

## GENERAL INFORMATION AND ORDERING INSTRUCTIONS FOR COLOR LIGHT SIGNALS

- 1—In this catalog will be found plates and ordering references covering assemblies and detail parts of the Styles "R-2", "TR-2", "P-5", "TP-5", "N", "N-2" and "N-3" Color Light Signals.
- 2—Light Signals are divided into classes by their range. The range required is determined by the speed at which trains may run, assuming an unobstructed view and signals on tangent track.
- 3—A long range signal is secured by accurate location of the lamp filament at the focal center of the lensing system. Maximum economy of energy is secured by the use of lamps having concentrated filaments. The range and spread of a light signal will vary considerably with the type of lamp used, the more distributed the filament, the greater the spread, and the shorter the range.
- 4—Extensive use has proved that the  $8\frac{3}{8}$ " lens is ample for the very exacting requirements of long range signals in high speed steam road service. The  $6\frac{3}{8}$ " lens serves the purpose very well for short range signals.

### STYLES "R-2" AND "TR-2" LIGHT SIGNALS: (Formerly Styles R and TR respectively).

- 5—The Styles "R-2" and "TR-2" Signals consist of a signal case containing the lamp units, supporting brackets for attaching the case to the mast, a platform, ladder, mast, socket and pinnacle. The signal may be arranged for mounting directly on a foundation or on top of a single or double instrument case. By means of the adjustable supporting brackets any desirable alignment of the signal in either the horizontal or vertical plane may be secured. The adjustments in these two planes are entirely independent. The signal can be aligned approximately with very little difficulty by simply pointing it in the direction desired, but for accurate alignment and to secure the best long range indication on tangent track as well as on curves, a sighting telescope should be used. Mounting Brackets of the Styles "R-2" and "TR-2" Signals allow the Units to be located a maximum of 15" off center of the Pole, either to right or left.
- 6—Styles "R" and "TR" Signals can be converted into "R-2" and "TR-2" by applying close up indication deflecting unit Ref. 7 or 7a, Plate B-2531 between inner and outer lenses. All other details are exactly the same.

### STYLES "P-5" AND "TP-5" LIGHT SIGNALS:

- 7—The "P-5" Signals are designed to provide accuracy in both the vertical and horizontal alignments and also, to meet the requirement of some railroads that the signal have a built-in sight, making a separate sighting telescope, such as that shown on Plate B-2600, Fig. A, unnecessary.
- 8—The adjustable supporting socket for the "P-5" Signal, illustrated in Fig. 1 is made up of two cast iron sleeves, one fitting over the other and so designed that the outer sleeve will rotate on the inner one, all points of contact between the two being machined and thus providing smooth and easy rotation. The inner sleeve is clamped directly to the supporting pipe by means of three set screws, and has two lugs, against which the two horizontal adjustment bolts bear. By "turning out" one of the bolts and "turning in" the other, the signal head is rotated about the inner sleeve, thus providing a micrometer adjustment in the horizontal plane. The vertical adjustment is obtained by means of tap bolts which bear on the adjusting bar.
- 9—The socket on the bottom of the signal case, as well as the top of the outer sleeve or supporting casting are made cylindrical in shape in the horizontal direction, the centers of the cylindrical surfaces coinciding with the center of the pin upon which the signal head is pivoted. With this arrangement the clearance between the supporting casting and the socket on the signal case can be made a minimum as,



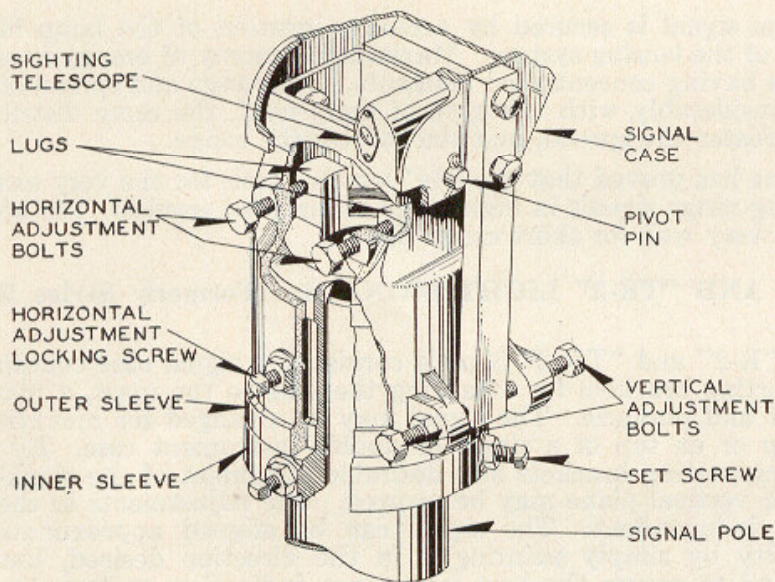
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PLATE **B-2500**

