INSTRUCTION PAMPHLET

MH18600

MAINTENANCE
INSTRUCTIONS
FOR

SEARCHLIGHT SIGNALS

MAY 1960

McKENZIE & HOLLAND (AUST.) PTY. LTD.
MELBOURNE & BRISBANE

McKENZIE & HOLLAND (AUST. PTY. LTD.)

INSTALLATION AND MAINTENANCE OF SEARCHLIGHT SIGNALS

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1. GENERAL

The searchlight type color light signal consists of an outer case which includes the lens, lens hood and mounting bracket, and an operating relay. The outer case proper is the same for all signals. Two types of mounting brackets are furnished for high signals. One type is designed for side of mast mounting, the centre line of the signal being approximately nine (9) inches from the centre line of the mast. Another type of mounting bracket is furnished providing for front of mast mounting. High signals are furnished with a background and "U" bolts for fastening the mounting bracket to the mast. Each signal is equipped with a sighting device for aligning the signal.

The signal operating unit is shipped in a separate container, being carefully packed to provide against damage to the mechanism in handling. The operating unit is accurately located and fastened in the case by means of three (3) fixed studs. The units are interchangeable in the sense that it is not necessary that a unit be installed in a particular case, provided of course that the unit and case are of the same type.

2. OPERATING UNIT

In standard three color light signalling, the red roundel is located in the centre and is in the light beam when the control coil is de-energised.

Current passed through the control coil in one direction rotates the vane (or armature) against a stop to bring the yellow roundel into the light beam. Current passed through the control coil in the other direction rotates the vane (or armature) in the opposite direction against a stop to bring the green roundel into the light

beam. Thus the required change in colors is effected. For two color light signalling the vane (or armature) is rotated only in one direction.

The light beam is concentrated at the colored roundel location by means of an elliptical glass reflector, which, with the lamp, lamp socket and reflector holder as a unit, is held in place with spring clips on the retaining plate which in turn is mounted in the case by means of screws and adjusting sleeves.

It is a characteristic of the elliptical reflector that, with the lamp filament located at the focal point of the reflector, the reflected light is concentrated at the other focal point of the complete ellipse, which in this signal unit is approximately the location of the colored roundel. After passing through the colored roundel, the diverging beam is condensed by the lens or lens system into practically a parallel beam. The lamp socket is adjusted and sealed at the factory and accurately based lamps may be placed in the socket without any readjustment.

Depending upon requirements both single and doublet lens systems are available.

2. 1. A.C. OPERATING UNIT

The operating mechanism is essentially a two element, three position, A.C. Vane Relay having two permanent magnets so positioned as to nullify any bounce in operation, and ensuring a dead-beat action.

The moving element is a sector-shaped aluminium vane which rotates approximately fifteen degrees each way from the centre position, at which it stands, due to counterweighting, when de-energised. Directly connected to the vane shaft is a spectacle in which are mounted three colored glass roundels, each of one inch diameter. The roundels are moved into the concentrated light beam, as required, by the movement of the vane.

2. 2. D.C. OPERATING UNIT

The operating mechanism is essentially a three position D.C. motor relay, having an operating or armature coil and a permanent magnet field. The moving element is an iron armature which rotates approximately thirteen and one-half (13½) degrees each way from the centre position, at which it stands, due to counterweighting, when de-energised.

The spectacle is directly connected to the armature shaft.

3. LOCATION OF SIGNALS

The best location for high signals is slightly above the engineman's head and as near the rail on his side of the cab as practicable. It is therefore desirable for "side-of-mast" mounting on ground masts, to locate the signal on the track side of the mast. The supporting arm is fastened to the mast at approximately a right angle to the track, and for "front-of-mast" mounting approximately parallel to the track. If the signal is located too low the lens hood interferes with the "close-up" view of the indication. Where a signal is located on a signal bridge it should be mounted as low as practicable, and, where convenient, approximately in line with the rail on the engineman's side. The location should be such that no part of the bridge structure interferes with the close-up view of the indication.

