

# INSTRUCTION BOOK

No. 1572.\*

## CINEMATOGRAPH PROJECTOR MECHANISM

TYPE A, FORMS K AND KB,

AND

TYPE A, FORM KC WITH FIREPROOF SPOOLBOXES.



THE BRITISH THOMSON-HOUSTON Co., LTD.,

RUGBY, ENGLAND.

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## IMPORTANT.

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The Cinematograph Projector Mechanisms described in this Instruction Book have been designed, manufactured, and tested with care. With proper attention they should give the purchaser the service that he may reasonably expect.

The purpose of this Instruction Book is to explain the function of the apparatus, and the manner in which it should be erected, adjusted and maintained.

If you desire further information, this will be supplied promptly upon request.

Please address enquiries from Great Britain and Ireland to the nearest BTH Service Depot (listed on page 10).

The serial number stamped on the nameplate should be mentioned in all enquiries.

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# CINEMATOGRAPH PROJECTOR MECHANISM

TYPE A, FORMS K, KB, AND KC.

FORM KC WITH FIREPROOF SPOOLBOXES.

*(Patents pending).*

THE Projector Mechanism, Type A, Forms K and KB, embodies a hinged gate with a large rear flicker shutter and integral changeover devices; the intermittent sprocket is driven by a maltese cross and roller mechanism. The K and KB mechanisms differ slightly in the lubrication arrangements, but are otherwise identical.

The Form KC is provided with a manually lubricated fire shutter which gives a greater flexibility in controlling the oil flow than is obtained with the automatic lubrication provided as the K and KB forms. The Form KC also incorporates an improved framing shaft assembly and a gate light shield to prevent arc glare from the back glass of the projection lens. With the foregoing exceptions the Form KC mechanism is similar to Form KB.

Continuous lubrication to all bearings and moving parts is ensured by an oil pump, and the prevention of oil throwing and leakage of oil is one of the features of the design.

All the main components can be quickly separated and reassembled, and all moving parts can be readily inspected and adjusted.

It should also be noted that the complete intermittent mechanism can be withdrawn as one unit from the main casing. The maltese cross and rollers operate in an oil bath formed by the cross box, the oil being in continual circulation.

Another noteworthy feature is the very low temperature at which the gate operates, even with a high intensity lantern, thus preventing damage to the gate aperture and film.

Easy, rapid, and accurate threading of the film has been provided for by the careful design of the pad rollers and the gate opening mechanism.

It cannot be emphasized too strongly that the successful operation of the cinematograph projector mechanism depends largely upon (a) systematic inspection at regular intervals; (b) keeping the mechanism clean; (c) maintaining all the working parts in good condition; and (d) following carefully the instructions on lubrication.

## OPERATION AND ADJUSTMENT.

### SPROCKETS AND ROLLERS.

Each sprocket is keyed on its spindle, and held in position by means of a cheese-headed screw 3, Fig. 1, which enables the sprocket to be removed easily. The sprocket is reversible, so that when a new sprocket is fitted the best running conditions may be obtained.