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due to the cylindrical shape, there is no change in this clearance when the signal head is adjusted in the vertical direction. The opening through the base casting and the bottom of the case is sufficient for the entrance of any number of wires that will ever be used, and parkway cable may be brought directly into the signal head if desired.

- 10—The sighting device is built into the socket on the bottom of the signal case. This sighting device is accurately aligned parallel to the light beams. The procedure to be followed in aligning the signal is clearly outlined in the first paragraph of Instruction Pamphlet U-5032.



**Fig. 1. Adjustable Supporting Socket for the Union Style "P-5" Color Light Signal**

**DESCRIPTION COMMON FOR STYLES "R-2", "TR-2", "P-5" AND "TP-5" LIGHT SIGNALS:**

- 11—Standard Color Combinations of Signal Units.

2 Indication Unit	3 Indication Unit	3 Indication Triangular
Upper Lens—Green Lower Lens—Red	Upper Lens—Green Center Lens—Yellow Lower Lens—Red	L.H. Upper Lens—Green R.H. Upper Lens—Yellow Lower Lens—Red

- 12—Special deflecting prisms of 10 or 20 degree spread can be applied over the 8 $\frac{3}{8}$ " doublet lens where additional spread of light is required on account of curves. The 10 degree prism is sufficient in most cases. The 20 degree prism takes care of extreme requirements. Deflecting prisms spread the light in the horizontal plane and on one side only. See Refs. 21 and 21a, Plate B-2531.

- 13—These Signals require special rebased lamps. Orders should specify the lamp bulb desired by referring to Plate B-2571.

- 14—Signal cases for D.C. lighting are provided with A.A.R. terminals to which the lamp receptacles are connected. (Except where both a Style "L-10" Lightout Relay and a backlight are used.) These same cases can be used for A.C. lighting



where one transformer furnishes power for all units, in which case the secondary circuit is selected through the proper control relays.

- 15—A more satisfactory arrangement for A.C. lighting is provided in Styles "R-2" and "P-5" signal cases with individual transformers for each lamp unit. With this arrangement the primary circuits of the transformers are selected through the proper control relays. This provides better voltage regulation on the lamps and considerably reduces the current carried by the relay contacts. Lamp receptacles are connected directly to the transformer secondaries. Outside wires are brought to the primary side of the transformers in A.C. signals or to the A.A.R. terminals in D.C. signals. This arrangement affords a ready means for connecting instruments when taking voltage and current readings.
- 16—The case and the lamp units are ventilated. A hasp is provided for locking the door.
- 17—Style "L-10" Lightout Relays of the design shown on Plate E-5080 can be furnished with all Styles "R-2" and "P-5" D.C. Signals, (except 2 color with backlight on bottom light) but where both "L-10" Lightout Relays and backlights are used, the terminal board is omitted and outside wires are connected direct to A.A.R. binding posts on the relay and lamp receptacles.