4. ALIGNMENT

First align the signal horizontally; this is done on high signals by loosening lock nut B and nut A, Figure 1 and turning the signal on stud bolt C as an axis until the vertical cross-hair in the sighting device located on the top of the signal case intersects the point on the

track where the engineman should first see the indication. With the signal in this position, the nut A and then lock nut B should be tightened and the adjustment should be checked by means of the sight to make sure that is has not been changed by the tightening of the nuts. The signal should then be aligned vertically. This is done by loosening nut E and adjusting nut D upward or downward until the horizontal cross-hair in the sight intersects the point on the track where the engineman should first see the indication. Nut E should then be tightened and the adjustment should again be checked to insure that the proper alignment has been maintained. As the light beam is parallel to the sighting device on the signal case, the centre line of the beam will be pointed to the selected location on the track.

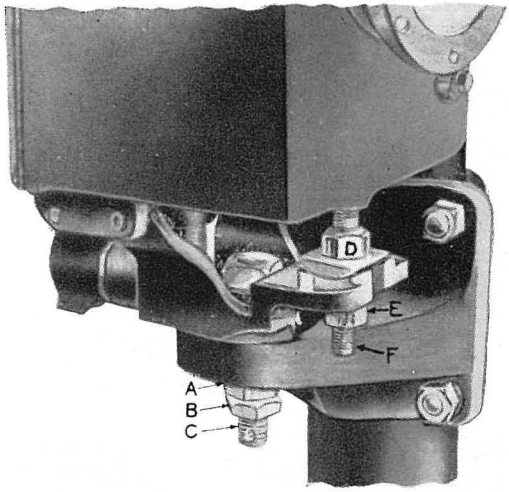


Fig. 1. Adjustable Bracket for "Side-of-Mast" Mounting

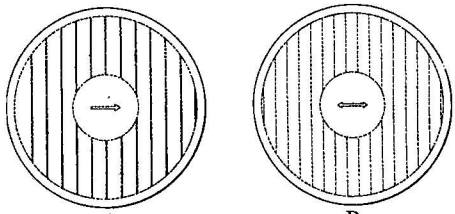


Fig. 2. Cover Glasses

Alignment on Curves

Standard Searchlight Signals are designed to produce a concentrated light beam for long range indication on tangent track or track of small curvature. Special cover glasses can be furnished when additional spread of light beam is required to properly signal track of greater curvature.

Two deflecting prism cover glasses similar to "A", Fig. 2, are available for use on curved track one 10° in one direction only from the centre line for moderately curved track, and the other one 20° in one direction only from the centre line for use where extreme spread is required. Spreadlight cover glasses similar to "B" Figure 2 are available, for 30° spread, being 15° on each side of the centre line.

The arrow in "A", Fig. 2, for deflecting prism cover glasses indicates the direction a portion of the light beam is deflected. It has a definite relation to the prismatic formation on the inside of the cover glass as shown in cross section. It is obvious that the same cover glass can be used to deflect light in the opposite direction by revolving it 180° in its mounting.

The cover glass, with its supporting ring, is mounted in front of the standard lens by means of two screws threaded into the standard lens ring in place of the dummy screws used to protect the tapped holes.

To align a signal on a moderately curved track, focus the sight on the farthest point of the curve, or on any other point where the indication should be first seen by the engineman. Fig. 3 illustrates how the signal is aligned and the deflecting prism cover glass applied. The signal is aligned on the point "X". The main beam is indicated by the full lines. The cover

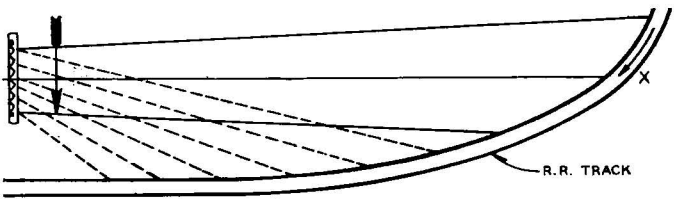


Fig. 3. Diagram showing Alignment of Light Signal Using Deflecting Cover Glass for Curved Track