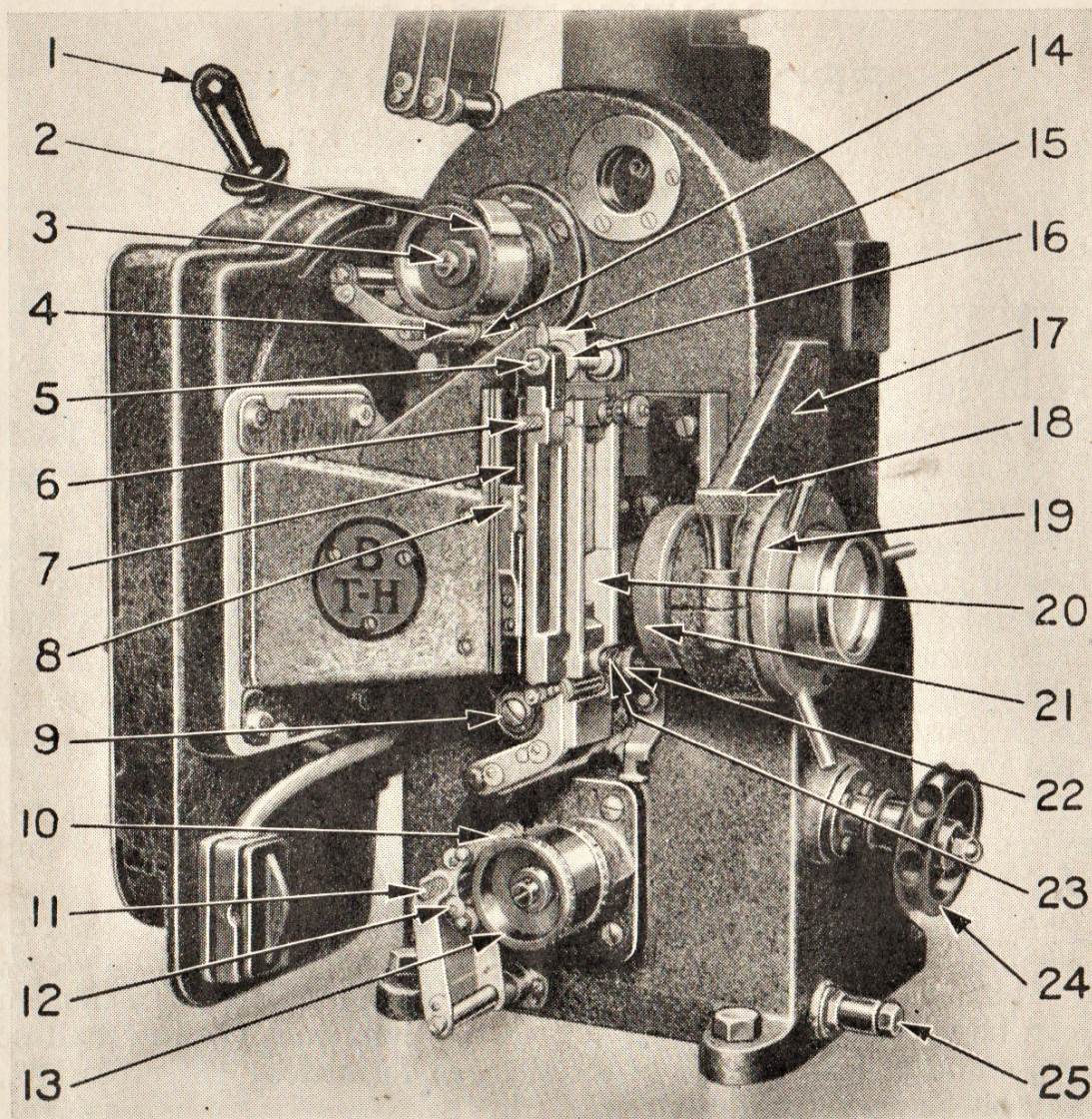


Fig. 1. General view of the Projector Mechanism, Type A, Form K.

- |                                  |                                            |
|----------------------------------|--------------------------------------------|
| 1. Changeover device.            | 14. Pad roller adjusting screw.            |
| 2. Top feed sprocket.            | 15. "Framing" aperture.                    |
| 3. Sprocket retaining screw.     | 16. Guide roller.                          |
| 4. Pad roller.                   | 17. Lens carrier.                          |
| 5. Guide roller adjusting screw. | 18. Locking screw for focusing adjustment. |
| 6. Gate skid retaining pin.      | 19. Screwed lens sleeve,                   |
| 7. Aperture plate.               | 20. Gate skid.                             |
| 8. Gate opening button.          | 21. Clamping ring for lens sleeve.         |
| 9. Intermittent sprocket.        | 22. Gate tension adjusting screw.          |
| 10. Pad roller.                  | 23. Gate tension spring.                   |
| 11. Finger grip on spindle.      | 24. Self-locking frame adjustment.         |
| 12. Eccentric locking washer.    | 25. Oil drain plug.                        |
| 13. Bottom feed sprocket.        |                                            |

## OPERATION AND ADJUSTMENT (CONTINUED.)

### SPROCKETS AND ROLLERS (CONTINUED).

In fitting an intermittent sprocket, make sure that the cross is in the locked position. The cheese-headed fixing screw in the end of the shaft must not be overstrained. The screwdriver should fit the slot accurately, and must be held in line with the shaft so as to avoid any side pressure tending to bend the shaft.

