Appendix B

EQUIPMENT SPECIFICATION FORMS

These equipment specification forms have been developed in order to simplify both the request for specifications and the comparison of different vendors' specifications. Copies of the General Information (see following page) and all pertinent forms are sent to each vendor under consideration when new equipment is to be purchased. Forms are included for the following equipment:

CONTENTS

Generators (3 pages)
X-ray Tubes
X-ray Tube Housings
Heat Integrators
Image Intensifiers (2 pages)
Video Systems
Disc or Tape Recorders
Cameras
Exposure Control Systems
Grids
Video Systems Performance
Camera Systems or Changer Performance

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GENERAL INFORMATION

The attached forms are provided so that we may more fairly evaluate your specifications compared to those of your competitors. It is hoped that the majority of the specification data are readily available and that it will not be necessary to specially test the equipment that is under consideration. If for any reason you feel that you cannot supply certain data, please let us know, stating the reasons that such information is not available. If you feel that your product is not properly represented by the data requested in these forms, please let us know and provide us with what you believe is the appropriate data.

The following guidelines should assist you in preparing the necessary information for our evaluation:

1. All blanks on the attached forms must be filled in for the equipment upon which you are bidding.
2. All data must be provided in the units noted.
3. We have not specified the methods of evaluation; therefore it will be necessary for you to provide the appropriate conditions for the tests you have carried out (e.g., kVp, mA, exposure time, focal spot size, scattering material (if any), geometry, test target used, etc.).
4. The specification data provided on these forms will become part of the purchase order and, hence, the specifications for acceptance.
5. If alternate (optional) equipment is to be considered a complete evaluation form will be required for each alternate item. For example, if two generators are being considered, one bid and the other as an option, two sets of the generator specification forms must be provided, one for each generator.
6. After completion of the forms please number all pages (e.g., page 1 of 10) to assure that none of your material is overlooked.
7. Please provide all other available data and specifications for equipment quoted (e.g., single exposure rating, anode thermal characteristic, housing cooling, angiographic rating, cineradiographic rating, and fluoroscopic rating charts for x-ray tubes and housings).
8. On your quote, please provide list and net price for all units of equipment comprising a component of the system (e.g., spot film camera system).
9. Price quotes for components should include the cost of necessary additional fixtures. For example, the quote price for a spot film camera system should include the cost of all mounting, support, and interfacing components.
10. These forms along with your detailed quotation and other supporting information should be supplied to ______________________________. A total of three copies would be appreciated.

If you have any questions concerning the forms, the information requested, or any other matters, please contact ______________________________.
Manufacturer

Model Number

Power Requirements

Preferred Mains Voltage

Single or Three Phase

kVA

V

Ø

kVA

kVp

Push-button or Dial

Minimum kVp

Maximum kVp

Steps

Specified Accuracy

mA

Push-button or Dial

Minimum mA

Maximum mA

mA Stations—Small Focus

Large Focus

Specified Accuracy

Timing

Type (e.g., forced extinction)

Manual—Minimum

10 msec

100 msec

Automatic—Minimum

10 msec

100 msec

msec ± msec at kVp mA
Timing (cont.)

Maximum Exposure Time
Is maximum exposure time adjustable?
__ sec __ yes __ no

Exposure Time Settings

Phase-In Interrogation Time
__ msec at __ kVp and __ mA

Maximum Exposures per Second
__ exposures/second

Exposure Time Display (Type)

Falling Load
__ yes __ no

kW Ratings

at 70 kVp __ kW
80 kVp __ kW
90 kVp __ kW
100 kVp __ kW
110 kVp __ kW
125 kVp __ kW
150 kVp __ kW

Premagnetization Time
__ msec

Time Sharing Capability
__ yes __ no

Fluoroscopy

kVp Range __ kVp to __ kVp
Steps

mA Range __ mA to __ mA
Steps

Timer Range __ min to __ min
Steps

Automatic Exposure Control __ kVp only __ mA only __ mA-kVp
combined
Focal Spot Size Selection

Available Independent of mA?