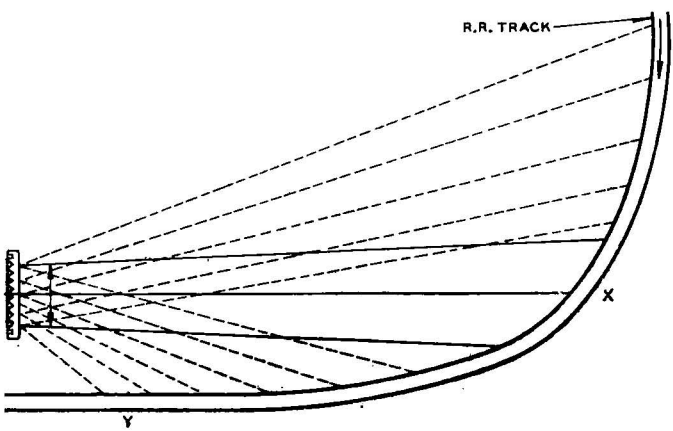


Fig. 4. Diagram showing alignment of Light Signal Using Spreadlight Cover Glasses for Curved Track

glass is applied to deflect a portion of the beam in the direction of the arrow. The deflected light is indicated by the broken lines. After the signal has been aligned, the indication should be observed from the track to determine whether the point of maximum range has been properly selected so as to utilize the full spread of the signal to best advantage around the curve.

For signals located on extreme curves where greater spread and shorter range are required, the spreadlight cover glass "B", Fig. 2, should be used. The sight is aligned half way across the curve at some point "X", Fig. 4 and the beam should be checked along the curve for close indication at "Y".

5. OTHER INSTALLATION DETAILS

When all wires have been brought-in and correctly terminated at the plug couplers, the inside of the signal case and lenses should be carefully cleaned. The operating unit should be inspected, tested and then thoroughly cleaned, particularly all exposed glass through which the light beam passes as well as the glass reflector, if found necessary. A clean cloth which does not deposit lint, dampened with alcohol, should be used to remove any grease or oily substance that may get on the lens, the glass reflector or other glass. The unit may then be fastened on the signal and plug couplers connected. The operating unit should always be handled with care and not subjected to shock and under normal conditions should not be opened. Where a signal is not to be immediately placed in service, it is advisable that a piece of paper be placed in front of the reflector to prevent reflected light from giving an indication.

Operating units are equipped with two front and two de-energised independent contacts per side, wired to terminal posts as designated.

All four (4) de-energised contacts are closed when the unit is de-energised. Two (2) of these contacts open and two (2) of the front contacts close when unit is operated to the "yellow" position, the other four (4) contacts being operated when unit is energised to the "green" position.

A wiring diagram of the unit is placed on the inside of the door of each signal case. With voltage polarity applied as shown on the diagram, the vane or armature should operate in the direction indicated.

It is important to check the voltage applied to the signal and the signal lamp when connected. In the A.C. signal the lamp is connected in series with the local winding of the operating unit.

6. INSPECTION AND TEST OF OPERATING UNIT

The operating unit should be given a visual inspection to see that it has not been physically damaged in shipment. Check to see that the glass base is not cracked or disturbed or that the glass reflector or any of the glass parts are not cracked or broken. By visual observation through glass base see that the counterweight arms and connections to the contacts are properly in place and on the A.C. unit that the vane is centrally located in the two element field gap and the permanent magnet gaps. Rock the unit gently sideways and see that the vane or armature rotates and the mechanism operates freely.

The pick-up and release of the unit should then be taken to see that these operating values are in practical accord with the values given on the test label, for the particular type of unit.

Release

Apply rated voltage to the control terminals and then gradually reduce this voltage until the front con-

tacts open. This value of the voltage is the release or drop-away and should not be less than the value stated on the test label.

Pick-up

Immediately after measuring release, the circuit should be opened for one second and then voltage applied in the same direction and gradually increased until the unit picks up and the front contacts are "made". This value is the pick-up, and should not be greater than the value stated on the test label.

The polarity of the voltage on the control coil terminals should then be reversed and the release and pick-up taken in the same manner in the reverse direction.

It is desirable in taking pick-up and release that the voltage applied to the control terminals be varied very gradually to aid in detecting any friction or mechanical resistance to the movement of the vane.