**LAMP UNIT:**

- 18—The Lamp Unit itself is the same in the "R-2", "TR-2", "P-5" and "TP-5" Signals. It consists of a doublet lens, the  $8\frac{3}{8}$ " diameter objective lens being clear and the inner lens being colored.
- 19—Each lamp unit consists of an accurately machined lens casting to which is assembled a special bayonet lamp receptacle and a doublet lens. The lamp receptacle is supported in a fixed relationship to the lenses in order that the lamps, which are accurately based, may be interchangeable. Thus the lamp filament is brought to the exact focal point of the lens system and the range of the signal is not altered by lamp replacement. The superiority of the Styles "R-2", "P-5", "TR-2" and "TP-5" signals is largely due to the accuracy with which the lamp units are constructed and adjusted. For this reason it is not desirable to have any changes made in the field which may affect the relative location of lenses and lamp receptacles. Lamp Units as a whole are interchangeable, and can be readily removed from the front of the signal case.
- 20—For "close up" indications lamp units are equipped with a deflecting unit, Ref. 7, Plate B-2531, providing a down spread of 25°. If specified a 50° down spread deflecting unit, Ref. 7a, Plate B-2531, will be supplied.

**MAST SIZES:**

- 21—All one and two arm Styles "R-2", "TR-2", "P-5" and "TP-5" Signals having dimensions and assembled as shown in these catalog plates, use 5 inch pipe masts. Some of these signals having three arms also use 5 inch pipe, but 5 inch and 6 inch (2 piece) pipe is used when all three arms are three light units and in some assemblies where instrument cases are not used.

**STYLE "N" LIGHT SIGNALS:**

- 22—The Style "N" Light Signal consists of a cast-iron case with either two or three openings to which have been applied doublet lenses. The clear objective lens is  $6\frac{3}{8}$ " in diameter. A single door at the back of the case may be locked in its closed position by means of a padlock. Ventilators are provided.
- 23—The Style "N" Signal is aligned by means of a pipe socket equipped with three set screws which secure it to the top of a pole or supporting bracket.
- 24—The Style "N" Signal is equipped with a double screw based lamp receptacle for each indication. When 110 volt single filament lamps are used two bulbs may be used per indication thus providing added protection against a dark signal due to one lamp burning out. The 110 volt lamps due to their large filament produce a comparatively short range indication. A somewhat longer range can be obtained by using a separately housed transformer having a 110 volt primary and a 30 volt



secondary winding and using 30 volt 36 watt double filament lamps. If double filament lamps are used only one lamp per indication is necessary and it should be placed in the receptacle nearest the lens. Lamps used with the Style "N" Signal will be found on Plate B-2571.

**STYLES "N-2" AND "N-3" SIGNALS:**

- 25—The Style "N-2" Signal has the same case and method of mounting as the Style "N", the difference in the two signals being in the lens units. The "N-2" Signal has special bayonet lamp receptacles Ref. 19, Plate B-2532 which are accurately located and fixed in place, thus making it possible to replace lamp bulbs without making any adjustments. Any of the special rebased lamps shown on Plate B-2571 can be used in the Style "N-2" signal and orders for this signal should specify the lamp bulb required.
- 26—Style "N-2" Signal is used where a longer range than that obtained from a Style "N" is required, but where clearances are such that a signal smaller than the "R-2" or "P-5" is required. The Style "N-2" Signal having a  $6\frac{3}{8}$ " outer lens is narrower than the "R-2" or "P-5".
- 27—The Style "N-3" Signal is the same as the Style "N-2" with the exception of the mounting. The "N-3" signal has an adjustable mounting that is similar to that of the "P-5" and in addition is equipped with a sighting device, therefore this signal is much easier to align than the similar "N-2" signal.

28—Standard Color Combinations of Styles "N", "N-2" and "N-3" Signal Units.

