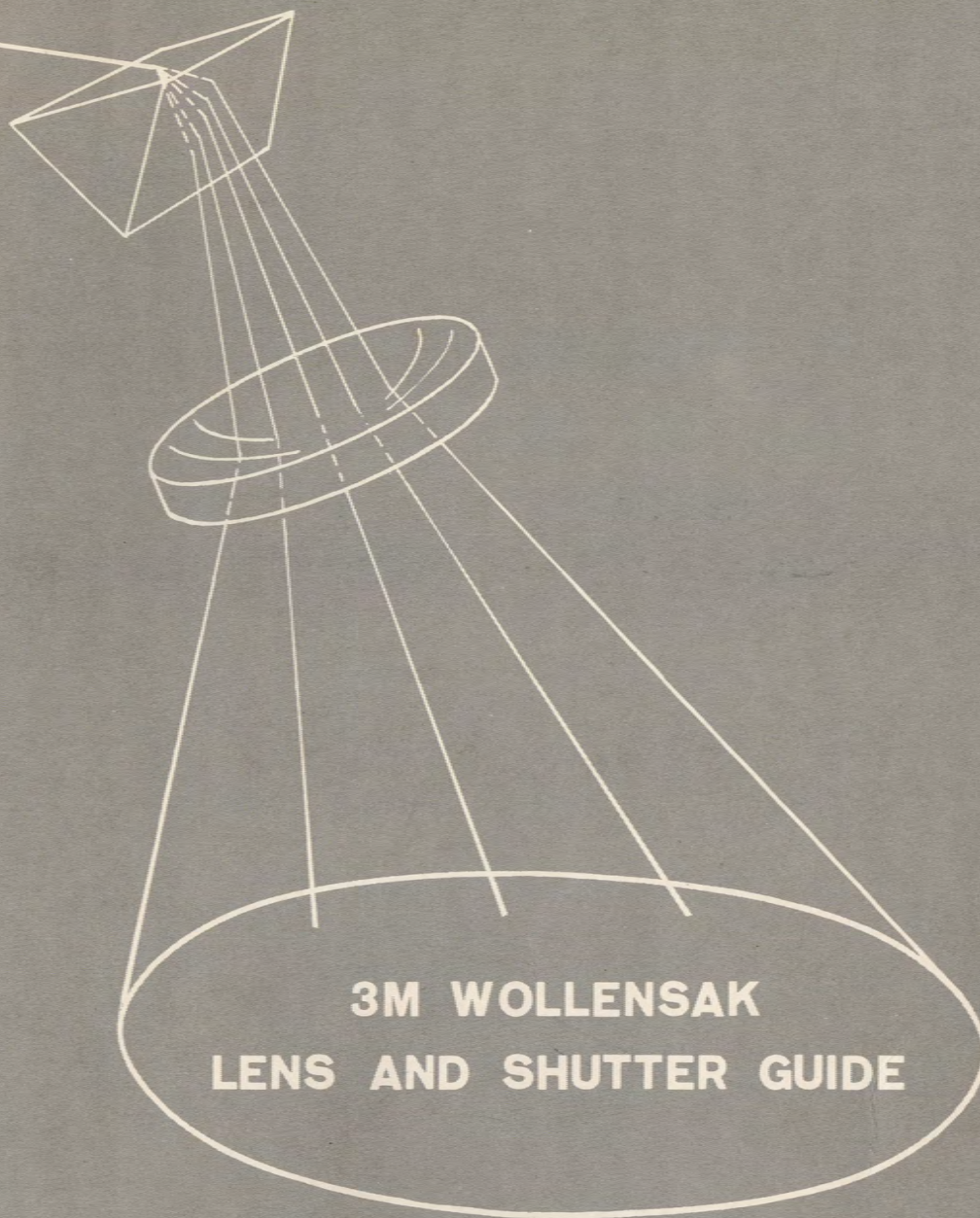


Margaret Riedel Reprod. Over



**3M**  
COMPANY  
**Wollensak**  
OPTICAL PRODUCTS

# 3M WOLLENSAK LENS AND SHUTTER GUIDE

1968

## HOW TO USE THE 3M WOLLENSAK LENS AND SHUTTER GUIDE

This booklet contains specifications on 3M Wollensak Lenses and Shutters. It is intended to help you select the proper solution to your optical requirements.

By selecting a design from this booklet, you can save time and money in getting your product into production. This is possible, because:

- You avoid design costs, which can amount to thousands of dollars.
- You save four to six months of design time.

We also urge you to contact us early, before your mechanical design is fixed. Our advice at that time also can save you time and money.

At the back of this Lens and Shutter Guide is a Lens Specification Inquiry sheet. If you make a copy of that sheet, fill in the requested information and send it to us, we can make recommendations as to your particular optical requirements.

For further information write:

3M Wollensak  
850 Hudson Av.  
Rochester, N. Y. 14621  
(716) 266-1000

## EXPLANATORY NOTES

D. F. means Double Frame  
S. F. means Single Frame  
W. A. means Wide Angle  
L. B. means Lens Barrell

A blank space in the Optical System column refers to the immediately preceding Optical System number.

The following are 3M Wollensak trade names found in this Lens and Shutter Guide: Amaton, Raptar, Fastax, Veritar, Fototel, Mirrotel, Versatel and Astroscope.

| OPTICAL SYSTEM | E.F.L. |      | LENS                                                  | COVERAGE | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|------|-------------------------------------------------------|----------|--------------|---------|----------------|----------------|
|                | IN.    | MM   |                                                       |          |              |         |                |                |
| 85-0402-4440-3 |        | 3.4  | f/1.5 155° W. A. Periphoto Lens                       | .300"    | X            |         |                |                |
|                |        | 3.7  | f/1.5 142° W. A.                                      | .300"    | X            |         |                |                |
|                |        | 3.7  | f/1.5 142° W. A.                                      | .300"    | X            |         |                |                |
| 85-0402-0420-9 |        | 3.7  | f/1.5 142° W. A. Fastax (Plastic)                     | .300"    | X            |         |                |                |
| 85-0402-0600-6 |        | 5.3  | f/1.5 84° W. A. Raptar "C" Mount Fastax               | 16MM     | X            |         | X              |                |
|                |        |      |                                                       | 16MM     | X            |         |                |                |
| 85-0405-3820-0 |        | 5.9  | f/6.3 Wide Angle                                      |          |              |         |                |                |
| 85-0401-5180-6 |        | 6.1  | Doublet System                                        |          |              |         |                |                |
| 85-0404-1750-4 |        | 6    | f/1 Visual Region Reducing lens                       | 1/8 Ø    |              |         |                | X              |
| 85-0405-5120-3 |        | 6.5  | f/1.9 Raptar                                          |          |              |         | X              | X              |
| 85-0401-4470-2 |        | 6.5  | f/1.9 Wide Angle Cine Raptar                          | 8MM      | X            |         | X              |                |
| 85-0402-5610-0 |        | 6.5  | f/1.8 Wide Angle Cine Raptar                          | 8MM      | X            |         |                |                |
|                |        | 6.5  | f/2.3 Wide Angle Cine Raptar                          | 8MM      | X            |         |                |                |
| 85-0401-7830-4 |        | 6.5  | f/2.5 Wide Angle Cine Raptar                          | 8MM      | X            |         |                |                |
|                |        | 6.51 | f/1.8 Raptar W. A.                                    |          |              |         | X              | X              |
| 85-0406-2480-2 |        | .7   | f/2.5 Raptar                                          |          |              |         | X              |                |
|                |        | 7.6  | f/1.2 Lens                                            | 14MM Ø   | X            |         |                | X              |
| 85-0404-4870-7 |        | 7.8  | f/2.5                                                 |          | X            |         |                |                |
|                |        |      | f/25 Raptar # 7 Professional L.B.                     |          |              |         |                |                |
| 85-0402-6650-5 |        | 9    | f/1.8 Wide Angle Cine Raptar                          | 8MM      | X            |         |                |                |
|                |        | 9    | f/2.5 Wide Angle Cine Raptar                          | 8MM      | X            |         |                |                |
| 85-0401-2240-1 |        | 9    | f/2.5 Wide Angle Cine Raptar                          | 8MM      | X            |         |                |                |
| 85-0405-9130-8 |        | 10   | f/2.8 Wide Angle Lens                                 |          | X            |         | X              |                |
|                |        | 10   | f/2.3 Raptar                                          | 8MM      |              |         |                |                |
| 85-0402-9070-3 |        | 10   | f/2.3 Raptar                                          | 8MM      |              |         |                |                |
| 85-0400-7480-0 |        | 12.7 | f/2.4 Sunray 107 Projection                           | 16MM     |              |         |                | X              |
| 85-0403-2560-8 |        | 12.9 | f/1.8 Raptar for 8MM Zoom                             | 8MM      |              |         |                | X              |
| TL-494-63      | 1/2    | 12.7 | f/2.5 Raptar                                          | 16MM     | X            |         |                |                |
| 85-0403-0350-6 | 1/2    | 13   | f/1.2 T.V. Raptar Wide Angle                          | 5/8 Ø    |              | X       | X              |                |
|                |        |      |                                                       |          |              | X       |                |                |
| 85-0401-7990-6 | 1/2    | 13   | f/1.5 Cine Raptar W. A.                               | 16MM     |              |         | X              |                |
| 85-0402-6010-2 | 1/2    | 13   | f/1.8 Cine Raptar W. A.                               | 5/8 Ø    |              |         | X              |                |
| 85-0405-9230-6 | 4.2X   | 13   | f/1.8 Wide Angle                                      |          |              |         | X              |                |
| 85-0402-7510-0 | 1/2    | 13   | f/1.8 Cine Raptar (triplet)                           | 8MM      |              |         | X              | X              |
| 85-0405-3130-4 |        | 13   | f/1.8 Raptar W. A.                                    |          |              |         | X              |                |
|                |        |      |                                                       |          |              |         | X              |                |
| 85-0400-7290-3 | 1/2    | 13   | f/1.9 Cine Raptar                                     | 8MM      | X            |         | X              |                |
| 85-0402-4910-5 | 1/2    | 13   | f/1.9 Cine Raptar (triplet)                           | 8MM      |              |         |                | X              |
| TL-607-61      | 1/2    | 13   | f/2 Underwater Lens                                   |          |              |         | X              |                |
| 85-0400-5140-2 | 1/2    | 13   | f/2.5 Cine Raptar                                     | 8MM      | X            |         |                |                |
|                |        |      |                                                       | 8MM      |              |         |                | X              |
| 85-0400-5140-2 | 1/2    | 13   | f/3.5 Cine Raptar                                     |          |              |         | X              |                |
| 85-0403-4820-4 | 1/2    | 13   | f/2.5 Cine Raptar (Non-browning glasses)              | 16MM     |              |         | X              |                |
| 85-0401-3560-1 | 1/2    | 13   | f/2.8 Cine Raptar                                     | 8MM      |              |         |                | X              |
| 85-0401-3760-7 | 1/2    | 13   | f/2.8 Raptar                                          | 8MM      | X            |         |                |                |
| 85-0402-4070-8 |        | 13.4 | f/3.5 Anastigmat                                      | 8MM      |              |         |                | X              |
| 85-0405-2180-0 |        | 13.7 | f/2.0 Micro Projection                                |          |              |         |                |                |
| 85-0404-8240-9 |        | 13.7 | f/2.0 Micro Raptar                                    |          |              |         |                |                |
| 85-0402-5600-1 |        | 13.8 | f/1.8 Cine Raptar                                     | 8MM      |              |         |                | X              |
| 85-0406-2190-7 |        | 13.7 | f/2.5 Micro Projection                                |          |              |         | X              |                |
| 85-0403-7290-7 |        | 13.8 | f/1.8 Backup Lens for Cine Zoom                       | 8MM      |              |         |                | X              |
| 85-0405-6700-1 |        | 14   | f/2.5 Data Recording Lens                             |          |              |         | X              |                |
| 85-0403-2660-6 |        | 15   | f/2.5 Raptar W. A.                                    | 5/8 Ø    | X            |         |                |                |
| 85-0405-0920-1 |        | 15.5 | Projection Lens                                       |          |              |         |                |                |
| 85-0402-4110-2 |        | 15   | f/3.5 for Data Recording Camera                       | 8MM      |              |         |                | X              |
| 85-0404-0200-1 |        | 15.6 | f/2.1 Backup Lens for 8MM Zoom with Reflex Viewfinder | 8MM      |              |         |                | X              |
|                |        |      |                                                       |          |              |         |                | X              |
| 85-0400-3250-1 |        | 15   | f/2.1 Projection                                      | 16MM     |              |         |                |                |
|                |        | 16   | f/2.4 Sunray 107 Projection                           | 16MM     |              |         |                |                |
| 85-0406-0740-1 |        | 16   | Cylindrical Sound Unit                                |          |              |         |                |                |
| 85-0401-8890-7 |        | 16.5 | f/6.0 Microfilm                                       | 16MM     | X            |         |                |                |
| 85-0405-8800-7 |        | 16.3 | Micro Projection f/2.8                                |          |              |         | X              |                |

