

**HELL**

## Automatic Telephoto Recorder TM 835

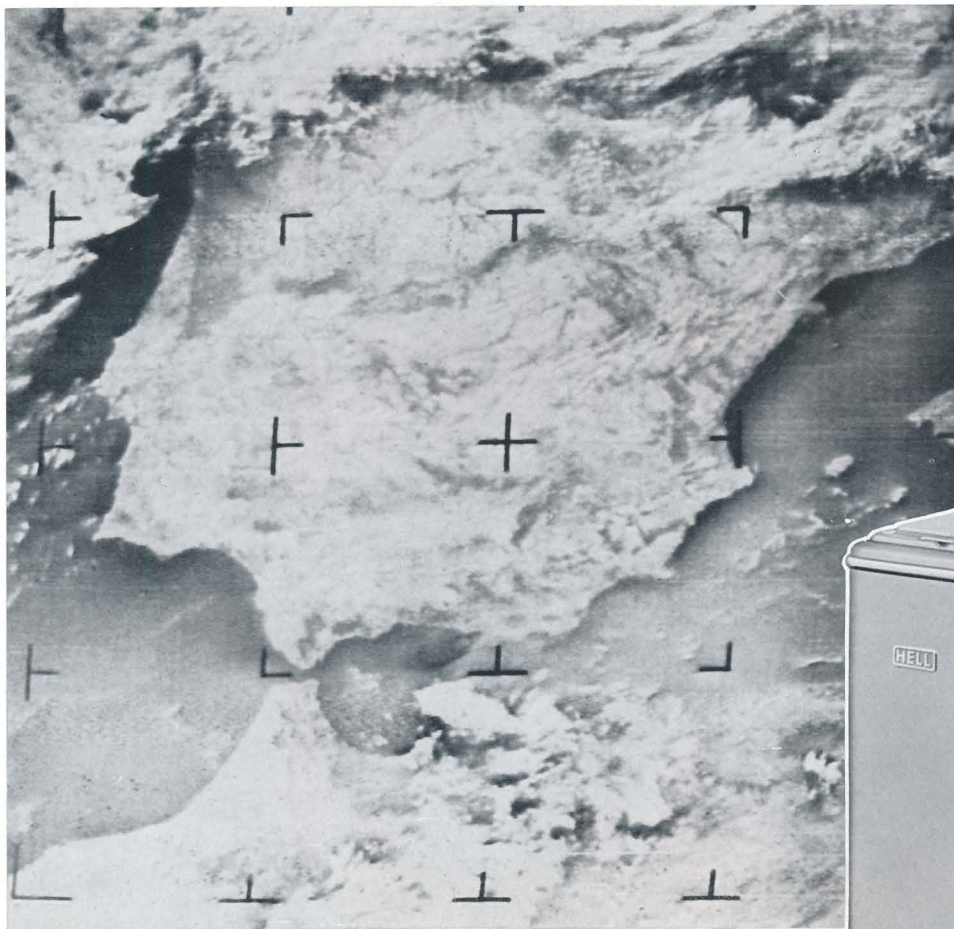


## Automatic Telephoto Recorder TM 835

Weather satellites supply meteorological offices, research institutes and many other places with photos of the earth's surface within the framework of the "Automatic Picture Transmission System" (APT) and the "High Resolution Infra Red System" (HRIR). The pictures recorded continuously by the satellites cover areas of several million square kilometres even at medium orbital heights.

The photographs are sent out by the satellite radio transmitters, the transmission being picked up by suitable VHF receivers on the ground. The Automatic Telephoto Recorder TM 835 records the photos fully automatically. In this way reliable pictures of the cloud structure over large areas of the earth can be supplied to the meteorological services and other important offices within a few minutes and thus permit a reliable evaluation of the general weather situation.

HELL Automatic Telephoto Recorder TM 835 records the pictures by photographic methods and supplies photos permitting an exact evaluation because the transitions from intense black to brilliant white are stepless and photographic recording prevents losses of sharpness and falsification of tonal values. The picture quality is the same as that of real photographs.



TM 835 Automatic Telephoto Recorder (APT/HRIR)

Combined equipment for fully automatic recording, developing and drying of cloud photos by the APT system (daylight photographs) and HRIR system (night photographs), either the starting programme according to the APT system or the marker pulses according to the HRIR system being utilised and the drum speed switched automatically. Recording is stopped with both systems by end contact.