All pad rollers are easily removable. Each roller assembly is made in three pieces thus facilitating free running and lubrication of the rollers.

To remove a roller for cleaning, slacken the screw that holds the eccentric locking washer (one being indicated at 12, Fig. 1) the edge of which fits in the slot in the roller spindle; rotate the washer clear of the spindle and then withdraw the spindle.

### ADJUSTMENT OF PAD ROLLERS.

The clearance of pad rollers on the sprocket can, in each case, be adjusted by a small screw 14, Fig. 1, which limits the movement of the pad roller bracket by coming into contact with the sprocket bearing cowl. These screws should be adjusted to give the following clearances between the rollers and the sprockets:—

1. On the top and bottom sprockets—0.018" (3 thicknesses of film)
2. On the intermittent sprocket— 0.012" (2 thicknesses of film)

### THREADING THE FILM IN THE PROJECTOR.

The following procedure for threading a film is recommended.

Place the film in the top spoolbox and with the spoolbox doors open, run off about 6 ft. of film.

Rotate the projector by hand until the intermittent sprocket 9 has just finished rotating, as shown by the dots on the washer on the intermittent shaft.

Place the film in the top fire-trap and close the spoolbox door.

Then thread the film as shown in Fig. 2.

### INTERMITTENT MECHANISM.

This unit, accurately adjusted and tested before dispatch, should normally require no attention. However, should it be thought that the mechanism is not working satisfactorily, a complete new unit should be substituted. **It is strongly recommended that this operation should be performed by a BTH Service Engineer.**

**Under no circumstances whatsoever should the mechanism be interfered with.**

### FRAMING AND SHUTTER-PHASING MECHANISM.

This mechanism is operated by a handle 24, Fig. 1, located on the front of the main gear-case.

One complete rotation of the framing handle moves the film one entire picture.

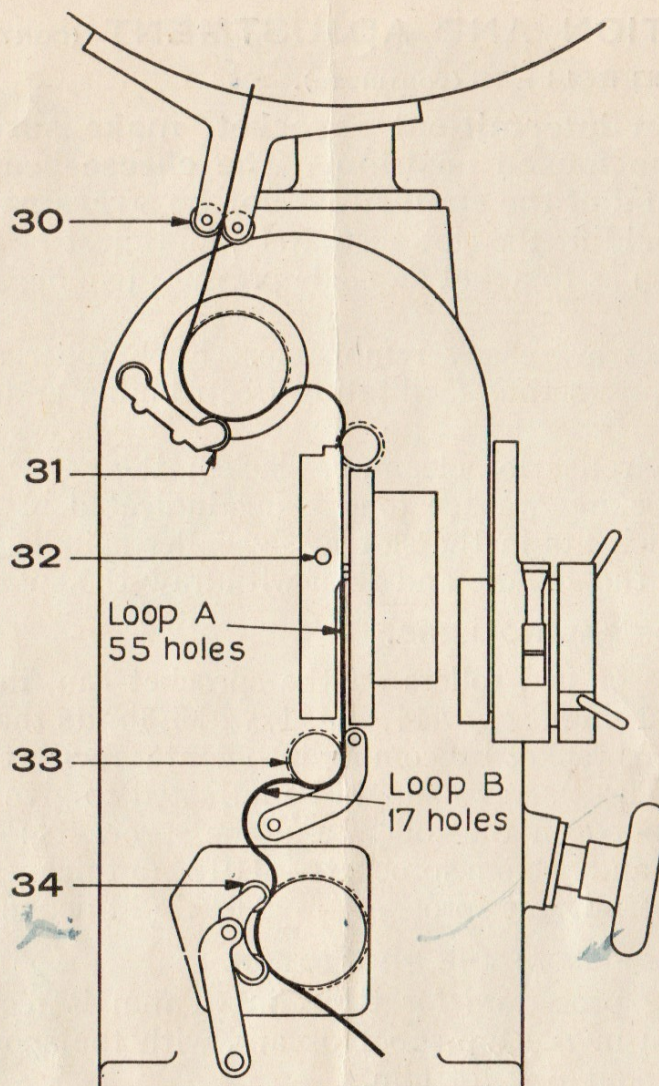


Fig. 2. View showing a film threaded properly in the projector mechanism.