| OPTICAL SYSTEM     | E.F.L. |       | LENS                                              | COVERAGE    | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|--------------------|--------|-------|---------------------------------------------------|-------------|--------------|---------|----------------|----------------|
|                    | IN.    | MM    |                                                   |             |              |         |                |                |
| 85-0402-6370-0     | .7     | 17    | f/2.3 Pro Raptar W. A.                            | 16MM        |              |         | X              |                |
| 85-0405-3940-6     |        | 17    | f/2.0 Raptar for Fastax WF-30                     |             |              |         | X              |                |
| 85-0403-8880-4     | .7     | 17    | f/2.3 Raptar                                      | 16MM        |              |         | X              |                |
| 157 85-0401-8550-7 | .7     | 17    | f/1.8 Cine Raptar                                 | 16MM        | X            |         | X              | X              |
| 85-0402-4940-2     | .7     | 17    | f/2.5 Cine Raptar W. A.                           | 16MM        | X            |         | X              |                |
| 85-0400-1480-6     |        | 17    | f/2.7 Raptar Lens                                 | 16MM        | X            |         | X              |                |
| 85-0404-8130-2     |        | 17    | f/2.7 Cine Raptar W. A.                           | 16MM        | X            |         | X              |                |
| 85-0403-7730-2     |        | 17    | f/3.5 Raptar                                      |             |              |         |                |                |
| 85-0403-7730-2     |        | 17.5  | f/2.3 Raptar 61° Coverage (full angle)            | 16MM        |              |         |                | X              |
| 85-0404-6120-5     |        | 17.6  | f/1.9 Raptar 1:1                                  | 683" Dia.   |              |         |                | X              |
| 85-0405-2200-6     |        | 18.0  | f/2.0 Micro Projection                            |             |              |         |                |                |
| 85-0402-4170-6     |        | 18    | f/3.5 Raptar                                      | 16MM        |              |         | X              | X              |
| 85-0404-8910-7     |        | 18.5  | f/2.0 Micro Raptar                                |             |              |         |                |                |
| 85-0405-2280-8     |        | 18.5  | f/2.0 Micro Projection                            |             |              |         |                |                |
| 85-0400-7580-7     |        | 19    | f/1.8 Sunray 117 Projection                       | 8MM         |              |         |                | X              |
| 85-0400-9370-1     |        | 19    | f/3.0 Sunray 107 Projection                       | 16MM        |              |         |                | X              |
| 85-0405-3840-8     |        | 19    | f/3.5 Raptar                                      | 16MM        |              |         |                | X              |
| 85-0403-2010-4     |        | 20    | f/1.5 Raptar                                      | 16MM        |              |         |                | X              |
| 85-0404-8330-8     |        | 20    | f/2.0 Micro Raptar                                |             |              |         |                | X              |
| 85-0401-0660-2     |        | 20    | f/3.5 Anastigmat <i>Cove</i>                      | 16MM        | X            |         |                | X              |
| 85-0406-1510-7     |        | 20    | f/3.5 Micro Projection                            |             |              |         |                | X              |
| Unassigned         |        |       | 20-80 MM f/1.8 Mod. 1                             |             |              |         |                |                |
| 85-0402-7020-0     |        | 20    | f/3.5 Lens in Tube (Special)                      | 16MM        |              |         | X              | X              |
| 85-0405-7680-4     |        | 25    | f/3.5 Micro Projection                            |             |              |         |                |                |
| 85-0405-6690-4     |        | 22.24 | f/3.5 Micro Projection                            |             |              | X       |                |                |
| 85-0406-3050-2     |        | 20    | f/4.0 Raptar Projection                           |             |              |         | X              | X              |
| 85-0402-9280-8     |        | 22    | f/3.5 (Periscope Lens)                            | 16MM        |              |         |                |                |
| 85-0404-8420-7     |        | 22.24 | f/2.0 Micro Raptar                                |             |              |         |                |                |
| 85-0405-2230-3     |        | 22.24 | f/2.0 Micro Projection                            |             |              |         |                |                |
| 85-0405-6290-3     |        | 21    | f/3.5 Amaton                                      |             | X            |         |                |                |
| 85-0401-9930-0     | .9     | 24    | f/3.5 Microfilm Projection                        | 16MM        |              |         | X              | X              |
| 85-0405-4690-6     | 1.0    | 24    | f/1.0 Glower                                      |             |              |         |                |                |
| 85-0405-2210-5     |        | 24    | f/2.0 Micro Projection                            |             |              |         |                |                |
| 85-0402-6610-9     |        | 24    | f/6.0 Micro Raptar                                | 16MM        |              |         | X              | X              |
| 85-0402-6830-3     | 1      | 25    | f/1.4 Cine Raptar                                 | 16MM        |              |         |                |                |
|                    |        | 26    | f/2.0 Raptar Recording Lens                       |             |              |         |                | X              |
| 85-0405-2350-9     | 1      | 25    | f/1.5 Cine Anastigmat                             | 16MM        |              |         |                |                |
| 85-0404-8020-5     | 1      | 25    | f/1.5 Raptar 4:1 & 8:1                            |             | X            |         | X              | X              |
| 85-0401-0410-2     | 1      | 25    | f/1.5 Cine Raptar (6 Elements)                    | 16MM        |              |         |                | X              |
| 85-0404-8990-9     | 1      |       | f/1.6 Projection                                  |             |              |         |                |                |
| 85-0404-9070-9     | 1      |       | f/1.6 Projection                                  |             |              |         |                |                |
| 85-0405-2810-2     | 1      |       | f/1.6 Projection                                  |             |              |         |                |                |
| 85-0400-7030-3     | 1      |       | f/1.6 Sunray 116 & 117 Projection                 | 8MM         |              |         |                | X              |
| 85-0402-4430-4     | 1      | 25    | f/1.8 Cine Raptar                                 | 18MM x 18MM | X            | X       |                |                |
| 85-0406-5460-1     |        | 26%   | f/3.5 Anastigmat Projection - 3 Elements          |             |              |         | X              | X              |
| 85-0401-0180-1     | 1      | 25    | f/1.9 Cine Raptar                                 | 16MM        |              |         |                |                |
| 85-0401-2160-1     | 1      | 25    | f/1.9 Sunray 107 Proj.                            | 16MM        |              |         |                | X              |
| 85-0405-2350-9     | 1      |       | f/2.0 for 1:1                                     |             |              |         | X              | X              |
| 85-0402-6340-3     | 1      | 25    | f/2.3 Raptar (10 Elements)                        | 16MM        |              |         | X              |                |
| 85-0401-7170-5     | 1      | 25    | f/2.3 Raptar (6 Elements) # 0 L.B.                | 35MM        | X            |         |                | X              |
| 85-0401-0580-2     | 1      | 25    | f/2.46 Sunray 107 Projection                      | 16MM        |              |         |                |                |
| 85-0400-6160-9     | 1      | 25    | f/2.5 Anastigmat                                  | 16MM        |              |         | X              |                |
| 85-0403-4770-1     | 1      | 25    | f/2.5 Cine Raptar (non-browning)                  | 16MM        |              |         | X              |                |
| 85-0400-5060-2     | 1      | 25    | f/2.5 Cine Raptar                                 | 16MM        | X            |         |                | X              |
| 85-0401-2900-0     | 1      | 25    | f/3.5 Cine Raptar (triplet)                       | 16MM        |              |         | X              |                |
| 85-0405-7680-4     |        | 25    | f/3.5 Micro Projection                            |             |              |         |                |                |
| 85-0400-5060-2     | 1      | 25    | f/3.5 Cine Raptar                                 | 16MM        | X            |         |                | X              |
|                    |        |       | f/4.5 Cine Raptar                                 | 16MM        |              |         |                | X              |
| 85-0401-1800-3     | 1      | 25    | f/4.5 Amaton #0 L.B.                              | 35MM        | X            |         | X              |                |
| 85-0406-1700-4     |        | 25    | f/4.5 Micro Projection                            |             |              |         |                |                |
| 85-0403-3710-8     | 1      | 25    | f/4.5 Micro Raptar # 0 L.B.                       | 16MM        | X            |         | X              |                |
| 85-0403-8190-8     |        | 30    | f/1.8 Raptar Backup Lens for 20-60 Varifocus Zoom | 5/8" Ø      |              |         |                |                |
| 85-0404-4060-3     |        | 30    | f/3.5 Amaton #0 L.B.                              | 35MM        | X            |         |                | X              |
| 85-0404-8510-5     |        | 30    | f/2.0 Micro Raptar                                |             |              |         |                | X              |
| 85-0405-2240-2     |        | 30    | f/3.5 Micro Projection                            |             |              |         |                | X              |

| OPTICAL SYSTEM | E.F.L.  |       | LENS                                   | COVERAGE        | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|---------|-------|----------------------------------------|-----------------|--------------|---------|----------------|----------------|
|                | IN.     | MM    |                                        |                 |              |         |                |                |
| 85-0403-2960-0 | 5.110   | 32    | f/2 Raptar                             | 19.5MM          | X            |         |                | X              |
| 85-0405-9250-4 | 1 1/4   | 32    | f/1.9 Projection Lens                  |                 |              |         | X              |                |
| 85-0403-6250-2 |         | 32    | f/4 Oscillo Raptar #0 L.B.             | 35MM DF         | X            |         |                |                |
| 85-0405-4730-0 | 1.14    | 29    | f/1.1 Detector Lens                    |                 |              |         |                |                |
| 85-0405-4740-9 | 1.14    | 29    | f/1.1 Glower Lens                      |                 |              |         |                |                |
| 85-0403-2390-0 |         | 32    | f/8 Amaton                             | 35MM            |              |         |                |                |
| 85-0402-4460-1 |         | 33    | f/2.3 Raptar                           | 35MM SF         |              |         | X              |                |
| 85-0406-0750-0 |         | 35    | Cylindrical Sound Unit                 |                 |              |         | X              |                |
| 85-0403-8480-3 |         | 34.27 | f/3.5 Amaton                           | 35MM SF         |              |         |                | X              |
| 85-0400-6670-7 | 1 3/8   | 35    | f/2 Raptar                             | 35MM            | X            |         | X              |                |
| 85-0400-6510-5 | 1 3/8   | 35    | f/2 Raptar #0 L.B.                     | 35MM DF         | X            |         |                | X              |
| 85-0404-2160-5 | 1 3/8   | 35    | f/2 Pro Raptar                         | 35MM SF         |              |         |                | X              |
| 85-0403-2870-1 | 1 3/8   | 35    | f/2.3 Raptar Spec. #0 L.B.             | 35MM SF         | X            |         |                |                |
| 85-0401-4340-7 | 1 3/8   | 35    | f/2.3 Raptar                           | 35MM SF         | X            |         | X              |                |
| 85-0403-4560-6 | 1 3/8   | 35    | f/2.3 Raptar                           | 35MM            |              |         |                | X              |
| 85-0402-7460-8 | 1 3/8   | 35    | f/2.5 Raptar W. A.                     | 35MM DF         |              |         |                |                |
| 85-0402-1190-7 | 1 3/8   | 35    | f/2.7 Amaton (for stereo)              | 35MM SF         |              |         |                |                |
|                |         |       | f/2.8 Amaton                           | 35MM SF         | X            | X       |                |                |
| 85-0401-8830-3 | 1 3/8   | 35    | f/2.8 Raptar                           | 35MM SF         |              |         |                |                |
| 85-0400-0960-8 | 1 3/8   | 35    | f/3.5 Amaton (Triplet)                 | 35MM SF         | X            |         |                | X              |
| 85-0403-8480-3 |         | 35    | f/3.5 Micro (34.27)                    |                 |              |         |                | X              |
| 85-0403-2840-4 | 1 3/8   | 35    | f/3.5 Amaton                           | 35MM SF         |              | X       |                |                |
|                |         | 35    | f/4.5 Raptar                           |                 |              |         |                |                |
| 85-0400-9980-7 | 1 3/8   | 35    | f/3.5 Raptar W. A.                     | 35MM DF         | X            |         | X              |                |
|                |         |       | f 5.6 Micro Raptar Projection          | 35MM DF         |              |         |                | X              |
|                |         | 35    | f/4.5 Projection                       | 35MM DF         |              |         |                | X              |
| 85-0402-8780-8 | 1 3/8   | 35    | f/4 Raptar                             | 35MM            | X            |         |                |                |
| 85-0403-7440-8 | 1 3/8   | 35    | f/4.5 Underwater Lens                  | 35MM DF         |              | X       |                |                |
| 85-0402-5790-0 | 1 3/8   | 35    | f/6.0 Micro Raptar                     | 35MM            |              |         |                | X              |
| 85-0403-3490-7 | 1 3/8   | 35    | f/11 Amaton Underwater Lens            | 35MM            |              | X       |                |                |
| 85-0405-8690-2 |         | 36    | f/4.5 Micro Projection                 |                 | X            |         |                |                |
| 85-0405-6660-3 |         | 36.2  | f/5.6 Amaton                           |                 |              |         | X              |                |
| 85-0405-2220-4 |         | 37.5  | f/2.0 Micro Projection                 |                 |              |         |                |                |
| 85-0401-7620-9 | 1 1/2   | 38    | f/1.5 Cine Raptar                      | 8MM             |              |         | X              |                |
| 85-0406-3290-4 |         | 37    | f/6.3 Sun Projection, Continuous Focus |                 |              |         |                | X              |
| 85-0400-8130-0 | 1 1/2   |       | f/1.8 Sunray 107 Projection            | 16MM            |              |         |                | X              |
| 85-0403-3440-2 | 1 1/2   | 38    | f/1.9 Raptar                           | 35MM SF         | X            |         |                | X              |
| 85-0401-0090-2 | 1 1/2   |       | f/2.0 Sunray 117 Projection            | 8MM             |              |         |                | X              |
| 85-0404-8070-0 | 1 1/2   | 38    | f/2.0 Raptar                           |                 |              | X       |                |                |
| 85-0401-4380-3 | 1 1/2   |       | f/2.5 Cine Telephoto                   | 8MM             |              |         | X              |                |
|                |         |       | f/2.8 Cine Telephoto                   | 8MM             |              |         | X              |                |
| 85-0401-1610-6 | 1 1/2   |       | f/2.7 Projection                       | 35MM            |              |         |                |                |
| 85-0406-5510-3 |         | 38.2  | f/3.5 Anastigmat Projection            |                 |              |         |                | X              |
| 85-0400-3180-0 | 1 1/2   |       | f/3.5 Cine Telephoto                   | 8MM             |              |         | X              |                |
| 85-0405-9930-1 | Re. 94- | 40    | f/1.8 Raptar                           |                 |              |         |                |                |
| 85-0401-4120-3 |         | 40    | f/1.5 Cine Raptar                      | 16MM            |              |         | X              |                |
| 85-0401-8510-1 |         | 40    | f/3.2 Microfilm Projection <i>Cove</i> | 35MM DF         |              |         |                | X              |
| 85-0406-1390-4 |         | 40    | f/4.5 Micro Projection                 | 35MM DF         |              |         | X              |                |
| 85-0400-6000-0 |         | 40    | f/3.2 Projection                       | 35MM DF         |              |         |                | X              |
|                |         |       | f/3.5 Amaton                           |                 |              |         |                |                |
| 85-0400-6130-2 |         | 40    | f/3.5 Projection                       | 35MM DF         |              |         |                |                |
| 85-0403-0770-5 |         | 40    | f/8 Raptar                             | 1 1/4" x 1 1/4" |              |         |                | X              |
| 85-0405-1970-5 |         | 40.6  | f/2.3 CRT Recording Lens               |                 |              |         |                | X              |
| 85-0401-3520-5 |         | 41.5  | f/2.8 Raptar                           | 35MM DF         |              | X       |                |                |
|                |         |       | f/4.5 Raptar                           |                 | X            |         |                |                |
| 85-0401-3380-4 |         | 41.6  | f/4.5 Amaton                           | 35MM DF         |              |         |                |                |
| 85-0404-8730-9 |         | 42.8  | f/2.0 Micro Raptar                     |                 |              |         |                |                |
|                |         | 42.8  | f/2.0 Micro Projection                 |                 |              |         |                |                |
| 85-0400-9700-9 |         | 44    | f/3.2 Amaton                           | 35MM DF         |              | X       |                | X              |
| 85-0405-6190-5 |         | 44.1  | f/1.3 Ultra-violet Lens                |                 |              |         |                | X              |
| 85-0403-6930-9 |         | 46    | f/2 Micro Raptar Projection            | 1 1/4" x 1 1/4" |              |         |                | X              |
| 85-0405-2720-3 |         | 46    | f/1.9 Scanner                          |                 |              | X       |                |                |
| 85-0400-9290-1 |         | 47.7  | f/12.5 Double Meniscus                 | 35MM DF         |              |         |                |                |
| 85-0402-9570-2 | 1.79    |       | f/1.5 Raptar                           | 16MM            | X            |         | X              |                |