# Method of Operation and Construction

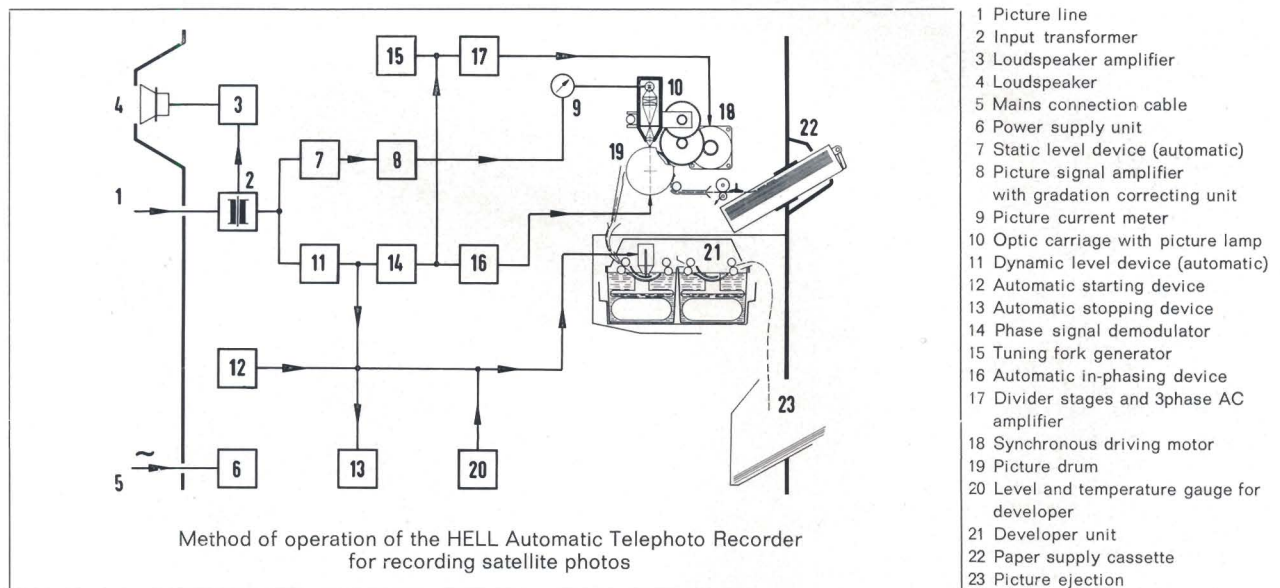
## Method of operation

The HELL Automatic Telephoto Recorder Type TM 835 automatically records cloud photos transmitted by weather satellites and received by suitable radio installations on earth. As compared with the earlier, manually operated equipment, a number of operations which required skill and dexterity in the operator have now been taken over by the electronic control system. For instance, a new sheet of photo paper is automatically withdrawn from the cassette after each picture transmission, fed to the picture drum and securely mounted on the latter. The optical system carriage returns rapidly to its original position and the machine is ready for further operation after 6 seconds. Operation of the equipment is shown in the above diagram.

The picture and control signals transmitted by the satellite are picked up by a polarised, directional aerial belonging to the VHF radio receiver. If necessary, the signal strength is increased in a pre-amplifier before amplification in a crystal-controlled receiver; the signals are then detected and fed to the Automatic Telephoto Recorder via a picture line. These picture signals control a picture recording lamp, whose light beam, fluctuating with the changing amplitude of the picture signals, is directed on to the rotating picture drum and exposes the photo paper in the form of a narrow helix. Picture drum rotation and carriage feed are effected via a gear and synchronous motor, which obtains its constant frequency control voltage from a built-in tuning fork generator. The picture signals and starting programme of the transmission can be heard through a built-in loudspeaker.

The 160 x 160 mm ( $6\frac{5}{16} \times 6\frac{5}{16}$  in.) photos are recorded with an index of cooperation of 270 corresponding to a resolution of approx. 5 lines/mm (125 lines/inch). The drum speed is 240 rev/min for daylight photographs (APT) and 48 rev/min for night photographs (HRIR).

An end contact terminates recording and initiates developing of the photo by automatically removing the exposed paper from the picture drum. The picture is available about 60 sec. after each recording. Separation of the developing and recording processes ensures that the next picture can be recorded while the previous one is being developed. Hence the transmission pauses between the different pictures can be very short. At the end of each transmission the equipment remains in operation until the last recorded picture is developed, fixed and dried.



The HELL Automatic Telephoto Recorder TM 835 for fully automatic recording, developing and drying of satellite photos is constructed and operated in the same way as the well-known automatic telephoto recorders employed by press agencies. All assemblies are neatly arranged in easily accessible positions inside the equipment. Plug-in printed circuits and the extensive use of transistors allow space for the electronically controlled automatic developing and drying system. The photos leave the equipment developed, fixed and dried.

