



ELECTRON TUBE DEPARTMENT ■ COMPONENTS DIVISION
INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION, CLIFTON, NEW JERSEY

D-3003/AS 17-21
STORAGE TUBE

T E N T A T I V E

APPLICATION:

THE DARK TRACE TUBE IS A CATHODE-RAY TUBE THAT RETAINS AN IMAGE FOR AN EXTENDED PERIOD OF TIME. IMAGE TIME IS ADJUSTABLE BETWEEN A FEW SECONDS AND SEVERAL HOURS.

THE IMAGE APPEARS DARK ON A LIGHT BACKGROUND AND CAN BE VIEWED IN NORMAL LIGHT. THE TUBE CAN BE USED WHEREVER UNIQUE OR SLOWLY DEVELOPING PHENOMENA WITH SPEEDS TO ABOUT 300 M/SEC (975 FT/SEC) ARE TO BE RECORDED, FOR EXAMPLE IN SWITCHING OR METERING, WHICH USED TO REQUIRE A LOOP OSCILLOGRAPH, OR IT CAN BE USED AS A STORAGE DEVICE IN RECORDING EQUIPMENT. OTHER EXAMPLES OF APPLICATION ARE IMAGE TRANSMISSION SYSTEMS WITH SLOW IMAGE SEQUENCE, MEANS FOR DIRECT TRANSMISSION OF DRAWINGS, AND RADAR DISPLAY UNITS. SINCE THE IMAGE CAN BE VIEWED UNDER NORMAL LIGHTING CONDITIONS, THAT IS, WITH THE EYE ADAPTED TO BRIGHT LIGHT, IT FINDS MANY APPLICATIONS IN THE LABORATORY AND INDUSTRY.

THE IMAGE CAN BE ERASED AT ANY TIME WITHIN ABOUT 10 SECONDS BY APPLYING A QUENCHING VOLTAGE.

DESIGN:

THE GLASS ENVELOPE HAS A RECTANGULAR IMAGE SCREEN MEASURING 4 X 5-1/4 INCHES. THE SCREEN DIAGONAL IS 6-3/4 INCHES, AND THE EFFECTIVE SCREEN AREA IS 3-1/8 X 4-7/8 INCHES.

THE TUBE'S BEAM SYSTEM IS FOCUSSED ELECTROSTATICALLY. DEFLECTION IS ACCOMPLISHED MAGNETICALLY AND THE DEFLECTION ANGLE IS 70°. A THIN MICA SHEET IS ARRANGED IMMEDIATELY BEHIND THE FRONT PANE AS AN IMAGE SCREEN. ON THE SIDE OF THE SHEET FACING THE CATHODE, A POTASSIUM CHLORIDE LAYER HAS BEEN DEPOSITED BY VAPORIZATION. WHEN THE CATHODE RAY STRIKES AN AREA, IT CHANGES THE GRID STRUCTURE OF THE CRYSTALS AND THIS LEADS TO A PURPLISH COLORING.

ON THE SIDE OF THE MICA SHEET FACING THE VIEWER, THERE IS A TRANSPARENT SEMI-CONDUCTIVE LAYER CONNECTED TO TWO TERMINALS THAT PASS THROUGH THE ENVELOPE. WHEN A QUENCHING VOLTAGE IS APPLIED, THE IMAGE IS QUENCHED BY JOULEAN HEAT. AT THE SAME TIME, THE PLATE VOLTAGE IS APPLIED OVER ONE OF THE TERMINALS.

THE FRONT PANE OF THE TUBE IS MADE OF FLAT GLASS, SO THAT ANY IMAGE CAN BE ACCURATELY TRACED ON TRANSPARENT PAPER APPLIED TO THE GLASS.

THE TUBE'S OPERATING CONDITIONS HAVE BEEN SO CHOSEN THAT THE REQUIRED VOLTAGES CAN BE PRODUCED WITH STANDARD TELEVISION COMPONENTS. SINCE WITH THE PHENOMENA TO BE REPRESENTED IT IS IN MANY CASES NOT POSSIBLE TO USE THE DEFLECTION FREQUENCIES COMMONLY USED IN THE TELEVISION INDUSTRY, SPECIAL CIRCUIT ARRANGEMENTS HAVE BEEN WORKED OUT FOR THE AS 17-21 TUBE THAT ALLOWS USING MASS-PRODUCED TELEVISION PARTS TO PRODUCE THE OPERATING VOLTAGES AND PROPER DEFLECTION.