| OPTICAL SYSTEM | E.F.L. |      | LENS                                      | COVERAGE        | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|------|-------------------------------------------|-----------------|--------------|---------|----------------|----------------|
|                | IN.    | MM   |                                           |                 |              |         |                |                |
| 85-0404-6510-7 | 2      | 48.9 | f/5.6 Raptar for 1:0.615X                 | 125.4MM Ø       |              |         |                | X              |
| 85-0401-2330-0 | 2      | 50   | f/1.5 Cine Raptar                         | 16MM            | X            |         | X              |                |
| 85-0404-7720-1 | 2      | 50   | f/2 Cine Raptar                           | 16MM            |              |         |                | X              |
| 85-0405-2170-1 | 2      | 50   | f/2.0 Micro Projection                    |                 |              |         |                |                |
| 85-0400-1390-7 | 2      |      | f/1.6 Series 107 Projection               | 16MM            |              |         |                | X              |
|                | 2      |      | f/1.6 Series 108 Projection               |                 |              |         |                |                |
| 85-0401-5540-1 | 2      |      | f/2.7 Raptar                              |                 |              |         | X              |                |
| 85-0401-4460-3 | 2      | 50   | f/1.6 Cine Raptar                         | 16MM            |              |         |                | X              |
| 85-0401-2850-7 | 2      | 50   | f/1.9 Cine Raptar                         | 16MM            | X            |         | X              |                |
| 85-0400-4520-6 | 2      | 50   | f/2.0 Raptar                              | 35MM DF         | X            | X       | X              | X              |
| 85-0400-4520-6 | 2      |      | f/1.9 Oscillo Raptar                      |                 |              | X       |                |                |
| 85-0403-8950-5 | 2      | 50   | f/2.0 Raptar                              | 35MM DF         |              |         |                |                |
| 85-0400-7620-1 | 2      | 50   | f/2.0 Sunray 106 Projection               | 16MM            |              |         |                |                |
| 85-0401-9430-1 | 2      | 50   | f/2.3 Raptar                              | 35MM SF         | X            |         | X              |                |
| 85-0403-6720-4 | 2      | 50   | f/2.3 Raptar                              |                 |              |         |                | X              |
| 85-0403-4660-4 | 2      | 50   | f/2.5 Raptar Telephoto (Non-Browning)     | 16MM            |              |         | X              |                |
| 85-0401-5540-1 | 2      | 50   | f/2.5 Raptar                              | 16MM            | X            |         | X              |                |
| 85-0403-5020-0 | 2      | 50   | f/2.8 Raptar                              | 35MM DF         |              |         | X              |                |
| 85-0403-6400-3 | 2      | 50   | f/2.8 Amaton                              | 35MM DF         |              | X       |                |                |
| 85-0402-5200-0 | 2      | 50   | f/2.8 Amaton                              | 35MM DF         |              |         |                | X              |
| 85-0401-2800-2 | 2      | 50   | f/2.8 Raptar                              | 35MM DF         | X            |         |                |                |
| 85-0400-5100-6 | 2      | 50   | f/3.5 Raptar Telephoto                    | 16MM            | X            | X       | X              | X              |
| 85-0403-4450-0 | 2      | 50   | f/4 Enlarging Pro Raptar                  | 35MM DF         | X            |         |                |                |
| 85-0406-1830-9 | 2      |      | f/3.5 Amaton                              |                 | X            |         |                |                |
| 85-0400-7220-0 | 2      | 50   | f/4.5 Amaton                              | 35MM DF         | X            |         |                | X              |
| 85-0400-9850-2 | 2      | 50   | f/4.5 Raptar Series II                    | 35MM DF         | X            |         |                | X              |
| 85-0402-7980-5 | 2      | 50   | f/4.5 Enlarging Raptar                    | 26" x 38"       | X            |         |                |                |
| 85-0401-8900-9 | 2      | 50   | f/4.5 Raptar                              | 35MM DF         |              | X       |                | X              |
| 85-0406-2280-6 |        | 50   | f/4.5 Micro Projection                    |                 |              |         |                | X              |
| 85-0402-5700-9 | 2      | 50   | f/6.0 Micro Raptar                        | 1 1/4" Ø        |              |         | X              |                |
| 85-0403-3330-5 | 2      | 50   | f/6.0 Micro Raptar                        | 1 1/4" Ø        |              |         |                | X              |
| 85-0401-1670-0 | 2      | 50   | f/6.3 Raptar Series IV                    | 35MM DF         | X            |         |                | X              |
| 85-0405-6340-6 | 2      | 51   | f/4.5 Graphic Raptar                      |                 | X            |         |                | X              |
|                |        |      |                                           |                 | X            |         |                |                |
| 85-0401-9730-6 | 2.04   | 52   | f/1.5 Raptar (7 element)                  | 35MM DF         | X            | X       |                |                |
| 85-0402-3590-6 | 2.04   | 52   | f/1.5 Raptar (T.V.)                       | 16MM            |              |         | X              |                |
| 85-0402-6160-5 |        | 53   | f/2.0 Raptar                              | 35MM DF         |              |         |                |                |
| 85-0402-2990-9 |        | 54   | f/2.7 Raptar with Dove Prism              | 1 1/4" x 1 1/4" |              |         |                | X              |
| 85-0402-3080-8 |        | 54   | f/2.7 Raptar                              | 1 1/4" x 1 1/4" |              |         |                |                |
| 85-0406-3110-4 |        | 55   | f/1.2 Oscillo Raptar                      |                 | X            |         |                |                |
| 85-0402-9820-1 |        | 55   | f/4.5 Enlarging Amaton                    | 1 1/2" x 1 1/2" |              |         |                |                |
| 85-0405-3470-4 |        | 55   | f/6.3 Aero Raptar                         |                 |              | X       |                |                |
| 85-0402-1020-6 | 2 1/4  |      | f/1.9 Raptar Projection                   | 35MM SF         |              |         |                | X              |
|                | 2 1/4  |      | f/3.0 Anastigmat Projection               |                 |              |         |                | X              |
| 85-0406-5300-9 | 2 1/4  | 56   | f/5.6 Raptar                              |                 |              | X       |                |                |
| 85-0402-6070-6 |        | 58   | f/2.8 Raptar                              | 1 1/2" x 1 1/2" | X            | X       |                |                |
| 85-0403-1580-7 |        | 58   | f/2.8 Raptar                              | 1 1/2" x 1 1/2" |              |         |                |                |
| 85-0406-2570-0 |        | 58   | f/4.5 Micro Projection                    |                 |              |         |                | X              |
| 85-0403-8750-9 |        | 60.6 | f/6.0 Micro Raptar                        | 1 1/4" x 1 1/4" |              |         |                | X              |
| Unassigned     | 2 1/2  | 63.5 | f/1.3 Ultra Violet Lens                   |                 |              |         |                | X              |
| 85-0401-0320-3 | 2 1/2  |      | f/1.6 Sunray 108 Projection               | 16MM            |              |         |                | X              |
| 85-0401-4550-1 | 2 1/2  |      | f/1.6 Sunray 109 Projection               | 16MM            |              |         |                | X              |
| 85-0404-2030-0 | 2 1/2  | 63   | f/1.7 Raptar                              | 1 1/4" x 1 1/4" | X            |         |                | X              |
| 85-0403-7250-1 | 2 1/2  |      | f/1.9 Oscillo Raptar 1:0.5X               | 2 1/2 Ø         | X            | X       |                |                |
| 85-0403-8660-0 | 2 1/2  |      | f/1.9 Raptar                              | 2 1/2 Ø         |              |         | X              |                |
| 85-0401-8990-5 | 2 1/2  |      | f/2.0 Raptar                              | 35MM            | X            |         | X              |                |
| 85-0401-6250-6 | 2 1/2  |      | f/2.5 Cine Raptar                         | 16MM            | X            |         | X              |                |
| 85-0403-1080-8 | 2 1/2  |      | f/2.7 Raptar (30-150MM Zoom Back-up Lens) | 16MM            |              |         |                | X              |
| 85-0404-5410-1 | 2 1/2  | 63.5 | f/2.7 Raptar Non-Browning Glasses         | 16MM            |              |         |                | X              |
| 85-0403-0580-8 | 2 1/2  |      | f/4 Raptar W. A. Pro 70                   | 70MM            | X            | X       | X              |                |
| 85-0402-8740-2 | 2 1/2  | 63   | f/5.6 Micro Raptar                        | 1 1/4" x 1 1/4" |              |         |                | X              |
| 85-0404-7790-4 | 2 1/2  | 63   | f/5.6 Raptar                              |                 |              | X       |                |                |
| 85-0405-1920-0 | 2-9/16 | 65   | f/2 Micro Raptar Projection               | 1 1/4" x 1 1/4" |              |         |                | X              |
| 85-0400-6760-6 | 2-9/16 | 65   | f/2.5 Sunray 106 Projection               | 16MM            |              |         |                |                |

| OPTICAL SYSTEM | E.F.L. |       | LENS                                           | COVERAGE | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|-------|------------------------------------------------|----------|--------------|---------|----------------|----------------|
|                | IN.    | MM    |                                                |          |              |         |                |                |
| TL-502-64      | 2 1/2  | 65    | f/3.5 Amaton # 2 L.B.                          |          |              |         |                |                |
| 85-0401-6540-0 | 2 1/2  | 65    | f/4.5 Raptar #O L.B.                           |          |              |         |                |                |
| 85-0404-0140-9 |        | 65.1  | f/4.5 Enlarging Raptar #O L.B.                 |          |              |         | X              |                |
| 85-0400-7710-0 |        | 65    | f/6.8 W. A. Raptar # 1 L.B.                    |          |              |         |                |                |
| 85-0400-7080-8 |        | 65    | f/6.3 Raptar for Microfilm                     |          |              |         |                |                |
| 85-0404-5740-1 |        | 67    | f/2 Micro Raptar for 14.5:1X                   |          |              |         | X              | X              |
| 85-0404-6280-7 |        | 67    | f/2.7 Raptar (Relay lens for 1:1X)             |          |              |         |                |                |
| 85-0402-0920-8 | 2 3/4  |       | f/1.9 Raptar Projection                        |          |              |         |                | X              |
| 85-0402-9710-4 | 2 3/4  |       | f/2.0 Raptar                                   |          |              |         |                |                |
| 85-0403-8390-4 | 2-7/8  |       | f/1.5 Raptar                                   |          |              |         |                |                |
| 85-0401-8620-8 | 3      | 72    | f/6.3 Raptar                                   |          |              |         |                |                |
| 85-0405-3860-6 | 3      | 72    | f/6.3 Raptar                                   |          |              |         |                |                |
| 85-0405-3890-3 | 3      | 72    | f/6.3 Raptar                                   |          |              |         |                |                |
| 85-0404-3770-0 |        | 73.55 | f/4.4 Enlarging Raptar                         |          |              |         |                |                |
| 85-0405-6430-5 | 3      | 74    | f/4.5 Graphic Raptar                           |          |              |         |                | X              |
| 85-0404-5930-8 | 3      | 75    | f/1.4 Oscillo Raptar 1:0.5X                    |          |              |         |                |                |
| 85-0401-0540-6 | 3      | 75    | f/1.6 Sunray 108 Projection                    |          |              |         |                | X              |
| 85-0403-2750-5 | 3      | 75    | f/1.9 Oscillo Raptar 1:0.9X                    |          |              |         |                |                |
| 85-0403-0080-9 | 3      | 75    | f/1.9 Cine Raptar                              |          |              |         |                | X              |
| 85-0403-2800-8 | 3      | 75    | f/1.9 Oscillo Raptar 1:0.5X                    |          |              |         |                |                |
| 85-0401-3970-2 | 3      | 75    | f/1.9 Oscillo Amaton                           |          |              |         |                |                |
| 85-0403-1680-5 | 3      | 75    | f/1.9 Oscillo Amaton 1:1 to 1:0.5              |          |              |         |                |                |
| 85-0403-0670-7 | 3      | 75    | f/1.9 Raptar for I.T.V.                        |          |              |         | X              |                |
| 85-0400-0680-2 | 3      | 75    | f/2.0 Sunray 107                               |          |              |         |                | X              |
| 85-0400-6850-5 | 3      |       | f/2.0 Anastigmat                               |          |              |         |                |                |
| 85-0401-2560-2 | 3      | 75    | f/2.3 Cine Telephoto                           |          |              |         |                |                |
| 85-0403-5720-5 | 3      | 75    | f/2.3 Raptar                                   |          |              |         |                | X              |
| 85-0402-0580-0 | 3      | 75    | f/2.3 Raptar                                   |          |              |         |                |                |
| 85-0401-2560-2 | 3      | 75    | f/2.5 Cine Telephoto                           |          |              |         |                |                |
| 85-0403-7910-0 | 3      | 75    | f/2.5 Raptar Telephoto (Non-Browning Glasses)  |          |              |         |                |                |
| 85-0401-3420-8 | 3      | 75    | f/2.8 Amaton                                   |          |              |         |                |                |
| 85-0401-9470-7 | 3      | 75    | f/2.8 Cine Telephoto                           |          |              |         |                |                |
| 85-0404-3330-3 | 3      | 75    | f/2.8 Oscillo Raptar (6 elements) 1:1 to 1:0.5 |          |              |         |                |                |
| 85-0403-4950-9 | 3      | 75    | f/2.8 Raptar                                   |          |              |         |                |                |
| 85-0403-5630-6 | 3      |       | f/2.8 Raptar                                   |          |              |         |                |                |
| 85-0401-5860-3 | 3      | 75    | f/3.0 Projection (triplet)                     |          |              |         |                |                |
| 85-0401-2520-6 | 3      | 75    | f/3.5 Raptar                                   |          |              |         | X              | X              |
| 85-0400-3510-8 | 3      | 75    | f/3.5 Series O Projection                      |          |              |         |                | X              |
|                |        |       | f/3.0 Projection                               |          |              |         |                | X              |
|                |        |       | f/3.5 Anastigmat                               |          |              |         |                |                |
| 85-0400-1550-6 | 3      | 75    | f/4.0 Cine Telephoto                           |          |              |         |                |                |
| 85-0400-5310-1 | 3      | 75    | f/4.5 Amaton # 1 L.B.                          |          |              |         |                |                |
| 85-0401-3290-5 | 3      | 75    | f/4.5 Amaton Mod. 1                            |          |              |         |                |                |
| 85-0400-9590-4 | 3      | 75    | f/4.5 Raptar Series II #1 L.B.                 |          |              |         |                |                |
| 85-0401-1470-5 | 3      | 75    | f/6.3 Raptar Series IV # O.L.B.                |          |              |         |                | X              |
| 85-0405-1670-1 | 3      | 76    | f/1.0 Infrared Objective                       |          |              |         |                |                |
| 85-0405-2940-7 | 3      | 76    | f/1.9 Oscillo Amaton                           |          |              |         |                |                |
| 85-0404-0690-3 | 3      | 76    | f/10 Amaton                                    |          |              |         |                |                |
| 85-0405-1660-2 |        | 76    | f/10 Infrared Objective                        |          |              |         |                |                |
| 85-0405-2070-3 | 3-1/8  | 80    | f/2                                            |          |              |         |                |                |
| 85-0400-8400-7 |        | 80    | f/3.5 Projection                               |          |              |         |                | X              |
| 85-0406-1090-0 |        | 80    | f/12.5 Dual Lens System                        |          |              |         |                | X              |
| 85-0404-3740-3 |        | 81.77 | f/3.4 Enlarging Raptar                         |          |              |         |                | X              |
| 85-0405-3490-2 | 3 1/4  |       | f/2.5 Raptar I 5.20                            |          |              |         |                |                |
| 85-0403-9270-7 | 3 1/4  |       | f/2.7 Sunray Series I Projection               |          |              |         |                |                |
| 85-0402-0830-9 | 3 1/4  |       | f/1.9 Cine Raptar                              |          |              |         |                |                |
| 85-0406-3330-8 | 3 1/4  |       | f/4.3 Projection Lens                          |          |              |         |                |                |
| 85-0401-2630-3 |        | 83    | f/3.2 Raptar #1 L.B.                           |          |              |         |                | X              |
| 85-0400-6950-3 |        | 83    | f/3.2 Viewfinder                               |          |              |         |                | X              |
| 85-0400-6970-1 |        | 83    | f/3.2 Amaton                                   |          |              |         |                | X              |
| 85-0401-3310-1 |        | 84    | f/5 Amaton                                     |          |              |         |                |                |
| 85-0402-2100-5 |        | 85    | f/1.5 Raptar #5 L.B.                           |          |              |         |                |                |
| 85-0400-6930-5 |        | 85    | f/3.2 Viewfinder                               |          |              |         |                | X              |
| 85-0400-6890-1 |        | 85    | f/3.5 Amaton #1 L.B.                           |          |              |         |                |                |
| 85-0401-2450-6 |        | 85    | f/3.5 Raptar                                   |          |              |         |                |                |