- |                                                  |                                        |
|--------------------------------------------------|----------------------------------------|
| 30. Bottom fire-trap-roller of the top spoolbox. | 33. Intermittent sprocket.             |
| 31. Top sprocket pad roller.                     | 34. Top pad roller of bottom sprocket. |
| 32. Gate-opening button.                         |                                        |

#### CHANGEOVER DEVICE.

The changeover shutters on each projector are coupled together by a Bowden cable. The changeover can be made from either mechanism, by operating the handle 1, Fig. 1, situated on top of the shutter housing at the rear of the projector. The Bowden cable should be adjusted occasionally to take up any stretch which may have developed.

#### GATE ASSEMBLY AND ADJUSTMENT.

The gate is equipped with guide rollers 16, Fig. 1.

The complete assembly is fixed to the main gear case by a registering key and three cheese-headed screws, the middle one of which serves as a stop to prevent the gate from fouling the lens.

**GATE ASSEMBLY AND ADJUSTMENT (CONTINUED).**

The guide rollers 16, Fig. 1, are in two sections. One section is fixed in position on the spindle but is free to rotate and can be adjusted by means of the adjusting screw 5. The other section is spring-loaded.

The hinged portion of the gate may be removed for cleaning by taking out the hinge pin. To do this, place a screwdriver in the saw-cut on top of the pin, and rotate the pin slightly in an anti-clockwise direction. This will release the pressure of the hexagon against the gate casting, when the pin may be pushed up easily from the bottom.

When replacing the pin, care must be taken that the projecting end of the spring is on the near side of the hinge bracket. Rotate the pin in an anti-clockwise direction to apply the necessary spring tension, and finally push the pin right home.

The spring-loaded gate skid 20, Fig. 1, can easily be removed by unscrewing the knurled head retaining pin 6.

Adjustable gate tension springs 23 are fitted to the top and bottom of the skids. These springs should be adjusted to give an equal amount of tension at each end of the skids.

The function of the gate skids is to bring the film to rest immediately the sprocket stops rotating and with the picture frame coincident with the gate aperture. The skids also hold the film perfectly flat over the gate aperture whilst it is at rest.

If the pressure on the skids is too light, the film will not necessarily come to rest in exactly the same place each time, which will cause a very unsteady picture. On the other hand, too great a pressure on the skids will cause unnecessary wear in the intermittent mechanism and film sprocket holes.

It is always advisable to run with the lightest possible skid pressure consistent with a steady picture. In no circumstances apply excessive pressure on the skids to prevent unsteadiness, which may be due to causes other than film tension.

Care should be taken not to use skids with damaged or distorted faces, otherwise they may not hold the film perfectly flat in the aperture plate, and may damage the film surface. If wooden skids are fitted, it is recommended that, when not in use, they should be removed from the projector and left soaking in projector oil.

**"KC" MECHANISM ONLY.**

A light shield is fixed on the stationary portion of the gate. This is hinged so that it can be swung back to the light tunnel when threading up the mechanism or cleaning the gate.

**LENS CARRIER.**

The lens carrier 17, Fig. 1, is of the fixed type and is rigidly mounted on the gear-case casting.

**LENS CARRIER (CONTINUED).**

The standard lens carrier is designed to accommodate British lenses  $2\frac{1}{16}$ " diameter over the barrel. Special carriers can be supplied to suit other lenses.

The lens body is a slide fit in the lens carrier sleeve 19, which is split at one end. It is screwed into the split lens carrier 17, which can be locked in position by means of a thumb screw 18. The clamping ring 21 is screwed on to the split end of the sleeve, and clamps the sleeve on to the lens body.

Rough focusing is obtained by slackening off the clamping ring 21, adjusting the lens by hand and re-clamping. The lens sleeve 19, should be about in the middle of its travel.

Accurate focusing is then obtained by loosening the thumb screw 18, rotating the lens sleeve 19, and tightening up the thumb screw.