_________ yes _________ no

Rotor Speeds

Available

_________ rpm

_________ rpm

Percentage Ripple
(Measured as x-ray output)

_________ % at 80 kVp, 100 mA

_________ % at 80 kVp, 200 mA

_________ % at 80 kVp, 400 mA

_________ % at 80 kVp, 600 mA

_________ % at 80 kVp, 800 mA

_________ % at 80 kVp, 1000 mA
### X-RAY TUBES

**Manufacturer**

**Tube Model #**

**Focal Spot Size**

<table>
<thead>
<tr>
<th></th>
<th>Unbiased</th>
<th>Biased</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>Small</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>Large</td>
<td>mm</td>
<td>mm</td>
</tr>
</tbody>
</table>

Will you accept star measurements for testing purposes? Yes/No

<table>
<thead>
<tr>
<th></th>
<th>kW</th>
<th>kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Focal Spot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Focal Spot</td>
<td></td>
<td></td>
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</tbody>
</table>

**kW Rating**

<table>
<thead>
<tr>
<th></th>
<th>kVp</th>
</tr>
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<tbody>
<tr>
<td>Maximum</td>
<td></td>
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</table>

**Anode Characteristics**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle—Small Focal Spot</td>
<td>°</td>
</tr>
<tr>
<td>Large Focal Spot</td>
<td>°</td>
</tr>
<tr>
<td>Heat Capacity</td>
<td>HU</td>
</tr>
<tr>
<td>Cooling Rate</td>
<td>HU/min (maximum)</td>
</tr>
</tbody>
</table>

**Rotor Speed Requirements**

<table>
<thead>
<tr>
<th></th>
<th>rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoroscopic—Small Focal Spot</td>
<td></td>
</tr>
<tr>
<td>Large Focal Spot</td>
<td></td>
</tr>
<tr>
<td>Radiographic—Small Focal Spot</td>
<td></td>
</tr>
<tr>
<td>Large Focal Spot</td>
<td></td>
</tr>
</tbody>
</table>

**Bias Power Supply**

<table>
<thead>
<tr>
<th></th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bias Voltage</td>
<td></td>
</tr>
<tr>
<td>Number of Tubes per Supply</td>
<td></td>
</tr>
</tbody>
</table>
X-RAY TUBE HOUSINGS

Manufacturer

Housing Model #

Housing Characteristics

Heat Capacity

Cooling Rate—Without Fan

With Fan

With Liquid Circulation System

_________________ HU

_________________ HU/min (maximum)

_________________ HU/min (maximum)

_________________ HU/min (maximum)
<table>
<thead>
<tr>
<th>Manufacturer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Model #</td>
<td></td>
</tr>
<tr>
<td>Number of Tubes</td>
<td></td>
</tr>
</tbody>
</table>

**Display and Warning**

<table>
<thead>
<tr>
<th>Digital or Analog Display</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All Tubes Simultaneously?</td>
<td>yes</td>
</tr>
<tr>
<td>% of Maximum or % Remaining</td>
<td></td>
</tr>
<tr>
<td>Audible Overload Indicator</td>
<td>yes</td>
</tr>
<tr>
<td>System Lock at Overload?</td>
<td>yes</td>
</tr>
<tr>
<td>Manual Lock Override?</td>
<td>yes</td>
</tr>
</tbody>
</table>
**IMAGE INTENSIFIERS (page 1)**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Model #</td>
<td></td>
</tr>
</tbody>
</table>

**Input Field Size**

<table>
<thead>
<tr>
<th>Size</th>
<th>in</th>
<th>±</th>
<th>in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Output Phosphor Size**

<table>
<thead>
<tr>
<th>Size</th>
<th>in</th>
<th>±</th>
<th>in</th>
</tr>
</thead>
</table>