| OPTICAL SYSTEM | E.F.L. |       | LENS                                          | COVERAGE        | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|-------|-----------------------------------------------|-----------------|--------------|---------|----------------|----------------|
|                | IN.    | MM    |                                               |                 |              |         |                |                |
| 85-0400-5570-0 |        | 86    | f/11 Double Meniscus                          | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0404-4760-0 | 3 1/2  | 88    | f/1.4 Oscillo Raptar for 1:1X                 | 4 1/2 Ø Obj.    |              | X       | X              | X              |
| 85-0404-1940-1 | 3 1/2  | 88    | f/1.4 Oscillo Raptar for 1:0.9X               | 4 1/2 Ø Obj.    |              | X       |                |                |
| 85-0403-0380-3 | 3 1/2  | 88    | f/8 Raptar                                    | 1 1/4" x 1 3/4" |              |         |                |                |
| 85-0404-2330-4 | 3 1/2  | 90    | f/6.4 Enlarging Raptar                        | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0402-2340-7 | 3 1/2  | 89    | f/1.9 Cine Raptar                             | 35MM            |              |         | X              |                |
| 85-0401-1180-0 | 3 1/2  | 90    | f/1.6 Sunray 108 Projection                   | 16MM            |              |         | X              |                |
| 85-0403-9330-9 | 3 1/2  | 90    | f/2.7 Sunray Series I Projection              | 35MM            |              |         |                |                |
| 85-0406-4980-9 | 3 1/2  | 90    | f/2.8 Raptar                                  |                 |              | X       |                |                |
| 85-0401-3210-3 | 3 1/2  | 90    | f/3.5 Raptar #2 L.B.                          | 2 1/4" x 3 3/4" |              | X       | X              |                |
| 85-0401-0950-7 | 3 1/2  | 90    | f/3.5 Amaton #2 L.B.                          | 2 1/4" x 3 3/4" | X            | X       |                |                |
| 85-0402-8030-8 | 3 1/2  | 90    | f/4.5 Enlarging Raptar #1 L.B.                | 2 1/4" x 2 1/4" |              |         | X              |                |
| 85-0405-6460-2 | 3 1/2  | 90    | f/4.5 Graphic Raptar #1 L.B.                  |                 | X            |         |                |                |
| 85-0403-4330-4 | 3 1/2  | 90    | f/4.5 Enlarging Pro Raptar #3 L.B.            | 2 1/4" x 3 3/4" | X            |         |                |                |
| 85-0400-5430-7 | 3 1/2  | 90    | f/4.5 Amaton                                  | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0400-5270-7 | 3 1/2  | 90    | f/4.5 Raptar Series II #0 or #1 L.B.          | 2 1/4" x 3 3/4" | X            |         |                |                |
| 85-0401-1530-6 | 3 1/2  | 90    | f/6.3 Raptar Series IV #0 L.B.                | 2 1/4" x 3 3/4" | X            | X       |                |                |
| 85-0401-1570-2 | 3 1/2  | 90    | f/6.3 Amaton                                  | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0401-1210-5 | 3 1/2  | 90    | f/6.8 Wide Angle Raptar #1 L.B.               | 4" x 5"         | X            | X       |                |                |
| 85-0404-2330-4 | 3 1/2  | 90    | f/6.9 Enlarging Raptar                        | School Pictures |              |         | X              |                |
| 85-0404-2850-1 |        | 90.5  | f/3.5 Enlarging Raptar                        | 2 1/4" x 2 1/4" |              |         | X              |                |
| 85-0400-9520-1 | 3 1/2  | 91    | f/2.3 107 Projection                          | 16MM            |              |         | X              |                |
| 85-0403-8430-8 | 19/32  | 91    | f/3.0 Raptar                                  | Scanner         |              |         | X              |                |
| 85-0402-3110-3 |        | 91    | f/4.5 Raptar                                  | 2 1/4" x 3 3/4" |              |         | X              |                |
| 85-0404-0380-1 |        | 92.5  | f/11.0 Enlarging Raptar                       | 2 1/4" x 3 3/4" |              |         | X              |                |
| 85-0403-9970-2 |        | 92.57 | f/6.6 Enlarging Raptar                        | 46MM            |              |         | X              |                |
| 85-0402-7940-9 |        | 94    | f/3.5 Raptar                                  | 2 1/4" x 2 1/4" |              |         | X              |                |
| 85-0402-2620-2 | 3 3/4  | 95.7  | f/1.9 Cine Raptar                             | 35MM            |              |         | X              |                |
| 85-0401-6910-5 | 3 3/4  |       | Projection                                    | 35MM            |              |         |                |                |
| 85-0403-9390-3 | 3 3/4  |       | Sunray Series I Projection                    | 35MM            |              |         |                |                |
| 85-0403-6000-1 |        | 95.8  | f/3.5 Enlarging Raptar                        | School Pictures |              |         | X              |                |
| 85-0405-5030-4 |        | 97.2  | f/3.0 Raptar                                  |                 |              |         | X              |                |
| 85-0400-5610-4 |        | 98.5  | f/6.3 Amaton                                  | 2 1/4" x 3 3/4" |              |         | X              |                |
| 85-0404-3710-6 |        | 99.6  | f/4.5 Enlarging Raptar #1 L.B.                | 2 1/4" x 3 3/4" | X            |         | X              |                |
| 85-0401-1280-8 | 4      |       | f/1.6 Sunray 108 Projection                   | 16MM            |              |         | X              |                |
| 85-0405-1940-8 | 4      |       | f/1.7 300                                     |                 |              |         |                |                |
| 85-0402-2710-1 | 4      |       | f/1.9 Cine Raptar                             | 35MM            |              |         | X              |                |
| 85-0402-0020-7 | 4      |       | f/2.3 Raptar #4 L.B.                          | 35MM            | X            |         | X              |                |
| 85-0400-9450-1 | 4      |       | f/2.5 Sunray 107 Projection                   | 16MM            |              |         |                |                |
| 85-0403-7960-5 | 4      |       | f/2.5 Raptar Telephoto (Non-Browning Glasses) | 16MM            | X            |         | X              |                |
| 85-0402-7820-3 | 4      | 101   | f/2.5 Raptar Telephoto                        | 16MM            |              |         | X              |                |
| 85-0406-5900-6 | 4      |       | f/2.8 Anastigmat Projection Plastic Mount     |                 |              |         | X              |                |
| 85-0402-4950-1 | 4      |       | f/2.8 Raptar                                  | 2 1/4" x 2 1/4" | X            | X       | X              |                |
| 85-0401-6700-0 | 4      |       | f/2.8 Amaton                                  | 4" Ø            |              |         |                |                |
| 85-0405-9790-9 | 4      | 101   | f/2.8 Raptar (5 Elements)                     |                 |              | X       |                |                |
| 85-0400-3580-1 | 4      |       | f/3.5 Series O Projection                     | 35MM            |              |         | X              |                |
| 85-0400-7680-5 | 4      | 101   | f/3.5 Amaton                                  | 3 3/4" x 3 3/4" | X            | X       | X              |                |
| 85-0401-9510-0 | 4      |       | f/3.5 Series O Projection                     | 35MM DF         |              |         | X              |                |
| 85-0400-2570-3 | 4      |       | f/4.5 Cine Telephoto                          | 16MM            | X            |         | X              |                |
| 85-0402-8050-6 | 4      | 101   | f/4.5 Enlarging Raptar #1 L.B.                | 2 1/4" x 3 3/4" | X            |         | X              |                |
| 85-0402-8050-6 | 4      | 101   | f/4.5 Enlarging Raptar with                   |                 |              |         |                |                |
| 85-0404-8100-5 |        |       | Chromatic Corrector #1 L.B.                   |                 | X            |         |                |                |
| 85-0400-4900-0 | 4      | 101   | f/4.5 Raptar Series II #1 L.B.                | 2 1/4" x 3 3/4" | X            | X       | X              |                |
| 85-0404-5040-6 | 4      | 101   | f/4.5 Raptar 8.8X Copy Lens #3 L.B. Pro.      | 2.51" x 3.35"   | X            |         |                |                |
| 85-0402-7210-7 | 4      |       | f/5.6 Enlarging Pro Raptar #3 Pro. L.B.       | 2 1/4" x 2 1/4" | X            |         |                |                |
| 85-0401-0730-3 | 4      | 101   | f/6.3 Raptar Series IV                        | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0404-3620-7 | 4      | 101   | f/6.5 Enlarging Raptar                        | School Pictures |              |         | X              |                |
| 85-0404-2390-8 | 4      | 101   | f/7.2 Enlarging Raptar                        | School Pictures |              |         | X              |                |
| 85-0404-3560-5 | 4      | 101   | f/8.1 Enlarging Raptar                        | School Pictures |              |         | X              |                |
| 85-0404-2460-9 | 4      | 101   | f/1.0 Enlarging Raptar                        | School Pictures |              |         | X              |                |
| 85-0405-6350-5 | 4-1/8  | 105   | f/4.5 Graphic Raptar #1 L.B.                  |                 | X            |         |                |                |
| 85-0401-2670-9 |        | 103   | f/4.5 Amaton                                  | 2 1/4" x 3 3/4" |              | X       |                |                |
| 85-0405-3810-1 |        | 105   | f/5.6 Lens System 1:0.9X                      |                 | X            |         |                |                |
| 85-0404-9990-8 | 4.3    |       | f/2.8 Oscillo Raptar #5 L.B.                  |                 | X            |         |                |                |
| 85-0402-2800-0 | 4 1/4  | 108   | f/1.9 Cine Raptar                             | 35MM            |              |         | X              |                |
| 85-0400-1840-1 | 4 1/4  | 108   | f/2.7 Series I Projection                     | 35MM            |              |         |                |                |
| 85-0403-7810-2 | 4 1/4  | 108   | f/6.3 Raptar 1:0.94X #7 L.B.                  | 8 1/4 Ø         | X            |         | X              |                |
| 85-0403-4160-5 | 4 1/4  | 108   | f/6.3 Amaton for 1:0.94X Copy Lens            | 8 1/2 Ø         |              |         |                |                |