2 Indication Unit	3 Indication Unit
Upper Lens—Green Lower Lens—Red	Upper Lens—Green Center Lens—Yellow Lower Lens—Red

**DWARF SIGNALS:**

- 29—The Styles "N" and "N-2" Dwarf Signals make use of the same case, the difference in the two signals being in the lens units. The Style "N" Signal is equipped with a double screw based lamp receptacle for each indication. When 110 volt single filament lamps are used two bulbs may be used per indication thus providing added protection against a dark signal due to one lamp burning out. The 110 volt lamps due to their large filament produce a comparatively short range indication. A somewhat longer range can be obtained by using a separately housed transformer having a 110 volt primary and a 30 volt secondary winding and using 30 volt 36 watt double filament lamps. If double filament lamps are used only one lamp per indication is necessary and it should be placed in the receptacle nearest the lens. The "N-2" Signal has special bayonet lamp receptacles, which are accurately located and fixed in place thus making it possible to replace lamp bulbs without making any adjustments. Any of the special rebased lamps shown on Plate B-2571 can be used in the Style "N-2" signal and orders for this signal should specify the lamp bulb required.
- 30—A triangular arrangement of lenses can be furnished, these signals being designated as "TN" and "TN-2" to correspond with the vertical designs, "N" and "N-2", described above. The advantage of the triangular arrangement is that it provides greater clearances where a three-color dwarf signal is used.
- 31—These signals, like the high signals, are ordinarily installed with a separate transformer.
- 32—All two arm Styles "N", "N-2" and "N-3" Signals having dimensions and assembled as shown in these catalog plates use 4 inch pipe. Most of these signals having three arms use 4 inch and 5 inch (2 piece) pipe.



**BACKLIGHTS:**

33—Backlights can be supplied as follows:

Style of Signal	Location of Backlight
2-Color Style "R-2" without Individual Transformers or "L-10" Relay	Bottom Light per Plate B-2521 or Top Light per Plate B-2521½
2-Color Style "P-5" without Individual Transformers or "L-10" Relay	Bottom Light per Plate B-2521
2-Color Style "R-2" with Individual Transformers or "L-10" Relay	Top Light per Plate B-2521½
3-Color Style "R-2" with or without Individual Transformers or "L-10" Relay	Bottom Light per Plate B-2521 or Top Light per Plate B-2521½
3-Color Style "P-5" with or without Individual Transformers or "L-10" Relay	Bottom Light per Plate B-2521
3-Color Triangular Styles "TR-2" and "TP-5" without Individual Transformers or "L-10" Relay	Bottom Light per Plate B-2524
2 and 3-Color Styles "N" and "N-2" Dwarf Signals without Individual Transformers or "L-10" Relay	Bottom Light per Plate B-2512

**MARKER LIGHTS:**

34—Three types of marker lights are available as shown on Plate B-2514. A one color Style "R-2" or "HC-33" marker is used when the marker light must be free from phantom indications and where an 8" diameter indication is required. The Style D semaphore lamp can be used if the marker is constantly illuminated in which case phantom indication would not be objectionable. The Style D marker produces a 5" diameter beam.

**SIGNAL LAMPS:**

35—A number of lamps of various voltage and wattage ratings are available for color light signals. These lamps are shown on Plate B-2571. Figs. A, B and C are precision lamps for use in "R-2", "TR-2", "P-5", "TP-5", "N-2" and "N-3" signals, one color style "R-2" marker and style D marker with special bayonet base. The Fig. A lamps are double filament, both filaments being identical. One filament usually burns out first and the lamp should then be replaced. One filament burnt out does not always affect the indication to a noticeable extent therefore these lamps should be inspected at regular intervals.

36—The Fig. B lamps are single filament and should be replaced after burning a given number of hours to prevent dark signals. The burning time depends upon voltage at which the lamps are operated and will have to be established as outlined in our Instruction Pamphlet U-5037.

37—The Fig. C lamps have special double filaments. The main filament is accurately located and has normal life while the secondary filament has much longer life and should outlast the main filament. Due to the secondary filament being low wattage and low candle power the reduced signal indication obtained from this filament alone is distinctive and serves to inform enginemen and maintainers of the need for lamp renewal before the signal becomes dark.

38—The D, E, and F screw base lamps are not of the precision type and are for use in Style "N" short range signals. These lamps can also be used in the style D marker with screw base lamp receptacle.

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39—The Figs. G and H lamps (S-11) have single contact candelabra bayonet bases. They are for use in the style D marker light but can be used with suitable adapters in any of the color light signals. The bases are located with  $\frac{1}{64}$ " signal precision with respect to the filament and can be replaced without need for socket adjustment.

**ORDERING INSTRUCTIONS**

40—For a complete Signal, the following will be furnished unless otherwise specified:  
 Dimensions—as shown on Plate listing complete Signals.  
 Pipe Post—size to suit height and type of Signal. (See paragraphs 21 and 32 of Plate B-2500).  
 Signal Units—standard color combination and without Backlights, individual Transformers or "L-10" Relay. (See paragraphs 11 and 28 of Plate B-2500).