**Phosphor Types**

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
<tr>
<td>Input</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td></td>
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</tbody>
</table>

**X-ray Absorption at 60 keV**

<table>
<thead>
<tr>
<th>Absorption</th>
<th>%</th>
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</table>

**Resolution**

<table>
<thead>
<tr>
<th>Field—Center</th>
<th>cycles/mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Edge</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field—Center</th>
<th>cycles/mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Edge</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field—Center</th>
<th>cycles/mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Edge</td>
<td></td>
</tr>
</tbody>
</table>

*Please state measurement technique (e.g., kVp, target type, scatter).*
### Brightness Falloff *

<table>
<thead>
<tr>
<th>Field</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Field</td>
<td>%</td>
</tr>
<tr>
<td>Medium Field</td>
<td>%</td>
</tr>
<tr>
<td>Large Field</td>
<td>%</td>
</tr>
</tbody>
</table>

### Contrast Sensitivity *

<table>
<thead>
<tr>
<th>Field</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Field</td>
<td>%</td>
</tr>
<tr>
<td>Medium Field</td>
<td>%</td>
</tr>
<tr>
<td>Large Field</td>
<td>%</td>
</tr>
</tbody>
</table>

### Contrast Ratio *

<table>
<thead>
<tr>
<th>Field</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Field</td>
<td>%</td>
</tr>
<tr>
<td>Medium Field</td>
<td>%</td>
</tr>
<tr>
<td>Large Field</td>
<td>%</td>
</tr>
</tbody>
</table>

### Conversion Factor *

<table>
<thead>
<tr>
<th>Field</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medium Field</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Field</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Flare or Veiling Glare *

<table>
<thead>
<tr>
<th>Field</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Field</td>
<td>%</td>
</tr>
<tr>
<td>Medium Field</td>
<td>%</td>
</tr>
<tr>
<td>Large Field</td>
<td>%</td>
</tr>
</tbody>
</table>

*Please state measurement technique.*
# VIDEO SYSTEMS

**Video Tube (Please provide manufacturer's data sheet)**

- **Manufacturer**
- **Type (e.g., vidicon, lead-oxide vidicon, or plumbicon)**
- **Model #**
- **Target Voltage** ___________ V

**Camera–Video Tube–Amplifier Chain**

- **Manufacturer**
- **Model #**
- **Bandwidth** ___________ MHz at –3dB
- **Signal-to-Noise Ratio** ___________ dB
- **Scan Lines Per Frame**
- **Shading Correction?** yes ___________ no
- **Gamma Correction?** yes ___________ no
- **Other Signal Processing (e.g., white clip or crush)?**
  - **Describe**
- **Composite Video Signal** ___________ mV
- **Sync Pulse** ___________ mV
- **RS/170 Standard Signal?** yes ___________ no
- **Does video signal contain serrations and equalizing pulses?** yes ___________ no
- **AGC or ATC?**
- **Aspect Ratio (4:3, 1:1, etc.)**

**Monitor**

- **Manufacturer**
- **Model #**
- **Size (diagonal)** ___________ in
- **Bandwidth** ___________ MHz at –3dB
- **Signal-to-Noise Ratio** ___________ dB
- **Black Level Clamping** yes ___________ no
**DISC OR TAPE RECORDERS**

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Model #</td>
<td></td>
</tr>
<tr>
<td>Type (U-matic, hard disc, floppy disc, etc.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bandwidth</th>
<th>MHz at -3 dB</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Signal-to-Noise Ratio</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner track</td>
<td>dB</td>
</tr>
<tr>
<td>Outer track</td>
<td>dB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Number of Images</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>fields</td>
<td>frames</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Real-Time Recording</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frames/sec — Record</td>
<td>fps</td>
</tr>
<tr>
<td>Playback</td>
<td>fps</td>
</tr>
<tr>
<td>Is (single frame) playback field or frame?</td>
<td>yes</td>
</tr>
<tr>
<td>Last Image Hold?</td>
<td>yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Composite Video Signal</th>
<th>mV</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sync Pulse</th>
<th>mV</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>RS-170 Standard Signal?</th>
<th>yes</th>
<th>no</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Does video signal contain serrations and equalizing pulses?</th>
<th>yes</th>
<th>no</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Automatic Video Level Control</th>
<th>yes</th>
<th>no</th>
</tr>
</thead>
</table>
CAMERAS