| OPTICAL SYSTEM | E.F.L. |        | LENS                                                                 | COVERAGE        | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|--------|----------------------------------------------------------------------|-----------------|--------------|---------|----------------|----------------|
|                | IN.    | MM     |                                                                      |                 |              |         |                |                |
| 85-0400-7380-2 | 4 1/4  | 108    | f/6.8 Wide Angle Raptar #2 L.B.                                      | 5" x 7"         | X            | X       |                |                |
| 85-0403-9910-8 | 4 1/4  | 108    | f/9.0 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0404-3220-6 |        | 109    | f/5.1 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0402-7730-4 |        | 110    | f/2.5 Raptar                                                         | 35MM            |              |         |                |                |
| 85-0405-7610-1 | 4.4    | 112    | f/2.8 Amaton                                                         |                 |              |         |                |                |
| 85-0401-3150-1 |        | 114    | f/4.5 Series II Raptar #2 L.B.                                       | 2 1/4" x 3 3/4" | X            | X       |                | X              |
| 85-0104-2550-5 | 4 1/2  | 114    | f/5.6                                                                | School Pictures |              | X       |                |                |
| 85-0104-2680-2 | 4 1/2  | 114    | f/8.0 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0402-1730-0 | 4 1/2  | 114    | f/1.9 Cine Raptar                                                    | 35MM            |              |         |                | X              |
| 85-0400-1900-3 | 4 1/2  | 114    | f/2.8 Series I Projection                                            | 35MM            |              |         |                |                |
| 85-0403-5150-5 | 4 1/2  | 114    | f/5.6 Enlarging Pro Raptar #2 Pro. L.B.                              | 2 1/4" x 3 3/4" | X            |         |                |                |
| 85-0400-9730-6 | 4 1/2  |        | f/1.5 Objective                                                      | 1/2 Ø           |              |         |                | X              |
| 85-0401-5010-5 |        | 115    | f/12.5 Micro Raptar                                                  | 35MM            |              |         |                |                |
| 85-1538-0435-7 | 4.6    | 113    | f/1.6                                                                |                 |              |         |                | X              |
| 85-0103-9820-9 |        | 116.27 | f/8.0 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0104-3250-3 |        | 116.54 | f/5.5 Enlarging Raptar                                               | School Pictures |              |         |                |                |
| 85-0103-9520-5 | 4 3/4  | 120    | f/2.9 Sunray Series I Projection                                     | 35MM            |              |         |                |                |
| 85-0103-7580-1 | 4 3/4  | 120    | f/5.6 Enlarging Raptar                                               | 2 1/4" x 3 3/4" |              |         |                |                |
| 85-0102-2250-8 | 4 3/4  | 121    | f/1.9 Cinema Raptar                                                  | 35MM            |              |         |                | X              |
| 85-0103-5860-9 |        | 123.5  | f/8.0 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0100-5480-2 |        | 126.8  | f/6.3 Series IA Raptar #1                                            | 3 3/4" x 4 1/4" |              |         |                |                |
| 85-0403-8870-5 |        | 124.84 | f/8.0 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0404-2970-7 |        | 124.84 | f/6.9 Enlarging Raptar                                               | School Pictures |              |         |                |                |
| 85-0400-4670-9 |        | 125    | f/8.0 Enlarging Raptar                                               |                 |              |         |                | X              |
| 85-0401-3630-2 | 5      | 127    | f/3.5                                                                | 35MM DF         |              |         |                | X              |
| 85-0402-1530-4 | 5      | 127    | f/1.9 Cine Raptar                                                    | 35MM            |              |         |                | X              |
| 85-0403-9740-9 | 5      | 127    | f/3.1 Sunray Series I Projection                                     | 35MM            |              |         |                |                |
| 85-0400-3620-5 | 5      | 127    | f/3.5 Series O Anastigmat Projection                                 | 35MM DF         |              | X       |                | X              |
| 85-0400-3720-3 | 5      | 127    | f/3.5 Series O Projection (Petzal)                                   | 35MM            |              |         |                |                |
| 85-0400-8310-8 | 5      | 127    | f/6.0 Verito (Diffused Focus)                                        | 3 3/4" x 4 1/4" |              |         |                |                |
| 85-0403-1910-6 | 5      | 127    | f/4.5 Enlarging Raptar #2 L.B.                                       | 4" x 5"         | X            | X       |                | X              |
| 85-0400-4960-4 | 5      | 127    | f/4.5 Raptar Series II #2 L.B.                                       | 4" x 5"         | X            | X       |                | X              |
| 85-0403-1230-9 | 5      | 127    | f/5.4 Raptar - (Back-up Lens for 60MM - 300MM Zoom)                  | 4" x 5"         |              |         |                | X              |
| 85-0405-2000-0 | 5      | 127    | f/5.4 Raptar Non-Browning Glasses - (Back-up lens 60MM - 300MM Zoom) | 4" x 5"         |              |         |                |                |
| 85-0404-2910-5 | 5      | 127    | f/6.4 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0400-9240-6 | 5      | 127    | f/6.3 Raptar Series IV #2 L.B.                                       | 4" x 5"         | X            |         |                |                |
| 85-0404-3160-4 | 5      | 127    | f/7.0 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0405-4640-1 |        | 127    | f/10 Raptar                                                          |                 |              |         |                |                |
| 85-0404-4110-8 |        | 128.5  | f/6.4 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0403-9880-3 |        | 128.5  | f/6.8 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0404-5610-6 |        | 128.5  | f/7.7 Enlarging Raptar                                               | School Pictures |              |         |                |                |
| 85-0404-1830-6 |        | 128.5  | f/8 Enlarging Raptar                                                 | School Pictures |              |         |                | X              |
| 85-0404-7010-7 |        | 128.57 | f/7.0 Enlarging Raptar                                               |                 |              |         |                |                |
| 85-0403-8810-1 |        | 130    | f/5.4 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0404-3130-7 |        | 130    | f/6.5 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0400-5540-3 | 5-1/8  | 130    | f/6.8 Series 1A Raptar No. 1A                                        | 3 3/4" x 4 1/4" |              |         |                |                |
| 85-0404-5580-1 |        | 130.1  | f/7.7 Enlarging Raptar                                               | School Pictures |              |         |                |                |
| 85-0404-5180-0 |        | 131.9  | f/4.6 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0404-1590-4 |        | 131.9  | f/4.9 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0404-2820-4 |        | 131.9  | f/7.9 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0403-6060-5 |        | 131.9  | f/8.24 Enlarging Raptar                                              | School Pictures |              |         |                | X              |
| 85-0404-2760-2 |        | 131.9  | f/8.5 Enlarging Raptar                                               | School Pictures |              |         |                | X              |
| 85-0403-5920-1 |        | 131.9  | f/9.63 Enlarging Raptar                                              | School Pictures |              |         |                | X              |
| 85-0400-4760-8 |        | 132.5  | f/8.0 Enlarging Raptar                                               |                 |              |         |                |                |
| 85-0404-7620-3 |        | 131.9  | f/7.1 Enlarging Raptar                                               |                 |              |         |                |                |
| 85-0402-2430-6 | 5 1/4  | 133.6  | f/2.0 Cine Raptar                                                    | 35MM            |              |         |                | X              |
| 85-0403-9540-3 | 5 1/4  |        | f/3.2 Sunray Series 1 Projection                                     | 35MM            |              |         |                |                |
| 85-0404-7330-9 |        | 135    | f/2.2                                                                |                 |              |         |                | X              |
| 85-0403-5500-1 |        | 135    | f/3.5 Raptar                                                         | 35MM SF         |              |         | X              |                |
| 85-0401-7550-8 | 5-3/8  | 135    | f/3.8 Enlarging Raptar                                               | 35MM            |              |         |                | X              |
| 85-0405-6490-9 | 5-3/8  | 138    | f/4.5 Graphic Raptar #3 L.B.                                         |                 | X            |         |                |                |
| 85-0402-8100-9 |        | 135    | f/4.5 Enlarging Raptar #3 L.B.                                       | 4" x 5"         | X            |         |                | X              |
| 85-0400-4810-1 |        | 135    | f/4.5 Raptar                                                         | 4" x 5"         |              | X       |                | X              |
| 85-0400-4810-1 |        | 135    | f/4.7 Raptar                                                         | 4" x 5"         |              | X       |                | X              |
| 85-0402-8870-7 | f/5.6  | 135    | f/5.6 Enlarging Pro Raptar #3 Pro. L.B.                              | 4" x 5"         | X            |         |                |                |
| 85-0401-1900-1 |        | 135    | f/6.3 Raptar Series IV                                               | 4" x 5"         |              |         |                |                |

| OPTICAL SYSTEM | E.F.L. |       | LENS                                             | COVERAGE        | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|-------|--------------------------------------------------|-----------------|--------------|---------|----------------|----------------|
|                | IN.    | MM    |                                                  |                 |              |         |                |                |
| 85-0404-7850-6 |        | 135   | f/7.2 Raptar                                     |                 |              |         |                | X              |
| 85-0404-2820-4 | 5-3/8  | 135   | f/8 Enlarging Raptar                             | 4" x 5"         |              |         |                |                |
| 85-0404-7430-7 |        | 135   | f/8.7 Enlarging Raptar                           |                 |              |         |                | X              |
| 85-0405-6490-9 |        | 138   | f/4.5 Graphic Raptar                             |                 | X            |         |                | X              |
| 85-0403-9560-1 | 5 1/2  |       | f/3.4 Sunray Series 1 Projection                 | 35MM            |              |         |                |                |
| 85-0402-3480-0 | 5 1/2  |       | f/3.5 Series O                                   | 35MM DF         |              |         | X              |                |
| 85-0402-1620-3 | 5 1/2  |       | f/2.1 Cine Raptar                                | 35MM            |              |         | X              |                |
| 85-0404-3890-6 | 5.55   |       | f/4 Projection                                   | 3" Dia.         |              |         | X              |                |
| 85-0405-2870-6 |        | 144   | f/2 Raptar for 5X                                |                 |              |         |                |                |
| 85-0402-2520-4 | 5 3/4  | 146   | f/2.2 Cine Raptar                                | 35MM            |              |         | X              |                |
| 85-0400-5550-2 | 5 3/4  |       | f/6.3 Series 1A Raptar No. 2                     | 4" x 5"         |              |         |                |                |
| 85-0400-8700-0 | 5 3/4  |       | f/7.7 Raptar                                     | 4" x 5"         |              |         |                |                |
| 85-0405-3920-8 | 5 3/4  | 147   | f/1.9 Oscillo Amaton                             |                 |              |         | X              |                |
| 85-0406-6240-6 |        | 150   | f/3.3 Collimator Lens                            |                 |              |         |                |                |
| 85-0401-6940-2 | 6      | 152   | f/2 Aero Raptar                                  | 4 1/2" x 4 1/2" |              |         |                |                |
| 85-0401-5690-4 | 6      | 152   | f/2 Aero Raptar #8 L.B.                          | 4 1/2" x 4 1/2" | X            |         |                |                |
| 85-0402-1820-9 | 6      | 152   | f/2.3 Cine Raptar                                | 35MM            |              |         | X              |                |
| 85-0405-0100-0 | 6      |       | f/2.3 Oscillo Raptar Spec. #7 L.B.               |                 | X            |         |                |                |
| 85-0405-0830-2 | 6      |       | f/2.3 Oscillo Raptar Spec. #7 L.B.               |                 | X            |         |                |                |
| 85-0401-9340-2 | 6      | 152   | f/2.7 Pro Raptar Telephoto #6 Pro. L.B.          | 35MM            | X            | X       |                |                |
| 85-0406-0060-4 | 6      | 152   | f/2.5 Aero Raptar                                |                 |              |         | X              |                |
| 85-0406-1400-1 | 6      |       | f/2.8 Lens Assembly                              |                 |              |         | X              |                |
| 85-0406-2710-2 | 6      |       | f/2.8                                            |                 |              |         | X              |                |
| 85-0402-9380-6 | 6      | 152   | f/3.5 Aero Raptar #7 Pro. L.B.                   | 2 1/4" x 2 1/4" | X            |         | X              |                |
| 85-0405-9800-6 | 6      | 152   | f/3.5 Raptar (5 Elements)                        |                 |              | X       |                |                |
| 85-0406-5350-4 | 6      |       | f/3.5 Projection Anastigmat                      |                 |              |         | X              |                |
| 85-0403-7340-0 | 6      | 152   | f/3.8 Raptar Telephoto (Non-Browning Glasses)    | 5/8" Ø          |              |         | X              |                |
| 85-0406-5190-4 | 6      | 152   | f/3.7 Raptar                                     |                 |              | X       |                |                |
| 85-0403-1170-7 | 6      | 152   | f/3.8 Cine Raptar Telephoto                      | 16MM            |              |         | X              |                |
| 85-0405-8980-6 | 6      |       | f/4.2                                            |                 |              |         | X              |                |
| 85-0400-2390-4 | 6      | 152   | f/4.5 Cine Telephoto f/4.9                       | 16MM            |              |         | X              |                |
| 85-0403-9620-3 | 6      | 152   | f/5.8 Sunray Series 1 Projection                 | 35MM            |              |         |                |                |
| 85-0402-9470-5 |        | 152.1 | f/2.5 Aero Raptar #7 L.B.                        | 4 1/2" x 4 1/2" | X            |         |                |                |
| 85-0400-8450-2 | 6-1/8  | 155   | f/4.0 Verito Diffused Focus                      | 4" x 5"         |              |         |                |                |
| 85-0403-0920-6 | 6 1/4  | 156   | f/12.5 Wide Angle for Copying 1:1X               | 8" x 10"        |              |         | X              |                |
| 85-0400-7410-7 | 6 1/4  | 157   | f/12.5 Wide Angle Raptar                         | 8" x 10"        |              |         |                |                |
| 85-0404-2620-8 | 6 1/4  | 157   | Sunray 121 Micro Projection                      | 35MM            |              |         | X              |                |
| 85-0401-8710-7 | 6 1/4  | 157   | f/9.5 Wide Angle Raptar                          | 8" x 10"        |              |         |                |                |
| 85-0404-6910-9 | 6 1/4  | 160   | f/2.5 Raptar for 1:0.94X                         |                 |              |         | X              |                |
| 85-0405-4060-2 | 6-3/8  | 161   | f/4.5 Graphic Raptar                             |                 | X            |         |                |                |
| 85-0404-4080-3 | 6-3/8  | 162   | f/2 Raptar (Input Lens) for 1:1X Spec. #7 L.B.   | 3" x 3"         | X            |         |                |                |
| 85-0404-8010-6 |        | 162   | f/2.2                                            |                 |              |         |                |                |
| 85-0405-2500-9 | 6-3/8  |       | f/2.1 Raptar (Input Lens) for 1:1X Spec. #7 L.B. |                 | X            |         |                |                |
| 85-0404-4530-7 | 6-3/8  | 162   | f/3.5 Raptar 2 1/2:1X Spec. #6 Pro. L.B.         | 4" Diagonal     | X            |         |                |                |
| 85-0400-5020-6 | 6-3/8  | 162   | f/4.5 Raptar Series II #4 L.B.                   | 4" x 5"         | X            | X       | X              |                |
| 85-0402-8160-3 | 6-3/8  | 162   | f/4.5 Enlarging Raptar #4 L.B.                   | 4" x 5"         | X            |         |                |                |
| 85-0402-5880-9 | 6-3/8  | 162   | f/5.6 Enlarging Pro Raptar #4 Pro. L.B.          | 4" x 5"         | X            |         |                |                |
| 85-0401-0470-6 | 6-3/8  | 162   | f/6.3 Raptar Series IV #3 L.B.                   | 4" x 5"         | X            |         |                |                |
| 85-0402-1910-8 | 6 1/2  | 165   | f/2.5 Cine Raptar                                | 35MM            |              |         | X              |                |
| 85-0400-8340-5 | 6 1/2  | 165   | f/6.0 Verito Diffused Focus                      | 4" x 5"         |              |         |                |                |
| 85-0400-8700-6 | 6 1/2  | 165   | f/12.5 Series 1A Raptar #2B                      | 4" x 5"         |              |         |                |                |
| 85-0405-7210-0 |        | 169.5 | f/5.6 Copy Lens                                  | 11 1/2"         |              |         |                |                |
| 85-0404-6030-6 | 6.75   |       | f/4.0 Projection                                 | 3" Dia.         |              |         | X              |                |
| 85-0405-3330-0 | 7      |       | Overhead Projection Lens                         |                 |              |         |                |                |
| 85-0404-1340-4 | 7      | 176   | f/1.9 Raptar 1:0.5X Spec. L.B.                   | 4" Ø Obj.       | X            |         |                |                |
| 85-0400-3660-1 | 7      | 176   | f/4.9 Series O Projection Anastigmat             | 35MM            |              |         |                |                |
| 85-0401-6290-2 | 7      | 177   | f/3.5 Projection                                 | 35MM            |              |         | X              |                |
| 85-0404-0320-7 | 7      | 178   | f/2.2 Raptar Projection Lens                     | 35MM            |              |         | X              |                |
| 85-0402-2000-7 | 7      | 178   | f/2.7 Cine Raptar                                | 35MM            |              |         | X              |                |
| 85-0401-9890-6 | 7      | 178   | f/2.8 Raptar                                     | 3 1/4" x 4 1/4" |              |         | X              |                |
| 85-0400-6180-7 | 7      | 178   | f/4.9 Series O Anastigmat                        | 35MM            |              |         | X              |                |
| 85-0405-8010-3 | 7 1/4  |       | f/4.5 Raptar                                     |                 |              |         | X              |                |
| 85-0405-4030-5 | 7.16   |       | f/2.8 Catadioptric                               |                 |              |         |                |                |
| 85-0400-8750-5 | 7      |       | f/12.5 Series 1A Raptar #3                       | 5" x 7"         |              |         |                |                |
| 85-0402-3860-3 |        | 180   | f/3.5 Raptar #6 L.B.                             | 35MM            | X            |         |                |                |
| 85-0405-1790-7 |        | 190   | f/1.2 Infrared                                   |                 |              |         |                |                |