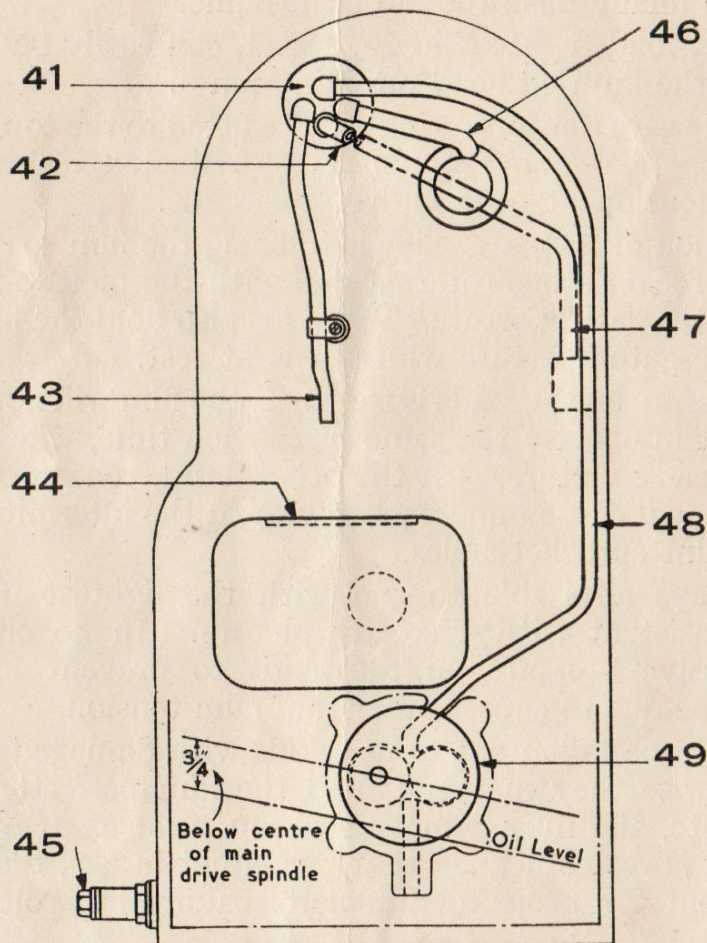


Fig. 3. Lubrication diagram.

- |                                                           |                                                                            |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| 41. Oil sight.                                            | 46. Feed pipe to top sprocket bearing, gear train, and main drive spindle. |
| 42. Oil splash feed to shutter bearing on Form K machine. | 47. Feed pipe to shutter bearing on Form KB machine.                       |
| 43. Oil splash feed to intermittent mechanism.            | 48. Delivery pipe.                                                         |
| 44. Filter on intermittent mechanism.                     | 49. Oil pump.                                                              |
| 45. Drain plug.                                           |                                                                            |

**LUBRICATION.**

The lubrication is very simple and can be easily understood by reference to Fig. 3. Asteroil AA is the only oil that should be used. The oil pump 49, Fig. 3, in the bottom of the gear-case is driven directly by the main driving spindle, and pumps oil from the sump into the oil sight 41 near the top of the gear-case.

From the oil filter in the oil sight the oil flows by gravity down three oil pipes, one to provide splash feed to the intermittent mechanism, one to feed the top sprocket bearing gear train, and main drive spindle, and the third on the Form K machine provides a splash lubrication to the shutter bearing; on the Form KB machine, this oil pipe is extended to the shutter bearing.

The bottom hold-back sprocket bearing is lubricated by oil direct from the inside of the pump.

**"KC" MECHANISM ONLY.**

As the fire shutter only rotates when the mechanism is started up or shut down, it only requires very little lubrication. The shutter should not be oiled until it appears sluggish in operation and then not more than 3 drops of oil should be dropped into the lubricator which is located on the top of the shutter housing. Over-oiling of the shutter will result in its failing to open when the mechanism is started up.

**BOTTOM SPOOLBOX CLUTCH.**

To adjust the slip of the clutch on the bottom spoolbox, the adjusting knob should be rotated in a clockwise direction to increase the spring pressure according to requirements.

The clutch should operate with the minimum pressure. This condition is obtained when the clutch will just keep the film taut between the hold-back sprocket of the soundhead and the spool. It should be tested with a fully-loaded spool.

A lubricator is provided on the spoolbox spindle for oiling, although care should be taken to keep the clutch leather clean and free from oil.