41—Complete Signals are furnished with Foundation Bolts, Ladder Foundation Pier, Pinnacle (where necessary) and Ladder to suit Signal desired.

42—When ordering a complete Signal, orders should contain the following information:  
 A—Number of Signal Units.

B—Type of Mounting, i.e., ground, bridge or bracket Signal. If Instrument Case is desired orders should refer to Section "L" Catalog, Plates L-1135 to L-1160, giving Plate Number and Reference of Case, lining and base casting for case.

C—Dimensions. If dimensions other than those shown on Plates B-2502, B-2504, B-2506 and B-2509 are desired, orders should specify dimensions "W", "X" and "Y" shown in Fig. 2. These apply to the location of the bottom lamp unit center in either a 2 or 3 light signal unit or the center of a one light marker light.

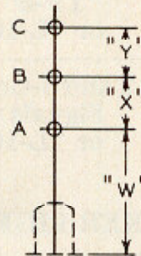


Fig. 2

D—Style of Units:

- (a) 2 or 3-Color "R-2", "P-5", "N", "N-2", "N-3" or 3-Color "TR-2" or "TP-5".
- (b) Color combination if other than standard is desired. (See paragraphs 11 and 28 of Plate B-2500).
- (c) Backlight if desired. (See paragraph 33 of Plate B-2500).
- (d) Individual Transformers or "L-10" Relay. (Style "R-2" and "P-5" Signal Units can be furnished with individual Transformers or "L-10" Relay mounted in the Signal Units; Styles "TR-2" and "TP-5" Signal Units for alternating current require Transformers or "L-10" Relay mounted in a separate case shown on Plate B-2590). If Transformers or "L-10" Relay are desired, orders should so state, specifying voltage and frequency for transformers and voltage and wattage of lamps when "L-10" Relay is wanted.

E—Mounting arrangement. If all units are not the same, mention the location of 2 light units, 3 light units or one light unit by referring to locations "A", "B" or "C" in Fig. 2. If it is desirable to mount signal units off center of pipe post, orders should specify "V" dimension shown in Fig. 3 and if unit is to be mounted on L.H. or R.H. side of post or if any other special pipe drilling is necessary. (This is necessary on account of post drillings for wires). The maximum "V" dimension for staggering signal units is:

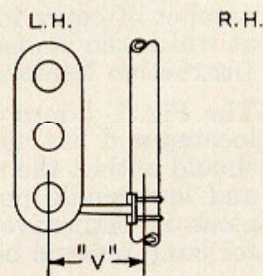


Fig. 3

- Styles "R-2" and "TR-2"—15".
- Styles "P-5", "TP-5", "N", "N-2" and "N-3"—13 $\frac{1}{2}$ ".
- Styles "R-2" and "HC-33" Marker Lights—17 $\frac{1}{8}$ ".
- Style "D" Semaphore Lamp—13 $\frac{5}{8}$ ".



- F—Lamp Bulb (Refer to Plate B-2571).  
 G—Marker Light (Refer to Plate B-2514).  
 H—Base (Refer to Plate B-2580 or B-2581).

43—Example:—If a special height Style "R-2" Signal is wanted as shown in Fig. 4, with units for D.C. operation and standard color combination, Single Instrument Case and 10-Volt, 18-Watt double filament lamp bulbs, the order should read as follows:—ONE 2-UNIT STYLE "R-2" GROUND SIGNAL, PLATE B-2502, WITH ONE UNIT REF. B, PLATE B-2517 IN LOCATION "B" AND ONE UNIT REF. A, PLATE B-2517 IN LOCATION "A"; UNIT IN LOCATION "A" TO BE MOUNTED ON L.H. SIDE OF POST, "V" DIMENSION 9", "W" DIMENSION 10'-0" AND "X" DIMENSION 5'-0". INSTRUMENT CASE REF. A, PLATE L-1135 WITH LINING REF..... AND BASE REF.....; LAMP BULBS REF. Cb, PLATE B-2571.

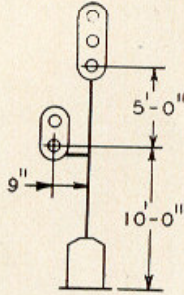


Fig. 4

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