| OPTICAL SYSTEM | E.F.L. |       | LENS                                          | COVERAGE        | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|-------|-----------------------------------------------|-----------------|--------------|---------|----------------|----------------|
|                | IN.    | MM    |                                               |                 |              |         |                |                |
| 85-0404-0110-2 | 7 1/2  | 190   | f/3.5 Raptar Pro-35 #6 Pro. L.B.              | 35MM            | X            |         |                |                |
| 85-0400-6420-7 | 7 1/2  | 190   | f/4.5 Raptar Series II                        | 5" x 7"         |              |         |                | X              |
| 85-0402-8210-6 | 7 1/2  | 190   | f/4.5 Enlarging Raptar #5 L.B.                | 5" x 7"         | X            |         |                | X              |
| 85-0401-0790-7 | 7 1/2  | 190   | f/6.3 Raptar Series IV #4 L.B.                | 5" x 7"         | X            |         |                | X              |
| 85-0402-3370-3 | 7 1/2  | 190   | f/2.9 Cine Raptar                             | 35MM            |              |         |                | X              |
| 85-0402-0220-1 | 7 1/2  | 190   | f/5.6 Enlarging Pro Raptar #5 Pro. L.B.       | 4" Diag.        | X            |         |                |                |
| 85-0405-6730-8 | 7 1/2  | 192   | f/4.5 Graphic Raptar #5 L.B.                  |                 | X            |         |                | X              |
| 85-0405-6920-5 | 7.7    |       | f/3.3                                         |                 |              |         | X              |                |
| 85-0404-3980-5 | 7.7    |       | f/4 Projection                                | 3" Dia.         |              |         |                | X              |
| 85-0404-4870-7 | 7.8    | 198   | f/2.5 Raptar for 1:1X #7 Pro. L.B.            | 4" Ø Obj.       | X            |         |                | X              |
| 85-0405-6210-1 | 7.825  |       | f/4.5 Symmetrical Copy Lens                   |                 |              |         |                |                |
| 85-0403-0490-0 | 8      | 202   | f/4 Raptar Telephoto Pro-70                   | 2 1/4" x 2 1/4" |              |         | X              |                |
| 85-0405-8790-0 | 8      | 202   | f/1.4 Raptar .690" Dia.                       |                 |              |         |                | X              |
| 85-0401-6690-3 | 8      | 203   | f/2.8 Amaton                                  | 4" Ø            |              |         |                |                |
| 85-0404-1500-3 | 8      | 203   | f/4.5 Raptar                                  | 5/8 Ø           |              |         |                |                |
| 85-0401-0250-2 | 8      | 203   | f/5.6 Telephoto #3 L.B.                       | 2 1/4" x 3 1/4" | X            | X       |                |                |
| 85-0401-3690-6 | 8      | 203   | f/7.5 Raptar                                  | 4" x 5"         |              | X       |                |                |
| 85-0403-9680-7 | 8      |       | f/7.8 Sunray Series I Projection              | 35MM            |              |         |                |                |
| 85-0402-8270-0 | 8 1/4  | 209   | f/4.5 Enlarging Raptar #6 L.B.                | 5" x 8"         | X            |         |                |                |
| 85-0405-6110-3 | 8 1/4  |       | f/4.5 Symmetrical Copy Raptar                 |                 |              |         |                |                |
| 85-0405-5820-8 | 8 1/4  |       | f/5.6 Copy Lens (1X)                          |                 |              |         |                |                |
| 85-0405-3170-0 | 8 1/4  | 209   | f/5.6 Raptar Copy                             |                 |              |         |                |                |
| 85-0403-2350-4 | 8 1/4  | 209   | f/4.5 Raptar Copy Lens                        | 11" Ø           | X            |         |                |                |
| 85-0400-8750-5 | 8 1/4  | 209   | f/6.8 Series 1A Raptar #3B                    | 5" x 8"         |              |         |                |                |
| 85-0403-0130-2 | 8 1/4  | 209   | f/6.8 Graphic Raptar Wide Field #4 Pro. L.B.  | 15" x 18"       | X            |         |                |                |
|                |        |       | at 1X                                         | 5" x 8"         | X            |         |                |                |
| 85-0401-3610-4 | 8 1/4  | 209   | f/8.0 Raptar #4 L.B.                          |                 | X            |         |                |                |
|                |        |       | #4 Pro. L.B.                                  |                 | X            |         |                |                |
| 85-0405-8830-4 | 8 1/4  | 210   | f/8.0 Raptar Copy Lens                        |                 |              |         |                | X              |
| 85-0400-5470-3 | 8 1/4  | 209   | f/12.5 Raptar Series 1A                       | 4" x 5"         |              |         |                |                |
| 85-0401-2050-4 | 8 1/4  | 209.5 | f/6.3 Raptar Series IV #4 L.B.                | 5" x 8"         | X            | X       |                |                |
| 85-0400-9180-4 | 8 1/4  | 209.5 | f/4.5 Raptar Series II #6 L.B.                | 5" x 8"         | X            |         |                | X              |
| 85-0406-0010-9 | 8 1/4  | 210   | f/5.6                                         | 16.2" Ø         |              |         |                | X              |
| 85-0400-8550-9 | 8 1/4  | 222   | f/4.0 Verito Diffused Focus                   | 5" x 7"         |              |         |                |                |
| 85-0406-0770-8 |        | 222   | f/4.7 Guidance Lens                           |                 |              |         | X              |                |
| 85-0400-8800-8 | 8 3/4  |       | f/12.5 Series 1A Raptar #3C                   | 5" x 8"         |              |         |                |                |
| 85-0405-2710-4 | 9      |       | f/1.9 Raptar                                  |                 |              |         |                |                |
| 85-0401-5780-3 | 9      |       | f/5.6 Series I Projection                     | 35MM DF         |              |         |                | X              |
| 85-0405-4680-7 | 9      |       | f/1.9 Raptar for 3X                           |                 |              |         |                | X              |
| 85-0405-9170-4 | 9      | 229   | f/5.6 Raptar Copy Lens #7 L.B.                |                 | X            | X       |                | X              |
| 85-0406-6510-2 | 9      |       | f/5.6 Raptar Copy Lens                        |                 |              |         |                | X              |
| 85-0404-8640-0 | 9 1/2  | 241   | f/3.8 Projection                              |                 |              |         |                |                |
| 85-0400-8070-8 | 9 1/2  | 241   | f/6.3                                         | 6 1/2" x 8 1/2" |              |         |                |                |
| 85-0402-8330-2 | 9 1/2  | 241   | f/4.5 Enlarging Raptar #6 L.B.                | 6 1/2" x 8 1/2" | X            |         |                |                |
| 85-0405-2530-6 | 9 1/2  |       | f/4.5 Raptar with partially reflecting Mirror |                 | X            |         |                |                |
| 85-0400-9660-5 | 9 1/2  | 241   | f/4.5 Raptar Series II #6 L.B.                | 6 1/2" x 8 1/2" | X            | X       |                |                |
| 85-0402-9390-5 | 9 1/2  | 241   | f/4.5 Projection Amaton                       | 6 1/2" x 8 1/2" |              |         |                | X              |
| 85-0401-1410-1 | 9 1/2  |       | f/6.3 Graphic Raptar #4 L.B.                  | 6 1/2" x 8 1/2" | X            |         |                |                |
| 85-0403-7490-3 | 9 1/2  |       | f/6.8 Graphic Raptar #4 Pro. L.B.             |                 | X            |         |                | X              |
| 85-0403-6330-2 | 10     | 254   | f/4.5 Raptar Telephoto #6 Pro. L.B.           | 35MM DF         | X            |         | X              | X              |
| 85-0405-9950-9 | 10     |       | f/2.5 for 2x Magnification                    |                 |              |         | X              |                |
| 85-0400-3100-8 | 10     | 254   | f/4.5 Cine Telephoto                          | 16MM            |              |         | X              |                |
| 85-0402-5250-5 | 10     | 254   | f/4.5 Raptar (Tessar Type) #6 L.B.            | 6 1/2" x 8 1/2" | X            |         |                |                |
| 85-0404-3980-5 | 10     |       | f/4 Projection                                |                 |              |         |                | X              |
| 85-0403-9760-7 | 10     | 254   | f/4.5 Raptar Telephoto #4 Pro. L.B.           | 4" x 5"         | X            | X       |                | X              |
| 85-0400-1740-3 | 10     | 254   | f/5.6 Telephoto #4 Pro. L.B.                  | 4" x 5"         | X            | X       | X              |                |
| 85-0401-3360-6 | 10     | 254   | f/6.0 Veritar                                 | 5" x 7"         |              | X       |                |                |
|                | 20     |       | f/12.5                                        |                 |              | X       |                |                |
| 85-0400-5530-4 | 10     | 254   | f/12.5 Raptar Series 1A                       | 4" x 5"         |              |         |                |                |
| 85-0401-4160-9 | 10 1/4 | 262   | f/10 Apochromatic Raptar #3 Pro.-L.B.         | 10" x 12"       | X            |         |                |                |
|                |        |       | (f/22) 1:1                                    | 11" x 14"       | X            |         |                |                |
| 85-0401-0130-6 | 10 1/2 |       | f/8 Amaton #4 Pro. L.B.                       | (f/22) 1:1      |              |         |                |                |
|                |        |       |                                               | 10" x 12"       |              |         |                |                |
| 85-0403-6620-6 | 10 3/4 |       | f/6.8 Graphic Raptar Wide Field Copy Lens     | 10" x 12"       | X            |         |                |                |
|                |        |       | #5 Pro. L.B.                                  | 1:1             |              |         |                |                |

Margaret Riedel

| OPTICAL SYSTEM | E.F.L. |     | LENS                                                          | COVERAGE                  | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|-----|---------------------------------------------------------------|---------------------------|--------------|---------|----------------|----------------|
|                | IN.    | MM  |                                                               |                           |              |         |                |                |
| 85-0402-7090-3 | 10%    |     | f/9.5 Apochromatic Raptar #3 L.B.                             | 10" x 12"<br>(f/22) 1:1   | X            |         |                |                |
| 85-0400-8600-2 | 11%    | 292 | f/4.0 Verito Diffused Focus                                   | 8" x 10"                  |              |         |                |                |
| 85-0400-6660-8 | 11-7/8 | 302 | f/4.5 Raptar Series II #7 L.B.                                | 8" x 10"                  | X            |         |                |                |
| 85-0402-8390-6 | 11-7/8 | 302 | f/4.5 Enlarging Raptar #7 L.B.                                | 8" x 10"                  | X            |         |                |                |
| 85-0403-1810-8 | 11-7/8 | 302 | f/4.5 Raptar #7 L.B.                                          | 8" x 10"                  | X            |         |                |                |
| 85-0401-1340-0 | 11-7/8 | 302 | f/6.3 Raptar Series IV                                        |                           |              | X       |                |                |
| 85-0406-5090-6 | 12     |     | f/3.5 Overhead Projection                                     |                           |              |         |                |                |
| 85-0403-9410-9 | 12     | 304 | f/2.5 Telephoto                                               | 1.8" Ø                    |              |         |                |                |
| 85-0401-7080-6 | 12     | 304 | f/4.5 Raptar #6 Pro. L.B.                                     | 35MM DF                   | X            |         | X              |                |
| 85-0405-3460-5 | 12     | 304 | f/5.0 Raptar Telephoto (Non-Browning Glasses)                 |                           |              |         | X              |                |
| 85-0605-7960-5 | 12     |     | Single Meniscus                                               |                           |              |         |                | X              |
| 85-0401-3460-4 | 12     | 304 | f/5.6 Raptar                                                  | 16MM                      |              |         |                |                |
| 85-0405-3010-8 |        | 305 | f/3.5 Raptar #10 L.B.                                         | 2" Dia.                   | X            |         |                |                |
| 85-0402-0490-2 | 12     | 304 | f/5.6 Raptar #6 Pro. L.B.                                     | 4½" x 4½"                 | X            |         |                |                |
| 85-0405-0310-5 | 12     |     | f/6.8 Raptar Wide Field Lens #5 Pro. L.B.                     |                           | X            |         |                |                |
| 85-0401-6060-9 | 12     | 304 | f/10 Apochromatic Raptar                                      | 11" x 13"<br>(f/22) 1:1   |              |         |                |                |
| 85-0405-9220-7 | 12.6   | 320 | f/4 Raptar #9 L.B.                                            |                           | X            |         |                |                |
| 85-0400-8850-3 | 13     |     | f/6.8 Series 1A Raptar No. 5A                                 | 8" x 10"                  |              | X       |                |                |
| 85-0402-0180-9 | 13     |     | f/10 Apochromatic Raptar #4 Pro. L.B.                         | 11" x 13"<br>(f/22) 1:1   | X            |         |                |                |
| 85-0404-7350-7 | 14     |     | f/2.5 Projection                                              | 10" x 10"                 |              |         | X              |                |
| 85-0404-0220-9 | 14     |     | f/3.5 Projection                                              | 10" x 10"                 |              |         | X              |                |
| 85-0404-0420-5 | 14     |     | f/3.5 Projection                                              | 10" x 10"                 |              |         | X              |                |
| 85-0404-2050-8 | 14     |     | f/4.1 Overhead Projection Lens                                | 10" x 10"                 |              |         | X              |                |
| 85-0403-6570-3 | 14     |     | f/4.5 Raptar Telephoto                                        | 35MM DF                   |              | X       |                |                |
| 85-0404-0020-3 | 14     |     | f/5.2 Projection Amaton                                       | 10" x 10"                 |              |         | X              |                |
| 85-0401-3260-8 | 14     |     | f/6 Veritar                                                   | 8" x 10"                  |              | X       |                |                |
| 85-0401-4010-6 | 14     |     | f/10 Process Apochromatic Raptar #4 Pro. L.B.                 | 12" x 17"<br>(f/22) 1:1   | X            |         |                |                |
| 85-0400-8650-7 | 14½    | 368 | f/4 Verito (Diffused Focus)                                   | 8" x 10"                  |              |         |                |                |
| 85-0405-4090-9 | 14.6   |     | f/4.3 Projection (Overhead)                                   |                           |              |         |                |                |
| 85-0405-2740-1 | 15     |     | f/4.1 Overhead Projection                                     |                           |              |         |                |                |
| 85-0401-9570-4 | 15     |     | f/4.5 Raptar Telephoto #6 Pro. L.B.                           | 35MM DF                   | X            |         | X              |                |
| 85-0405-2300-4 | 15     |     | f/4.5 Raptar with Reticle Printer                             |                           |              |         | X              |                |
| 85-0400-0750-3 | 15     |     | f/5.6 Telephoto #6 L.B.                                       | 5" x 7"                   | X            |         |                |                |
| 85-0401-0830-1 | 15     |     | f/8 Amaton #5 Pro. L.B.                                       | 16" x 20"<br>(f/22) 1:1   | X            | X       |                |                |
| 85-0403-6430-0 | 15     |     | f/10 Process Apochromatic Raptar #5 Pro. L. B.                | 13" x 16"<br>(f/22) - 1:1 | X            |         |                |                |
| 85-0404-7980-1 | 16     |     | f/4.1 Projection                                              |                           |              |         |                |                |
| 85-0401-9630-6 | 16     |     | f/4.5 Raptar Telephoto                                        | 35MM DF                   |              |         | X              |                |
| 85-0401-3660-9 | 16     |     | f/10 Process Apochromatic Raptar #5 Pro. L.B.                 | 14" x 17"<br>(f/22) 1:1   | X            |         |                |                |
| 85-0405-4720-1 | 16½    |     | f/10 Apochromatic Raptar #5 Pro. L.B.                         |                           | X            |         |                |                |
| 85-0403-6380-7 | 17     |     | f/4.5 Raptar Telephoto #6 Pro. L.B.                           | 35MM DF                   | X            |         |                |                |
| 85-0405-2610-6 | 17     |     | f/10 Apochromatic Process                                     |                           |              |         |                |                |
| 85-0405-2850-8 | 18     |     | f/1.8 Aero Raptar                                             |                           |              |         |                |                |
| 85-0402-0250-0 | 18     |     | f/5.6 Raptar Telephoto #6 Pro. L.B.                           | 35MM DF                   | X            |         | X              |                |
| 85-0405-2590-0 | 18     |     | f/6.0 Catadioptric                                            |                           |              |         |                |                |
| 85-0404-4250-2 | 18     |     | f/6 Catadioptric & 4½" (114MM) f/4.5 Refractor Lens           | 35MM SF                   |              |         | X              |                |
| 85-0405-3430-8 | 18     | 463 | f/6.3 Raptar (Non-Browning Glasses)                           |                           |              |         | X              |                |
| 85-0401-5810-8 | 19     |     | f/10 Process Apochromatic Raptar #6 Pro. L.B.                 | 18" x 22"<br>(f/22) 1:1   | X            |         |                |                |
| 85-0403-6770-9 | 20     |     | f/4.5 Raptar Telephoto Pro-35                                 | 35MM DF                   |              |         | X              |                |
| 85-0401-9280-0 | 20     |     | f/5.6 Telephoto #6 L.B.                                       | 35MM DF                   | X            |         | X              |                |
| 85-0402-7310-5 | 20     |     | f/8.0 Raptar Telephoto                                        | 5" x 7"                   |              | X       |                |                |
| 85-0402-8650-3 | 20     |     | f/5.6 Raptar Telephoto #7 Pro. L.B.                           | 2¼" x 2¼"                 | X            |         |                |                |
| 85-0402-0140-3 | 20     |     | f/6.3 Fototel for Reflex Camera                               | 35MM DF                   |              |         | X              |                |
| 85-0404-1360-2 | 20     |     | f/6.3 I. R. Mirrotel                                          | 30MM                      |              |         | X              |                |
| 85-0402-1140-2 | 20     |     | f/6.3 Fototel for Non Reflex Camera                           | 35MM DF                   |              |         | X              |                |
| 85-0403-4620-8 | 20     |     | f/6.3 Mirrotel                                                | 35MM SF                   |              |         | X              |                |
| 85-0403-6070-4 | 20     |     | f/6.3 Mirrotel Single Turret Fiducial Marker w/cont. focusing | 35MM SF & 5/8 Ø           |              |         | X              |                |