7. MAINTENANCE

The first essential of maintenance of the signal is cleanliness. The case door should be kept tightly closed, except when necessary to open it, to keep all dust, rain, snow, etc. out of the signal. It will therefore usually be only necessary to clean the outside surface of the lens occasionally as the conditions of the atmosphere, etc. require. If dust or foreign material collects on the reflector or glass through which the light beam passes or on the inside of the lens for any reason, it should, of course, be cleaned off. To clean both sides of the lenses, it is necessary to remove the operating unit and the hand-hole cover. The windows in the operating unit, the reflector and the lamp can be cleaned whilst out of the case. A lintless cloth as described in Section 5 should be used for this operation.

Except in cases of emergency, we recommend that the operating unit not be opened in the field. If, for any reason, the unit is thought not to be in proper operating condition, we recommend that it be replaced by a spare operating unit and sent to the railroad repair shop or to our factory for investigation and repair.

Periodical inspection should be made of the colored glass roundels to see if they are properly in place or broken. Inspection of the colored roundels may be made be removing the reflector holder and observing the roundels through the glass at this location. Occasionally a roundel will crack due to a strain set up in the glass on account of the intense heat of the concentrated light beam. The roundels, however, are made from special heat resisting glass to withstand this heat. A simple crack through the glass is not considered objectionable as the small retaining ring around the edge of the glass will hold the parts in place. If, however, a double crack should occur or a small piece break out, allowing white light to pass through, the roundel should be replaced. It is not recommended to replace any faulty roundel in the field, as considerable damage could be inflicted on both the pivots and roundel bracket, but to replace the unit with a spare unit and return the faulty unit to the railroad workshop or to our factory for repair.

Considerable accuracy is required in the adjustment of the lamp socket with respect to the reflector to insure that maximum efficiency and proper alignment with the sighter are obtained. Replacement of the reflector alone, in signals where the reflector has been broken, does not insure that best results will be obtained and for this reason only two methods of replacement are recommended. Either replacement of the reflector complete with a reflector holder adjusted at the factory, or returning the complete operating unit to our factory where the lamp socket can be re-adjusted.

In the A.C. operating unit the vane spindle is mounted in special agate pivots and as no oil should ever be used on these bearings or other pivots of the relay, there is normally no occasion to open the unit.

In the D.C. operating unit the armature is mounted on knife-edge bearings, no lubrication being necessary.

We recommend that the pick-up and release of the operating unit be taken and recorded periodically. This should be done as outlined herein under "Inspection and Tests" (Section 6). As the iron structure of this unit is made of a special non-aging iron, very little variation may be expected from the operating values given in the table, on account of residual magnetism. The principal purpose of the electrical test, therefore, is to determine whether any friction is developing in the vane spindle or armature bearings or other moving parts. A "jerky" movement of the vane or armature when the control coil or armature coil current is varied gradually, is an indication of friction, roughness or foreign particles in the bearings or pivots of the moving parts. When this test is made, the operation of the contacts, when used, should be observed to see that they are closing properly. An increase in pick-up value or a decrease in release of over 20%, in our opinion, would indicate undue friction and would justify sending an operating unit to the shop for investigation and repair

8. LAMPS

Lamps furnished by McKenzie & Holland (Australia) Pty. Ltd. for the searchlight type signal are based with the filaments accurately located with respect to the pins in the base. It is obvious that when such a lamp is installed for replacement, the signal indication will remain the same as before. If non-precision lamps, having filaments appreciably off the true location,

are used, not only will the signal indication be impaired, but the alignment of the light beam may not be parallel to the sighting device on the signal and therefore not pointed in the direction indicated. For best results, therefore, it is desirable that only accurately based lamps be used.

To instal or remove the operating unit it is first necessary to remove the reflector and then to remove the three cheese-headed screws which pass through the adjusting sleeves (16) and attach the reflector retaining plate (9) to the case.