## Construction

The few controls and instruments for monitoring the transmission process are on the top of the machine. The interchangeable cassette for 250 cut sheets of photo paper is supported on the right-hand side wall. A conveyor system accessible from outside is installed under the cassette and delivers the photos to a receptacle after drying.

The automatic developing unit is arranged in the front casing wall. Consisting essentially of two dishes for the developer and fixer, conveyor rollers and drive, the automatic equipment is controlled electronically and is fully enclosed. The liquid level and temperature are constantly monitored by a combined sensor. When the machine is not in use the developer and fixer are kept in plastic containers, whence they are forced by compressed air into the dishes if photos are being recorded. In this way the liquids are largely protected against evaporation and the interior of the machine against corrosion. One filling of developer and fixer is sufficient for processing 250 photos. The liquids can be kept in the machine for more than 2 weeks or can be stored for one year in their unopened original containers. The automatic developing unit can be pulled out from the front of the machine when the baths require renewal.

The TM 835 satisfies all technical requirements and its operating data and method of operation conforms to the standards of the space authorities (NASA).

# Automatic Telephoto Recorder TM 835

## Tape recordings of satellite photos

If copies of satellite photos are required, the transmissions can also be stored on magnetic tape in addition to picture recording by an automatic telephoto recorder. All good commercial 2-track tape recorders with 19 cm/min (9.5 cm/min) tape speed are suitable for these recordings.

## Storage of satellite photos on tape

If all or only specific satellite photos are to be transmitted by lines or radio links to other offices, it is advisable to record them by means of a HELL Telephoto Tape Recorder. Recording takes place simultaneously with picture recording in the automatic telephoto recorder. During reproduction either entire satellite orbits or only individual picture can be sent out within the framework of meteorological transmissions or at any time.

## Technical Data

### Automatic Telephoto Recorder

for recording of cloud photos taken from weather satellites

Index of cooperation

Drum rotation speed

Recording system

Picture size

Paper size

Definition

Recording times

Picture drum

Modulation

Carrier frequency

Picture frequency

Picture signals

Picture line

Line impedance

Signal input

Automatic level control

Starting programme

APT system:

HRIR system:

Stop

Synchronization

Tuning fork natural frequency

Adjustment range

Temperature coefficient

Picture developing and drying

Developing time for one picture

Mains voltages (switchable)

Permissible mains voltage fluctuations

Mains frequencies (switchable)

Power consumption

Dimensions

height

width

depth

approx.

Weight when ready for use

### Type TM 835

APT/HRIR-Program

270 (CCITT)

240/48 r.p.m.

photographic, positive

160 x 160 mm (6<sup>5</sup>/<sub>16</sub> x 6<sup>5</sup>/<sub>16</sub> in.)

165 x 165 mm (6<sup>1</sup>/<sub>2</sub> x 6<sup>1</sup>/<sub>2</sub> in.)

5 lines/mm (125 lines/inch resp. 800 lines/picture)

200 sec./picture (APT-System)

1000 sec./picture (HRIR-System)

53.6 mm (2<sup>7</sup>/<sub>64</sub> in.) diameter, 167 mm (6<sup>37</sup>/<sub>64</sub> in.) length

AM

2400 c.p.s.

max. 1600 c.p.s.

white = max. carrier frequency

black = approx. 35 db below maximum

2-wire cable

600 ohms

min. 0.75 V, max. 1.0 V

between -20 to +2.5 db

3 sec. 300 c.p.s. modulated carrier, 5 sec. phasing-in signal

Marker pulses

after 200 seconds by end contact

Tuning fork generator Type St 79 S

480 c.p.s.

less than 5 parts in 10<sup>7</sup>/°C

± 80 parts in 10<sup>6</sup>

automatically

approx. 60 seconds

105, 115, 125, 200, 220, 240 V

± 10 %

50 . . . 60 c.p.s.

approx. 1000 VA

1080 mm (3 ft. 6 1/2 in.)

810 mm (2 ft. 8 in.)

630 mm (2 ft. 1 in.)

160 kg (350 lbs.)

### Special Accessories

Tape Recorder

commercial, 2-track tape, for tape speed 19 cm/min (7.5 in/min) or 9.5 cm/min (3.8 in/min)

Telephoto Tape Recorder

Type SP 890 for satellite photos, consisting of Recording Unit, Retransmitting Unit and Rewinding Unit; with Monitor on request

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