

# IMAGE INTENSIFIER TUBE

## TYPE FW-113

### A PRODUCT OF ITT LABORATORIES

Nutley, N. J. • Fort Wayne, Ind. • San Fernando and Palo Alto, Calif.

The FW-113 two-stage cascaded image converter tube is a magnetically focused image intensifier with an S-11 photocathode, sensitive in the visible portion of the spectrum. The tube consists of two magnetically focused image converter tubes, cascaded in a single glass envelope, the output of the first communicating with the input of the second through a thin transparent window. The two sections of the tube are diodes, with one electrode common, and only three electrical connections are necessary for operation. A minimum of light and image detail is lost in the thin-film coupling, and the output is a greatly intensified replica of the input image. Magnetic focusing assures uniform, high resolution over the entire

viewing screen area. The magnet establishes an essentially uniform focusing field axially of the tube. An electromagnet may also be used for focusing, and would afford the advantage for experimentation that focusing could be achieved at different tube operating voltages. Either a P-20 screen for visual observation of the output image, or a P-11 to match the input response of photosensitive devices and photographic plates can be supplied.

Because of immediate widespread interest in the tube for experimental purposes, an objective specification indicative of the state of the art is available, based upon limited test data from a few developmental tubes.

#### FW-113 Characteristics (objective)

##### Electrical Characteristics (1):

First stage	-10 ± 2 kv
Second stage	+10 ± 2 kv
Focusing magnetic flux density	475 gauss

##### General Characteristics:

Input cathode surface	S11
Output phosphor screen (2)	P20
Useful cathode diameter	1.5 inches
Useful phosphor screen diameter	1.5 inches
Image magnification (3)	0.9 - 1.0
Resolution, paraxial	15 line pairs/mm
Resolution at 0.675 inch R	15 line pairs/mm
Background screen brightness (4)	2 μ lambert
Overall luminous sensitivity (5)	1000 μa/lumen
Brightness gain (6)	400
Maximum input illumination	1 foot-candle



Image Intensifier

- (1) Independent voltage controls are required to focus each stage. Voltages given are design values for the specified magnetic focusing field strength, but other values of E and H may be determined from the approximate relationship  $H \propto \sqrt{E}$ . Lower values of E with a consequent reduction of brightness gain can be used to reduce the mean background screen brightness. The upper value of E, 12 kv/stage, is specified on the basis of a suitable margin of safety regarding destructive internal glow or flashover.
- (2) P-11 phosphor also available.
- (3) Image magnification and distortion are de-

pendent upon the uniformity of the magnetic focusing field.

- (4) Cathode not illuminated; temperature 25 degrees C.
- (5) Ratio of phosphor screen current to cathode illumination from a standard tungsten light source, 2870 degrees K color temperature.
- (6) The quotient of luminous output flux, in terms of visual excitation, divided by cathode illumination flux from a standard tungsten light source. With a P-11 phosphor, fluorescent in the blue, the brightness gain would be 100. Specified in terms of S-11 cathode response, brightness gain with a P-11 phosphor would be 1200.

For further information and detailed technical specifications write to the Director, Components and Instrumentation Laboratory, ITT Laboratories, 3700 E. Pontiac St., Fort Wayne, Indiana.