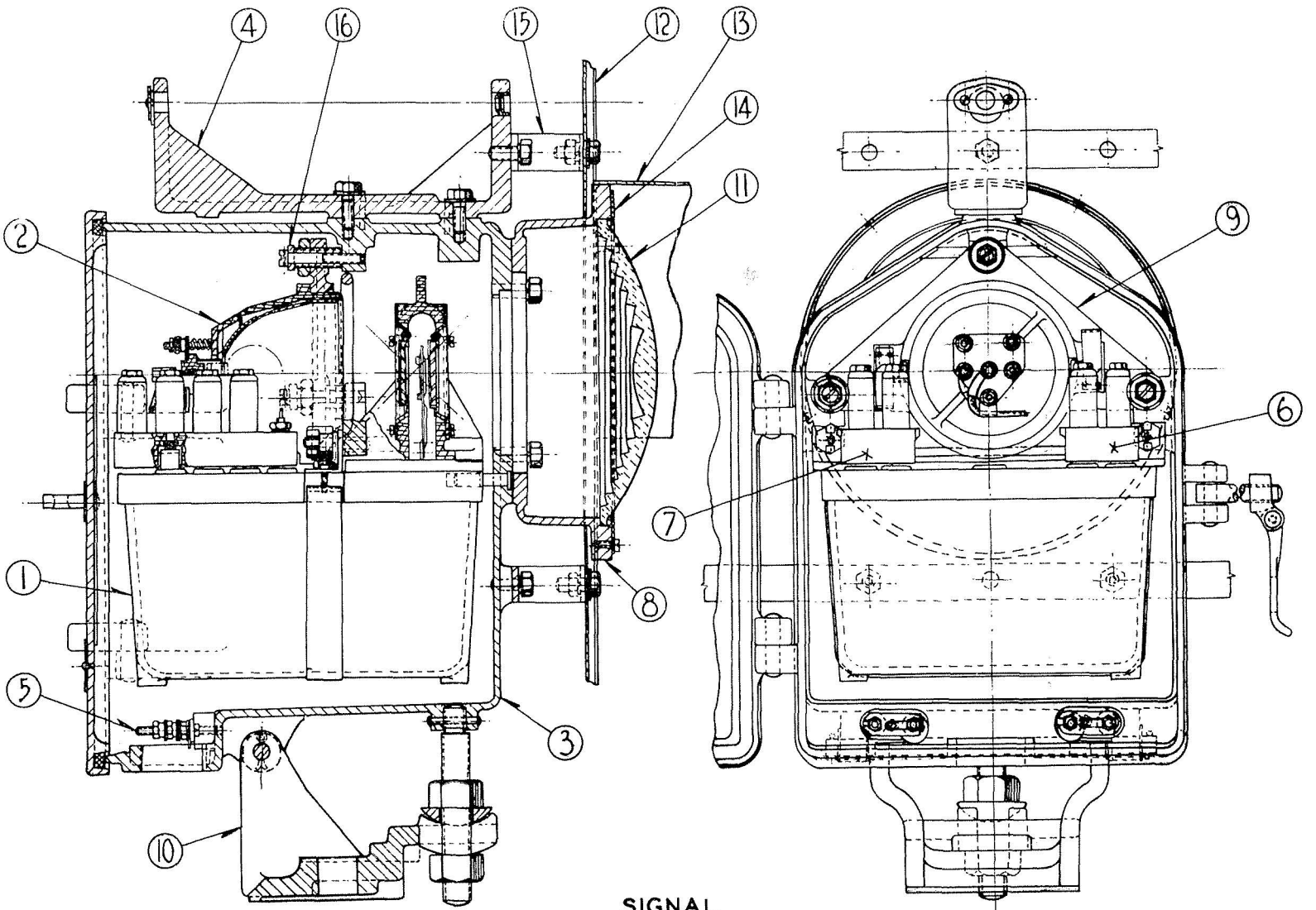
WARNING: Do not attempt to turn the hexagon headed adjusting sleeve or nuts as these parts are soldered together to maintain the correct focal adjustment of the optical system.

NOTE: References (9) and (16) above apply to the style "K2" diagram. The instructions apply equally to the style "K3" signal.

McKENZIE & HOLLAND (AUST.) PTY. LTD.