TECHNICAL CHARACTERISTICS:

BEAM SYSTEM	TETRODE WITH UNIT LENS
ENVELOPE	ALL-GLASS DESIGN
BASE	TWELVE-SIDED (DUODEKAL) WITH 7 PRONGS
FOCUSSING	ELECTROSTATIC
DEFLECTION	MAGNETIC
DEFLECTION ANGLE	70° DIAGONAL
FRONT AREA	FLAT CLEAR GLASS
SCREEN	DARK TRACE SCREEN
IMAGE TIME	EXTREMELY LONG, UP TO SEVERAL HOURS
SCREEN AREA	3-1/8 X 4-7/8 INCHES
OVERALL LENGTH, INCLUDING BASE	APPROX. 10-1/2 INCHES
WEIGHT	APPROX. 1-1/2 POUNDS
WRITING RATE	12,000 INCHES PER SECOND

HEATING VALUES FOR PARALLEL OR SERIES SUPPLY

FILAMENT VOLTAGE	V _H 6.3 V
FILAMENT	I _H 0.3 A
OXIDE CATHODE	INDIRECTLY HEATED

RATINGS:

PLATE VOLTAGE	7 - 14	KV
SCREEN GRID VOLTAGE	300	VOLTS, APPROX.
CONTROL GRID VOLTAGE (PEAK)	±2	VOLTS
FOCUSSING VOLTAGE	0 - 400	VOLTS
BIASING POTENTIAL	-40 - -86	VOLTS
QUENCHING POWER	10 - 15	WATTS
RESISTANCE OF QUENCHING LAYER	80 - 120	OHMS
MAXIMUM CATHODE CURRENT	0.5	MILLIAMPERE
NEGATIVE GRID BIAS	0 - 150	VOLTS
GRID LEAK RESISTANCE	0.5	MEGOHMS
CATHODE CURRENT WITH STATIONARY SPOT	0.5	UA
CHARGE DENSITY DURING BEAM DEFLECTION	1.5	UC/CM ²

AVERAGE OPERATING CONDITIONS:

ANODE VOLTAGE	10	KV
GRID No. 2 VOLTAGE	300	VOLTS
GRID No. 3 VOLTAGE	0 - 400	VOLTS
CUT-OFF VOLTAGE (NOTE 1)	-40 - 86	VOLTS
ERASING WATTAGE (NOTE 2)	75	WATTS

NOTE 1: THE CUT-OFF VOLTAGE CORRESPONDS TO THAT VOLTAGE WHICH DOES NOT RESULT IN A DISCOLORATION OF THE SCREEN BY THE SHARPLY FOCUSED BEAM.

NOTE 2: TO ERASE THE PICTURE, AN ERASING VOLTAGE MUST BE APPLIED TO THE TWO CONTACTS AT THE NARROW BULB SIDES. IT IS RECOMMENDED THAT THE VOLTAGE WHICH WILL RESULT IN AN ERASING POWER OF 75 WATTS BE FOUND BY EXPERIMENT. THE RESISTANCE OF THE ERASING COAT IS 80 TO 120 OHMS.

HEATER-CATHODE VOLTAGE:

HEATER NEGATIVE		
DURING THE FIRST 15 SECONDS OF THE HEATING-UP PERIOD	410	VOLTS
AFTER THE HEATING-UP PERIOD	200	VOLTS
HEATER POSITIVE	125	VOLTS

