function ok

no \(\uparrow\)

yes
No function with REMOTE CONTROL

IR Remote Control

**Condition:**

- Receiver and Transmitter must operate on the same channel
- Projector operates by pressing
- an installed IR Remote Control Receiver does not work

1. check the IR Remote Transmitter
2. measure supply voltage on contacts. See figure.

- $\geq 3V$ DC

- check if pulses are generated by pressing a button
- measure with a logic pen if pulses are generated by pressing a button. Use the positive pole of the battery as a test-point.

- is voltage $\geq 3V$ DC?
  - yes
    - replace batteries or accumulators
    - o.k.
  - no
    - does the Remote Control operate?
      - yes
      - no

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are there pulses?

replace the PCB of the Transmitter.

does the Remote Control operate?

check the IR Remote Receiver

measure the pulses with a logic pen on the receiver socket. Press the Forward or Reverse Button to check the signal.

PCB
Remote Control Receiver

View to Print Side
3

are there pulses?

yes

replace the PCB of the Receive.

no

does the Remote Control operate?

no

check signal on Keyboard PCB

yes

measure the IC U1, Pin 3 with a logic pen if there are pulses.

o.k.

if no pulses are detected, replace Keyboard PCB

projector operates with Remote Control

End
Cable Remote

Condition:

The Button Function of the projector operates

check that the Cable Remote Control sends a signal to the projector

measure the pulses with a logic pen on Keyboard PCB:

IC U1
Pin 1  Transport forward
Pin 15 Transport reverse
Pin 14 Focus forward
Pin 13 Focus reverse
Pin 4  Standby

when a Button is pressed

are there pulses?

replace Cable Remote Control

no

yes

Cable Remote Control operates
No Slide Transport forward/reverse and other projection problems

Condition:

Electrical function (Switch On procedure and Button Function) operates

check mechanical function of the buttons

test the buttons in the upper housing. The parts may be damaged.

if needed replace defective parts

assemble the upper housing and check the buttons

the transport function operates

End
Shutter Problems

Condition:

Slide Transport with a Slide Tray and slides operate

the Shutter is does not open when a slide remains is in the gate

check the Shutter Soldenoid

remove Connector P12 and measure the resistance of the Magnet

is the resistance appr. 35 ohm?

replace the Magnet

measure J12 on Master PCB for 34 VDC

does the Shutter operate?

\[ \star \]

\* an easy method to actuate the Shutter is:

Simulate a slide with a piece of plastic. Press the FORWARD/REVERSE Button. While the Slide Lifter is going down, place the slide in position. Note, the slide must be in position before a cam cycle is completed.
Is there a 34 V DC voltage during a slide change?
see figure on page 28

yes

change the Master PCB

no

does the Shutter operate?

no

measure the resistance of the Shutter Solenoid

yes

details see figure.

replace the Solenoid if necessary

SHUTTER SOLENOID

P12

0HMS 30 Ω

Shutter operates

o.k.
Fan Problems

Condition:

The Lamp Module is inserted

Does the Lamp Switch operate? Remove the "Fan Switch Connector" (see figure) from the Fan PCB and jumper the pins.

no

does the Fan operate?

no

does the Fan operate?

yes

replace the Lamp Housing and Microswitch Assembly

yes

o.k.

2

Supply Connector

Fan Switch
2

check the Fan Supply DC voltage Motor

measure the Fan Supply Voltage on the Keyboard PCB. The blue wire is negative and the red wire is positive

does the DC voltage measure appr. 20 - 26 VDC?

yes

check the wires and the Fan Connector

no

replace the Keyboard PCB

the Fan operates
Slide Obstruction in Slide Tray

Conditions for a correct transport cycle

- Check SLIDE LIFTER LEVER. In the up position, the alignment above the CENTER HOUSING must be 3.8 mm (0.15 in.) with a tolerance of 0.2 mm (0.008 in.). If the measurement is greater, replace the SLIDE LIFT LEVER.

- Check the CENTER HOUSING for damaged parts such as:

  DRIVE RING
  GEAR WHEELS
  CODER DISK

Inspect whether the parts are complete. Are there damaged or broken teeth on the wheels? If so, replace them.
Wrong Transport Step by 80/140 SLIDE TRAY

Condition:

Switch On Procedure o.k.

* Projector does not change the step count *

Step count is only effective when the Drive Ring passed zero.

check the function of the button

measure the signal change on U21, PIN1 or PIN 15 of the Keyboard PCB with a logic pen

is there a signal change?

no

replace Keyboard PCB

yes

does the correct slide step transport operate?

no

o.k.

yes

2

03/98

5-30

Kodak AG, Stuttgart
2

check Connector to the Master PCB

inspect the plug P2 from Keyboard PCB to the Master PCB

does the correct slide step transport operate?

no

replace Microcontroller and/or Master PCB

The Slide Step function operates

yes

o.k.
No Focus Actuation

Condition:

Focus Keys operate correctly

Focus does not move when the Button is pressed

check the Focus Motor

measure the coil resistance of the Focus Motor on plug P11

Is the resistance value appr. 30 ohm?

yes

no

if the resistance is close to zero or infinity, replace the Focus Motor

does the Focus operate?

no

yes

o.k.
2. Check the supply voltage of the Focus Motor.

- To measure for 5 VDC on J11 of the Master PCB, press a Focus Button.

- Is there supply voltage?
  - No: Replace Master PCB or Microcontroller.
  - Yes: Check the Connector J/P 11.