ORDERING REFERENCES FOR SEARCHLIGHT SIGNAL STYLE "K2" 3 ASPECT

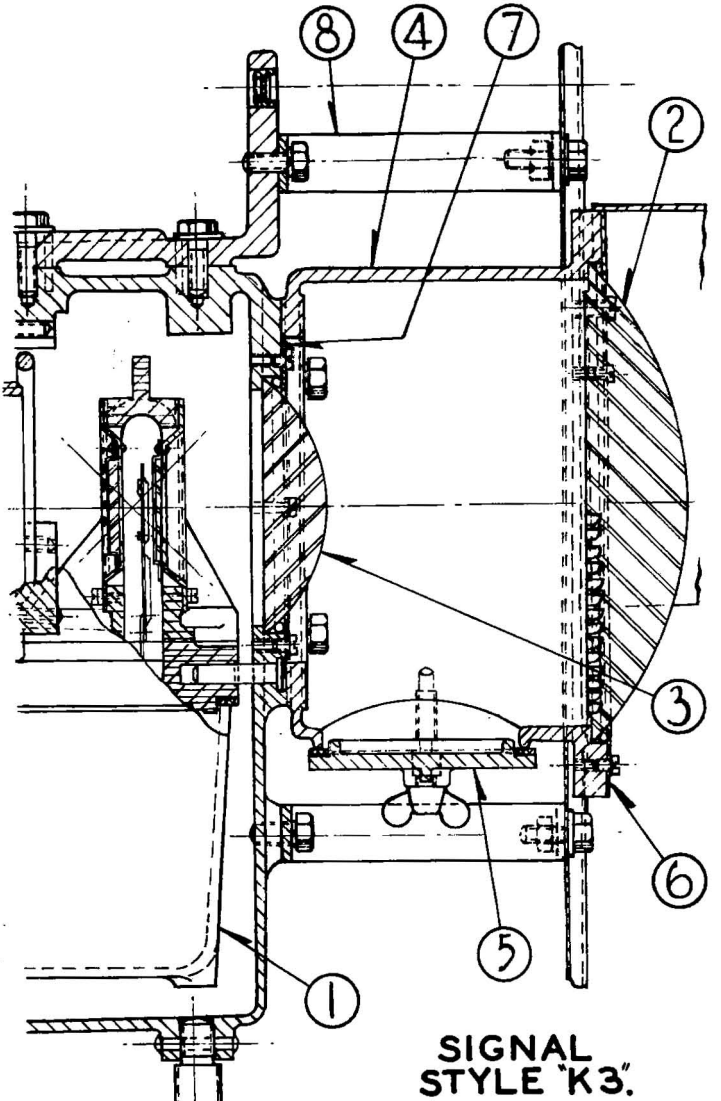
No.	Piece No.	Drg. No.	Sheet	Qty.	Name of Part	Material
1		EM225	1 (A.C.) or 2 (D.C.)		Relay Complete (Voltage and spectacle arrgt. as specified.)	
2		B7622/1			Reflector Complete	
3	M12788	EM217	1		Case & Cover Complete	
4	M13118	CM604	4		Sight Bracket Complete	
5	M12282	AM1170	81		Terminal Block Complete	
6	M12839	BM174	31		Plug Coupler Complete R.H.	
7	M12838	BM174	31		Plug Coupler Complete L.H.	
8	M13063	CM604	3		Adaptor	
9	M13064	BM843	3		Retaining Plate–Reflector	
10	M8510	CM350	15		Bracket–Signal Mtg.	
11		B7780			Lens	
12	M8545	BM539	5		Background	
13	M13036	BM345	8		Hood	
14	71187	AM866	1		Lens Ring	
15	M13065	AM2707	42		Background Strap	
16	M13119	AM3035	92		Adjusting Sleeve	



SIGNAL
STYLE "K2".

ORDERING REFERENCES FOR SEARCHLIGHT SIGNAL STYLE "K3" 3 ASPECT

No.	Piece No.	Drg. No.	Sheet	Qty.	Name of Part	Material
1		EM225	1 (A.C.) or 2 (D.C.)		Relay Complete (Voltage and spectacle arrgt. as specified.)	
2		B7139	1		Front Lens	
3		B4331	1		Inner Lens	
4	M8583	CM604	1		Lens Adaptor	
5	M8483	AM1466	30		Lens Inspection Cover	
6	71187	AM866	1		Lens Ring (Front)	
7	M8519	AM866	16		Lens Ring (Inner)	
8	M8518	AM2707	42		Background Strap	
	Not Shown					
	M14238	BM174	31		Plug Coupler Complete R.H.	
	M14237	BM174	31		Plug Coupler Complete L.H.	



SIGNAL
STYLE "K3".

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