**PRECAUTIONS TO REDUCE FIRE RISKS.**

The following instructions are intended as a guide in regulating projection room practice, so that the danger from fire is reduced to a minimum.

1. As the most common cause of fire in the projection room is the film breaking in the mechanism, or coming off the sprocket, all films, during re-winding, should be examined carefully for damaged sprocket holes and defective joints, and all such defects cut out or repaired.
2. All sprockets, gate skids, pad rollers, and fire-trap rollers should be kept in good condition. A worn or damaged sprocket

is a source of danger and may cause the film to come off the sprocket and break ; the same remark applies to a worn or badly adjusted pad roller. A worn gate skid, or aperture plate, or excessive gate tension, which may be applied when worn skids are used, may cause a film joint to break in the gate.

3. The BTH projector mechanism is fitted with aluminium reflectors located at the back of the gate. These help to keep the gate cool and their surfaces should be kept clean. If the gate temperature increases above normal, these surfaces should be examined after removing the gate assembly, and if the surfaces have become dirty or stained they should be cleaned with carbon tetra-chloride or a similar cleaning agent.
4. If a film breaks in the projector or soundhead, stop the projector as quickly as possible. If the film is allowed to pile up on top of the gate, or other part of the mechanism ; it will most probably ignite and cause a large conflagration.
5. If fire occurs in the spoolbox, on no account attempt to retrieve the film, but keep the door shut and envelop the spoolbox in a fire blanket.
6. The hand-operated light cut-off and changeover shutter on the projector should not be opened when the projector mechanism is not running.
7. If a serious fire occurs on a projector it is always advisable to have the projector examined by the makers at the earliest opportunity. In the case of BTH projectors, engineers are available at short notice from all service depots.

### MAINTENANCE.

The complete projector should be thoroughly cleaned after each period of operation, and the oil supply should be changed periodically.

The following items should receive special attention :—

#### DAILY.

- (a) Sprockets should be cleaned and, if necessary, a stiff brush used to remove any dirt or emulsion which may have collected between the teeth.
- (b) Spoolbox fire-traps and rollers should be cleaned and inspected for any small pieces of broken film or other foreign matter collecting behind the rollers.
- (c) Clean pad-rollers and gate guide-roller, and see that they rotate freely.
- (d) Clean gate aperture plate, any emulsion being scraped off with a non-ferrous metal tool ; emulsion can be removed more easily by moistening it with water.

- (e) Detach the removable part of the gate, clean, and inspect. If wooden gate skids are fitted, they should be lubricated by soaking overnight in projector oil, surplus oil being removed with a clean rag when replacing them in the projector.
- (f) Remove any traces of surplus oil from projector or spool-boxes.
- (g) Examine lens surfaces, and, if necessary, clean carefully with a soft cloth, which should be reserved for the purpose.

**AFTER FIRST 10 HOURS RUN.**

The oil in the gear-case should be changed. Use only BTH Asteroil AA, and fill to the level indicated in Fig. 3.

Inspect oil filter in the oil sight, and if necessary wash out with clean oil.

**NOTE.**—When removing oil filter, care must be taken not to screw down the clamping ring too tightly, or unevenly, otherwise the glass will crack. It may also be necessary to renew the rubber gasket.

**AFTER EVERY 50 HOURS.**

Lubricate pad-rollers, gate-rollers, fire-trap-rollers. Fill lubricators on spoolbox, and adaptation gear. Wipe off any surplus oil from rollers and fire-traps.

**AFTER EVERY 250 HOURS.**

Drain the gearbox, wash the oil filter in clean oil, and then pour in sufficient clean Asteroil AA to cover the inlet hole to the pump.

Run the machine sufficiently long to work the oil into the pump and through the oil pipes, and then drain off and refill to the level indicated in Fig. 3 with clean Asteroil AA.

**AFTER EVERY 1000 HOURS.**

Examine filter on intermittent box; remove filter and wash with clean oil if necessary.

Examine the bottom of the gear-case by removing the nine screws securing the back plate, taking care not to damage the gasket. Remove any sludge that may have collected, and replace the back plate; the joint between the latter and the casting must be made oil-tight with suitable jointing compound.

# MAIN BTH CINEMA SERVICE DEPOTS IN BRITISH ISLES.

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