The Focus function operates.
No Standby Function

The Stand-by Button does not operate

check the Stand-by Key

Press the Stand-by Switch to measure the signal change on the Keyboard PCB with a logic pen

Is there a signal change?

yes

replace Keyboard PCB

no
do the Stand-by Function operate?

yes o.k.

no

check the Keyboard Connector

inspect Keyboard Connector P2 and wires

do the Stand-by Function operate?

yes o.k.

no

replace Microcontroller and/or Master PCB

Stand-by Function operates
Communication Trouble 4020/5020/7020/9020 and 9020/CINE

Check Communication Interface P-BUS IN

use Service Software TL-4575 and send a command

Does the projector execute the command?

Check the 5 VDC voltage on J5 (Master PCB) between PIN 1 and 2

is voltage present?

YES

ok

NO

YES

ok

NO
replace Master PCB

Is the communication function ok?

YES

measure on IC U2 (see figure) the supply voltage

NO

Is there voltage?

YES

check wires and the connector P6 to the Master PCB

NO
replace Back Panel PCB.
Communication is now ok.
AUTO FOCUS 5020, 9020 and 9020/CINE: No AUTO FOCUS Function

Condition:

Focus Motor operates by a command from the Keyboard or the Remote Control. Autofocus Switch "on".

Error condition: The Autofocus is defective

Remove Connector P3 from the Autofocus PCB, and measure the 5 VDC supply voltage

Measure on Master PCB on Test Point 5 VDC

is there 5 VDC on P3, PIN 1?

no

yes

is 5 VDC on Test Point 5 VDC?

no

yes

replace Master PCB

2
IR-LED Pulses

3.5 VDC

2 ms

Receiver Pulses

time increases when the Autofocus is active

5 VDC

2 ms

1.5 ms

* For an easy check of the Autofocus function, push an inserted slide against the "pressure pad". A small movement of the slide is sufficient to start the Focus Motor.

Check the function of the IR-LED. Measure the pulses on J/P2 PIN 1 with an oscilloscope. See figure.

are there pulses present?

no

replace IR-LED Assembly

yes

check the function of the Autofocus Receiver T1 or T2. Measure the pulses on PIN 2 or 3 with an oscilloscope. See figure.

are there pulses present?

no

replace Receiver Assembly

yes

replace Autofocus PCB

*check Autofocus function
Accessory Slot 7020/9020 and 9020/CINE

Malfunction of the 12/7 PIN Module

- Check the “TR5” fuses on the ADAPTER PCB F11 and F12. Each fuse is 0.8 A.
- If the change of the fuses was not successful or the fuses operate but the ADAPTER does not operate, use a new ADAPTER PCB.
6. Projector Checking

1. Power on the Projector. If there is no function and no initialization procedure, check the primary and the secondary Fuse F1 and F2.

Slide jam (all models)

2. To avoid slide jams check the position of the DRIVE RING. Use FIXTURE TOOL TL 622 0454 to adjust the TRAYMOTION PCB how it is described in Modification Instruction No.1

NOTE

Take care of the spring located at the rear side of the Metal Slide (see figure 6-1). The spring must be outside of the Slide Gate.

![Diagram of Projector Parts](image-url)
CODER DISK

- Check bolts for proper fitting (see figure 6-2).
- Take care that the slots of the CODER DISK are free of dust.
- Ensure that the CODER DISK can free rotate and do not touch the LIGHT BARRIER.
- If there are still slide transport problems replace the TRAY MOTION PCB.
7. MAINTENANCE

Maintenance Intervals

After about 1 500 running hours or 500 000 SLIDE LIFTER cycles at a room temperature of 0 - 40°C (32 - 104°F) we recommend maintenance by an authorized Kodak Service.

When the projector is operated in a dusty environment or in an enclosed area, maintenance should be done every 1000 operating hours or less, depending on the quantity of dust.

When operating in an enclosed area, supply the necessary air and exhaust. If needed, the enclosure should have an additional fan.

Maintenance Procedure

Open the projector. Clean with a dust cleaning device.

The following structural components should be dismounted, cleaned, if necessary parts replaced, lubricated and assembled.

<table>
<thead>
<tr>
<th>Component</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>Upper Housing</td>
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<tr>
<td>Center Housing</td>
<td>4-4/5/6/7</td>
</tr>
<tr>
<td>Fan, Keyboard PCB and Tray Motion PCB</td>
<td>4-8/9</td>
</tr>
<tr>
<td>Transformer, Power Supply PCB and Back Panel Assy</td>
<td>4-11</td>
</tr>
<tr>
<td>Mechanism Frame and Lens Mount</td>
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<tr>
<td>Lens Mount</td>
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</tr>
<tr>
<td>Mechanism Frame</td>
<td>4-15/16/17</td>
</tr>
</tbody>
</table>

Cleaning of the other parts and structural components depends on how dirty they are.

See Item 4 DISASSEMBLY/ASSEMBLY.

Cleaning

It is important to clean the parts of the magazine drive and the diapositive transporter. See center housing, mechanism frame and lens mount. These parts should be cleaned thoroughly with a cleaner that does not damage the material.
The following parts should be checked for wear and, if necessary, replaced.

The optical parts, such as LENS, CONDENSER LENS and HEAT ABSORBING GLASS should be cleaned regularly with lens cleaner.

**Ultrasonic cleaning**

At present, there is no information on the reactions of the individual components. We do not suggest this method.
Lubrication

Use the lubricant BARRIERTA L 25 DL (50 g) No. 558 1960.

NOTE
Never use any other oil or lubricants.

Grease all arrow marked spots.
LENS MOUNT

GLIDING SURFACE

figure 7-4