Manufacturer

Model #

Film Size

Image Size

Film Holders

Maximum Input Capacity

Maximum Output Capacity

Frame Rates

Lens

Focal Length

Widest Aperture

f/# Stops Available

Continuous or Waterhouse

Resolution* (Camera only—i.e., lens plus film during maximum speed run)

*Please state measurement technique.
EXPOSURE CONTROL SYSTEMS

Fluoroscopic

Manufacturer

Model #

Type (ionization, PMT, peak video, average video)

% of Image Area View for Exposure Control

Technique (mA-kVp variable, mA variable, kVp variable, etc.)

Manual Overrides (Types and Techniques)

Spot Film and/or Spot Film Cameras (Specify)

Manufacturer

Model #

Type (ionization, screen-PMT, etc.)
If screen, what type?

Technique (Fixed mA and kVp with variable time, floating mA and/or kVp with fluoro, etc.)

Maximum Exposure Time

Minimum Exposure Time

Manual Technique (mA and/or kVp and/or Time)

Density Selector

Type

Number of Steps

% Exposure (not density) Change per Step
GRIDS

Application
(Bucky, fluoro, image intensifier, film changer, etc.)

Manufacturer

Model #

Ratio

Lines/cm

Lead Content

Focus Range

Removable?

yes no
VIDEO SYSTEMS PERFORMANCE

Total Video Chain Including Image Intensifier
but Excluding Image Storage Devices

<table>
<thead>
<tr>
<th>Metric</th>
<th>Small Field</th>
<th>Medium Field</th>
<th>Large Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MHz at -3 dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal-to-Noise Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brightness Fall-Off*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contrast Sensitivity*</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Contrast Ratios*</td>
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<tr>
<td>Flare or Veiling Glare*</td>
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<td></td>
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</tr>
<tr>
<td>Resolution*—Center</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>cycles/mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cycles/mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cycles/mm</td>
<td></td>
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</tbody>
</table>

Total Video Chain Including Image Intensifier
and Image Storage Devices

<table>
<thead>
<tr>
<th>Metric</th>
<th>Small Field</th>
<th>Medium Field</th>
<th>Large Field</th>
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</thead>
<tbody>
<tr>
<td>Bandwidth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MHz at -3 dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signal-to-Noise Ratio</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner Track</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer Track</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution—Center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cycles/mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cycles/mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cycles/mm</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Please state measurement technique.
### CAMERA SYSTEMS OR CHANGER PERFORMANCE

**Image Intensifier—Camera, Spot Film System, or Film Changer**

<table>
<thead>
<tr>
<th>Resolution*</th>
<th>Small Field</th>
<th>Medium Field</th>
<th>Large Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Frame—Center</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
</tr>
<tr>
<td>50%</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
</tr>
<tr>
<td>Edge</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
</tr>
</tbody>
</table>

**Nominal Frame Rate (_____ fps)**

<table>
<thead>
<tr>
<th></th>
<th>Small Field</th>
<th>Medium Field</th>
<th>Large Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
</tr>
<tr>
<td>50%</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
<td>__________ cycles/mm</td>
</tr>
<tr>
<td>Edge</td>
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**Maximum Frame Rate (_____ fps)**

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**Brightness Falloff***

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**Contrast Sensitivity***

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**Contrast Ratio***

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**Flare or Veiling Glare***

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*Please state measurement technique.
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