| OPTICAL SYSTEM | E.F.L. |     | LENS                                                                    | COVERAGE                | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|-----|-------------------------------------------------------------------------|-------------------------|--------------|---------|----------------|----------------|
|                | IN.    | MM  |                                                                         |                         |              |         |                |                |
| 85-0402-6200-9 | 20     |     | f/6.3 Fototel with Fiducial Marker                                      | 35MM DF                 |              |         |                |                |
| 85-0403-5260-2 | 20     |     | f/6.3 Mirrotel (focusing) with cont. focus and Reticle Printer Sun Unit | 35MM SF & 5/8 Ø         |              |         |                | X              |
| 85-0404-5150-3 | 20     |     | f/6.3 Mirrotel                                                          |                         |              |         |                |                |
| 85-0405-1650-3 | 20     |     | f/6.3 I. R. Mirrotel                                                    |                         |              |         |                |                |
| 85-0405-5640-0 | 20     |     | f/6.3 Mirrotel Single Turret                                            |                         |              |         |                |                |
| 85-0406-3760-6 | 20     |     | f/6.3 Mirrotel Single Turret                                            |                         |              |         |                | X              |
| 85-0402-6230-6 | 20     |     | f/6.3 Mirrotel                                                          | 5/8 Ø                   |              |         |                |                |
| 85-0405-9830-3 | 20     |     | f/6.3 Plain Back                                                        | 70MM                    |              |         |                | X              |
| 85-0405-9820-4 | 20     |     | f/6.3                                                                   | 35MM                    |              |         |                | X              |
| 85-0402-9860-7 | 20     |     | f/6.3 Mirrotel Sealed with Sun Shade                                    | 35MM SF & 5/8 Ø         |              |         |                |                |
| 85-0405-7860-2 | 20     |     | f/6.3 Mirrotel                                                          |                         |              |         |                |                |
| 85-0403-1480-0 | 20     |     | f/6.3 Mirrotel with Fiducial Marker                                     | 35MM SF & 5/8 Ø         |              |         |                |                |
| 85-0405-6290-3 | 21     |     | f/3.5 Amaton                                                            |                         |              |         |                |                |
| 85-0405-3300-3 | 21½    |     | f/10 Apochromatic Raptar #6 L.B.                                        |                         | X            |         |                |                |
| 85-0403-9400-0 | 24     |     | f/3.0 Catadioptric Lens                                                 |                         |              |         |                | X              |
| 85-0403-7070-3 | 24     |     | f/3 Catadioptric Lens                                                   | 1.8" Ø                  |              |         |                | X              |
| 85-0401-6370-2 | 24     |     | f/4.5 Raptar                                                            | 35MM DF                 |              |         | X              |                |
| 85-0403-5770-0 | 24     |     | f/5.6 Raptar Telephoto #7 L.B.                                          | 35MM DF                 | X            |         | X              |                |
| 85-0403-0890-1 | 24     | 610 | f/5.6 Raptar Telephoto Pro-35                                           | 35MM DF                 |              |         | X              |                |
| 85-0406-3090-8 | 25     |     | f/5.6 Raptar Spec. #9 L.B.                                              | 4½" x 4½"               | X            |         |                |                |
| (TL-65-01)     |        |     | f/11                                                                    |                         |              |         |                | X              |
| 85-0401-6650-7 | 25     |     | f/10 Apochromatic Raptar                                                | 20" x 24"<br>(f/22) 1:1 | X            |         |                |                |
| 85-0402-0310-2 | 27     |     | f/5.6 Photo Theodolite #8 Pro. L.B.                                     | 35MM DF                 | X            |         |                |                |
| 85-0403-6820-2 | 30     |     | f/5.6 Raptar Telephoto #9 Pro. L.B.                                     | 35MM DF                 | X            |         |                |                |
| 85-0401-6030-2 | 36     |     | f/8 Telephoto (Aerial)                                                  | 9" x 18"                | X            |         | X              |                |
| 85-0406-3290-7 | 36     |     | f/15 Diffraction                                                        |                         |              |         |                |                |
| 85-0402-8440-9 | 37     |     | f/6.3                                                                   |                         |              |         |                | X              |
| 85-0404-2210-8 | 40     |     | f/6.3 Mirrotel Invar Mounting                                           | 2¼" x 2¼"               |              |         |                | X              |
| 85-0403-4610-9 | 40     |     | f/6.3 Mirrotel, Single Turret, Density Filters                          | 30MM Dia.               |              |         |                | X              |
| 85-0403-2180-5 | 40     |     | f/6.3 Mirrotel Single Turret and Continuous Focus                       | 2¼" x 2¼"               |              |         |                |                |
| 85-0404-7360-6 | 40     |     | f/6.3 Mirrotel Double Turret                                            | 2¼" x 2¼"               |              |         |                | X              |
| 85-0403-6260-1 | 40     |     | f/6.3 Mirrotel                                                          |                         |              |         |                |                |
| 85-0404-5190-9 | 40     |     | f/6.3 Mirrotel Single Turret (Density) Cont. Focus (Sealed)             | 2¼" x 2¼"               |              |         |                |                |
| 85-0405-3510-7 | 40     |     | f/6.3 Mirrotel                                                          |                         |              |         |                |                |
| 85-0402-3440-4 | 40     |     | f/6.5 Catadioptric ±1040'                                               |                         |              |         |                |                |
| 85-0405-3210-4 | 40     |     | f/8 Mirrotel with 3 auxiliary attachments                               | 35MM SF & 5/8 Ø         |              |         |                | X              |
| 85-0402-6240-5 | 40     |     | f/8 Catadioptric ±620                                                   |                         |              |         |                |                |
| 85-0405-5650-9 | 40     |     | f/8 Mirrotel                                                            | 5/8"                    |              |         |                | X              |
| 85-0401-8150-6 | 40     |     | f/8 Mirrotel single turret                                              |                         |              |         |                |                |
| 85-0405-9840-2 | 40     |     | f/8 Mirrotel                                                            | 35MM DF                 |              |         |                | X              |
| 85-0403-2190-4 | 40     |     | f/8.0                                                                   | 35MM                    |              |         |                | X              |
| 85-0402-6960-8 | 40     |     | f/8.0 Mirrotel                                                          | 35MM SF                 |              |         |                | X              |
| 85-0402-7470-7 | 40     |     | f/8 Mirrotel Standard Single Turret                                     | 70MM                    |              |         |                | X              |
| 85-0402-6350-2 | 40     |     | f/8 Mirrotel with Printer, Fiducial and Continuous Focusing             | 35MM DF                 |              |         |                | X              |
| 85-0403-3750-6 | 40     |     | f/8 Mirrotel Single Turret and Fiducial                                 | 35MM SF                 |              |         |                |                |
| 85-0404-1640-1 | 40     |     | f/8 Mirrotel Single Turret with Density Filters                         | 35MM DF                 |              |         |                |                |
| 85-0405-0330-6 | 40     |     | f/8 Mirrotel Double Turret and Continuous Focusing                      | 35MM SF                 |              |         |                | X              |
| 85-0405-9850-1 | 40     |     | f/8 Mirrotel                                                            | 35MM DF                 |              |         |                | X              |
| 85-0405-9840-2 | 40     |     | f/8.0                                                                   |                         |              |         |                | X              |
| 85-0402-6520-0 | 40     |     | f/8.0                                                                   |                         |              |         |                | X              |
| 85-0403-6170-2 | 40     |     | f/8 Mirrotel with Double Turret                                         | 35MM SF                 |              |         |                |                |
| 85-0403-3120-0 | 40     |     | f/8 Mirrotel Single Turret Fixed Focus                                  | 35MM DF                 |              |         |                | X              |
| 85-0406-1150-2 | 40     |     | f/8 Mirrotel                                                            | Spec.                   |              |         |                | X              |
| 85-0402-6640-6 | 40     |     | f/8 Mirrotel On Trunnion Mt.                                            |                         |              |         | X              |                |
| 85-0403-0390-2 | 40     |     | f/8 Mirrotel with Double Turret                                         | 35MM DF                 |              |         |                | X              |
| 85-0404-2560-6 | 40-8   |     | f/8 Mirrotel with Diaphragm Reflex Viewer                               | 35MM SF                 |              |         |                | X              |
|                |        |     | Dual Lens System                                                        | 5/8" Ø                  |              |         | X              | X              |

| OPTICAL SYSTEM | E.F.L. |    | LENS                                                                    | COVERAGE        | IRIS BARRELL | SHUTTER | FOCUSING MOUNT | PLAIN MOUNTING |
|----------------|--------|----|-------------------------------------------------------------------------|-----------------|--------------|---------|----------------|----------------|
|                | IN.    | MM |                                                                         |                 |              |         |                |                |
| 85-0406-3530-3 | 40-8   |    | Dual Lens System 06063540 (Reticle)                                     |                 |              |         |                | X              |
| 85-0405-1770-9 | 44     |    | Catadioptric                                                            |                 |              |         |                |                |
| 85-0405-2510-8 | 52     |    | f/13 Astroscope                                                         |                 |              |         |                |                |
| 85-0402-3560-9 | 60     |    | f/5.6 Mirrotel                                                          | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0405-2880-5 | 60     |    | f/12 U.V. Mirrotel                                                      |                 |              |         |                |                |
| 85-0403-7080-2 | 80     |    | f/12.5 Mirrotel Double Turret                                           | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0406-3770-5 | 80     |    | f/12.5                                                                  |                 |              | X       |                |                |
| 85-0403-4730-5 | 80     |    | f/12.5 Mirrotel Double Turret Continuous Focus                          | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0404-0210-0 | 80     |    | f/12.5 Mirrotel Single Turret                                           | 2 1/4" x 2 1/4" |              |         |                |                |
| 85-0403-4690-1 | 80     |    | f/12.5 Mirrotel Standard                                                | 2 1/4" x 2 1/4" |              |         |                | X              |
| 85-0402-5450-1 | 80     |    | f/14 Mirrotel                                                           | 35MM SF         |              |         |                |                |
| 85-0403-1660-7 | 80     |    | f/14 Mirrotel with Cont. Focus Double Turret                            | 35MM SF         |              |         |                |                |
| 85-0402-7120-8 | 80     |    | f/14 Mirrotel with Cont. Focus Double Turret                            | 35MM SF         |              |         |                | X              |
| 85-0403-0400-9 | 80     |    | f/14 Mirrotel with Diaphragm Reflex Viewer                              | 35MM SF         |              |         |                | X              |
| 85-0403-0690-5 | 80     |    | f/14 Mirrotel Sealed                                                    | 35MM SF         |              |         |                |                |
| 85-0403-6270-0 | 80     |    | f/14 Mirrotel Single Turret (Density) Cont. Focus (600 Ft. to Infinity) | 35MM SF         |              |         |                |                |
| 85-0405-8850-2 | 80     |    | f/11 Mirrotel                                                           |                 |              |         |                | X              |
| 85-0403-0700-2 | 80     |    | f/14 Mirrotel Cont. Focus                                               | 35MM SF         |              |         |                |                |
| 85-0405-9860-0 | 80     |    | f/8 Mirrotel                                                            |                 |              | X       |                |                |
| 85-0404-0760-4 | 80     |    | f/14 Mirrotel Single Turret, with R. P. and Right Angle Eyepiece        |                 |              |         |                | X              |
| 85-0405-1820-2 | 80     |    | f/14 Mirrotel Single Turret                                             |                 |              |         |                | X              |
| 85-0403-3980-7 | 80/40  |    | f/11 80-40 Versatel                                                     | 1.8" Ø          |              |         |                | X              |
| 85-0405-4020-6 | 84.375 |    | f/8 Catadioptric                                                        |                 |              |         |                |                |
| 85-0405-1780-8 | 88     |    | Catadioptric                                                            |                 |              |         |                |                |
| 85-0405-5040-3 | 100    |    | f/8 Catadioptric                                                        |                 |              |         |                |                |
| 85-0403-0610-3 | 200    |    | f/17 Mirrotel                                                           | 35MM DF         |              |         |                | X              |
| 85-0405-2520-7 | 200    |    | f/17 Mirrotel with Focusing Barlow                                      |                 |              |         |                |                |
| 85-0405-3910-9 | 120    |    | f/1.9 Zoom Dual Lens                                                    |                 |              |         |                | X              |
| 85-0405-2670-0 | 120    |    | f/19 Mirrotel                                                           |                 |              |         |                |                |
| 85-0403-2260-5 | 9-30   |    | f/1.8 Raptar Zoom for 8MM                                               | 8MM             |              | X       |                |                |
| 85-0405-6050-1 | 121.5  |    | f/1 Raptar                                                              |                 |              |         |                |                |
| 85-0405-1720-4 | 150    |    | f/23.4 Catadioptric                                                     |                 |              |         |                |                |
| 85-0403-4100-1 | 15-25  |    | f/1.5 8MM Projection Zoom                                               | 8MM             |              |         |                | X              |
| 85-0405-4550-2 | 330    |    | Modified Cassegrain                                                     |                 |              |         |                |                |
| 85-0403-8070-2 | 20-60  |    | f/1.8 Vari-focus                                                        | 5/8" Ø          |              | X       |                |                |
| 85-0403-8070-2 | 28-75  |    | f/2.3 Vari-focus                                                        |                 |              | X       |                | X              |
| 85-0404-5360   | 30-150 |    | f/2.7 TV Zoom with Non Browning Glasses                                 | 5/8" Ø          |              |         |                |                |
| 85-0403-1030-3 | 30-150 |    | Wollensak TV Auto Zoom Lens f/2.7                                       | 5/8" Ø          |              | X       |                |                |
| 85-0404-0550-9 |        |    | 20X Viewfinder for 8MM Camera                                           |                 |              |         |                | X              |
| 85-0407-2900-7 |        |    | 20X Reflex Finder                                                       |                 |              |         |                |                |
| 85-0402-1080-0 |        |    | f/2.7 30-150MM TV Zoom                                                  |                 |              | X       |                |                |
| 85-0404-5360-8 |        |    | f/5.4 60-300 TV Zoom Non-Browning                                       |                 |              | X       |                |                |
| 85-0403-1230-9 |        |    | f/5.4 60-300 TV Zoom Back-up Lens Assembly                              |                 |              | X       |                |                |
| 85-0404-5360-8 |        |    | f/2.7 30-150MM TV Zoom Non-Browning                                     |                 |              | X       |                |                |
| Unassigned     |        |    | f/2.2 14-145MM TV Zoom                                                  |                 |              |         |                |                |
| Unassigned     |        |    | f/4.4 28-290 MM TV Zoom                                                 |                 |              |         |                |                |