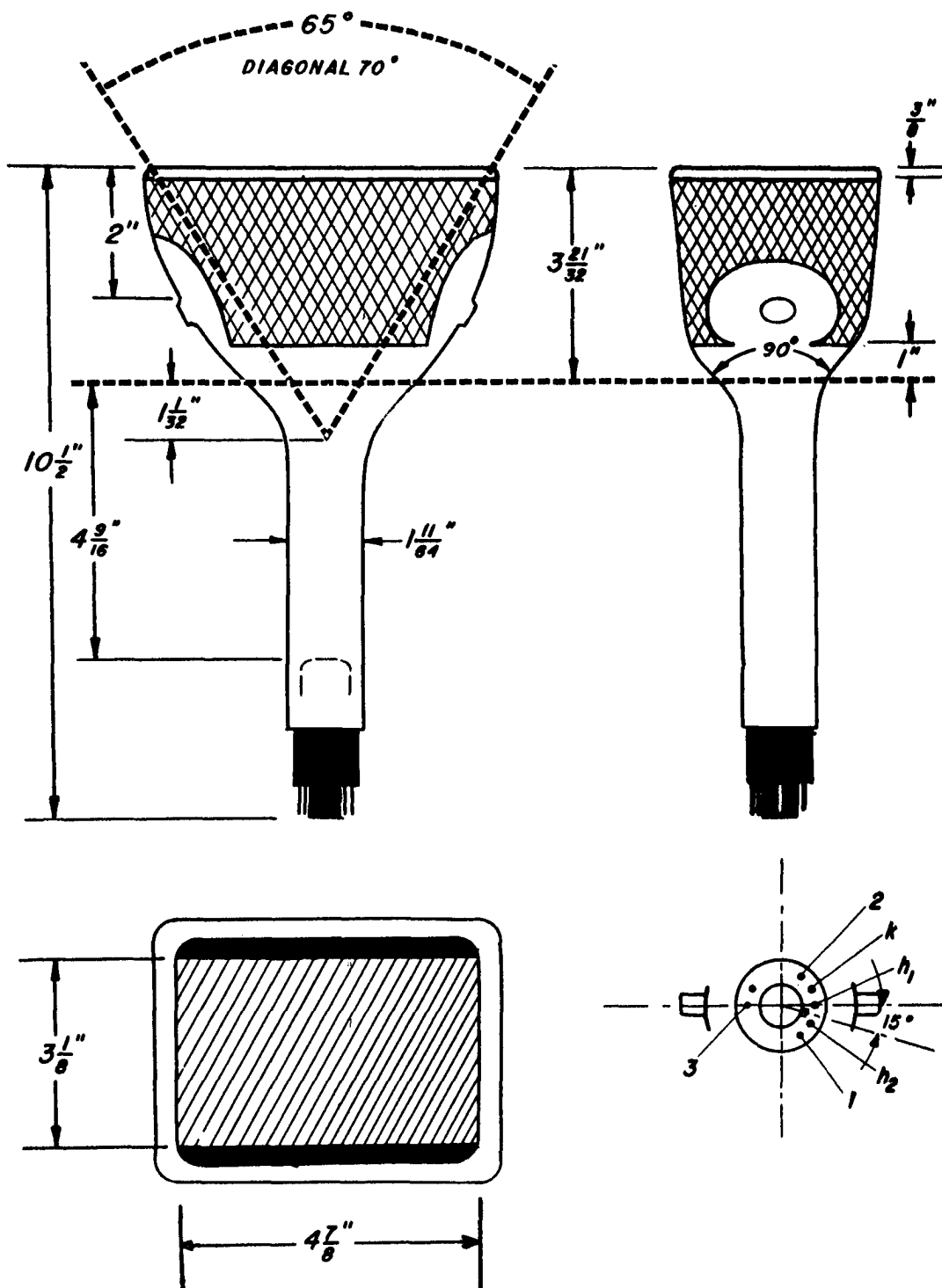
CAPACITANCES

CONTROL GRID TO ALL OTHER ELECTRODES	7	UUF
CATHODE TO ALL OTHER ELECTRODES	5	UUF
ANODE TO EXTERNAL COATING	400 - 800	UUF

ADDITIONAL INFORMATION FOR SPECIFIC APPLICATIONS CAN BE OBTAINED FROM THE

ELECTRON TUBE APPLICATIONS SECTION
ITT COMPONENTS DIVISION
POST OFFICE BOX 412
CLIFTON, NEW JERSEY





OUTLINE
D-3003/AS 17-21 STORAGE TUBE