1980 - 5X BORRSIGHT  
3615 - 7X BORRSIGHT  
3541 - 10-30 VARI POWER TELESCOPE  
5866 & 5867 GONIOMETER RATICIA  
5796 PROJ LENS {1 ELEMENT}

## ALPHAX SHUTTER DIMENSIONS

FIGURE 1

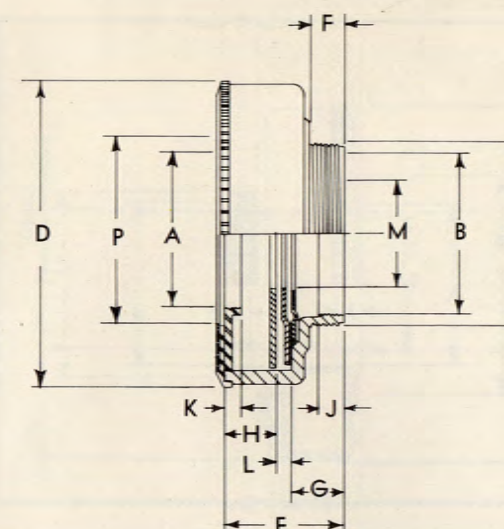
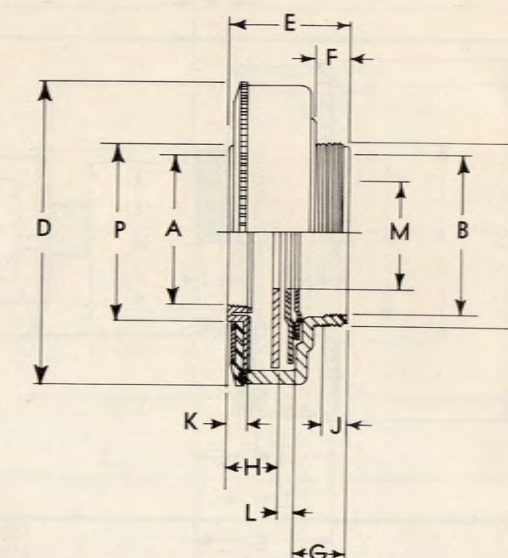


FIGURE 2



|                                                                     | FIGURE 1                      |                                 | FIGURE 2                        |                                 |                                 |                                 |
|---------------------------------------------------------------------|-------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                                                                     | #0 ALPHAX                     | #1 ALPHAX                       | #2 ALPHAX                       | #3 ALPHAX                       | #4 ALPHAX                       | #5 ALPHAX                       |
| A FRONT MOUNTING THREAD                                             | .797 x 50 NS-3<br>P.D. .7840  | .941 x 50 NS-3<br>P.D. .9280    | 1.231 x 50 NS-3<br>P.D. 1.218   | 1.7952 x 40 NS-3<br>P.D. 1.7790 | 2.4219 x 40 NS-3<br>P.D. 2.4057 | 2.9309 x 40 NS-3<br>P.D. 2.9147 |
| B REAR MOUNTING THREAD                                              | .8622 x 50 NS-3<br>P.D. .8492 | 1.0209 x 50 NS-3<br>P.D. 1.0079 | 1.231 x 50 NS-3<br>P.D. 1.218   | 1.7952 x 40 NS-3<br>P.D. 1.7790 | 2.4219 x 40 NS-3<br>P.D. 2.4057 | 2.9309 x 40 NS-3<br>P.D. 2.9147 |
| C FLANGE THREAD                                                     | .9528 x 40 NS-2<br>P.D. .9366 | 1.1849 x 40 NS-2<br>P.D. 1.1687 | 1.3268 x 40 NS-2<br>P.D. 1.3106 | 1.9966 x 30 NS-2<br>P.D. 1.9749 | 2.6226 x 30 NS-2<br>P.D. 2.6009 | 3.1281 x 30 NS-2<br>P.D. 3.1064 |
| D OUTSIDE DIAMETER                                                  | 1.600 ± .015                  | 2.039 ± .015                    | 2.398 ± .015                    | 2.960 ± .015                    | 3.754 ± .015                    | 4.760 ± .015                    |
| E MOUNTING OVERALL                                                  | .615 ± .001                   | .662 ± .001                     | .827 ± .001                     | .945 ± .001                     | 1.024 ± .001                    | 1.024 ± .001                    |
| F DISTANCE FROM REAR MOUNT SEAT TO SHUTTER SEAT                     | .185 ± .010                   | .185 ± .010                     | .220 ± .010                     | .275 ± .010                     | .320 ± .010                     | .320 ± .010                     |
| G DISTANCE FROM REAR MOUNT SEAT TO DIAPHRAGM LEAVES (MINIMUM)       | .264 MIN.                     | .276 MIN.                       | .315 MIN.                       | .390 MIN.                       | .410 MIN.                       | .410 MIN.                       |
| H DISTANCE FROM FRONT MOUNTING SHOULDER TO SHUTTER BLADES (MINIMUM) | .271 MIN.                     | .298 MIN.                       | .425 MIN.                       | .410 MIN.                       | .485 MIN.                       | .495 MIN.                       |
| J THREAD LENGTH REAR                                                | .080 ± .015                   | .110 ± .015                     | .150 ± .015                     | .215 ± .015                     | .150 ± .015                     | .150 ± .015                     |
| K THREAD LENGTH FRONT                                               | .085 ± .015                   | .116 ± .015                     | .156 ± .015                     | .200 ± .015                     | .180 ± .015                     | .215 ± .015                     |
| L SEPARATION BETWEEN SHUTTER BLADES AND DIAPHRAGM LEAVES (MAX.)     | .075 MAX.                     | .088 MAX.                       | .080 MAX.                       | .145 MAX.                       | .126 MAX.                       | .116 MAX.                       |
| M MAXIMUM APERTURE                                                  | .551 MAX.                     | .736 MAX.                       | 1.020 MAX.                      | 1.375 MAX.                      | 1.687 MAX.                      | 2.245 MAX.                      |
| N SPEED RANGE INCLUDING T & B                                       | 1/25 TO 1/150                 | 1/10 TO 1/200                   | 1 TO 1/100                      | 1 TO 1/50                       | 1 TO 1/50                       | 1/2 TO 1/50                     |
| P NAME PLATE OPENING, MINIMUM (OR RETAINING RING DIAMETER MAXIMUM)  | .950 MIN.                     | 1.237 MIN.                      | 1.458 MIN.                      | 2.165 MIN.                      | 2.671 MIN.                      | 3.222 MIN.                      |

# RAPAX SHUTTER DIMENSIONS

FIGURE 1

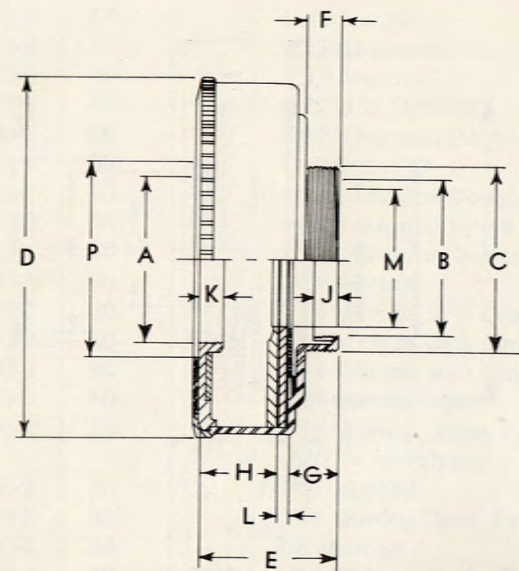
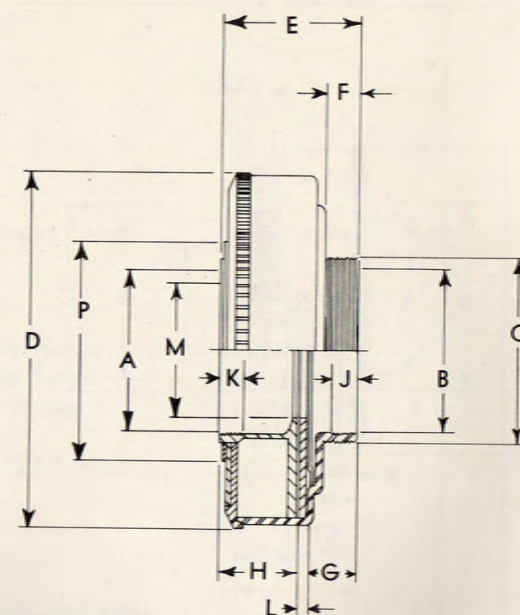


FIGURE 2

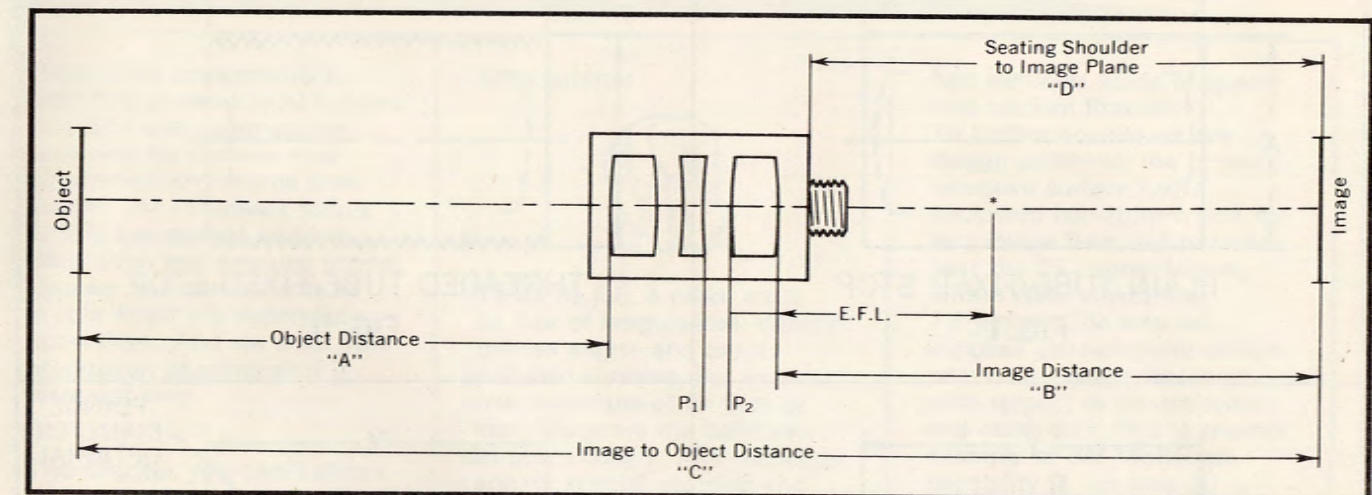


|                                                                       | FIGURE 1                        | FIGURE 2                        |                                 |
|-----------------------------------------------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                                                                       | #1 RAPAX                        | #2 RAPAX                        | #3 RAPAX                        |
| A FRONT MOUNTING THREAD                                               | .975 x 50 NS-3<br>P.D. .9620    | 1.250 x 50 NS-3<br>P.D. .1237   | 1.548 x 40 NS-3<br>P.D. 1.5318  |
| B REAR MOUNTING THREAD                                                | 1.0209 x 50 NS-3<br>P.D. 1.0079 | 1.250 x 50 NS-3<br>P.D. 1.237   | 1.5748 x 50 NS-3<br>P.D. 1.5618 |
| C FLANGE THREAD                                                       | 1.185 x 40 NS-2<br>P.D. 1.1687  | 1.3268 x 40 NS-2<br>P.D. 1.3106 | 1.6654 x 32 NS-2<br>P.D. 1.6451 |
| D OUTSIDE DIAMETER                                                    | 2.059 ± .015                    | 2.530 ± .015                    | 2.858 ± .015                    |
| E MOUNTING OVERALL                                                    | .728 ± .001                     | .827 ± .001                     | .827 ± .001                     |
| F DISTANCE FROM REAR MOUNT SEAT<br>TO SHUTTER SEAT                    | .205 ± .015                     | .232 ± .015                     | .232 ± .015                     |
| G DISTANCE FROM REAR MOUNT SEAT<br>TO DIAPHRAGM LEAVES                | .281 MIN.                       | .317 MIN.                       | .312 MIN.                       |
| H DISTANCE FROM FRONT SHOULDER TO<br>SHUTTER BLADES                   | .382 MIN.                       | .426 MIN.                       | .430 MIN.                       |
| J THREAD LENGTH REAR                                                  | .100 ± .015                     | .180 ± .015                     | .180 ± .015                     |
| K THREAD LENGTH FRONT                                                 | .085 ± .015                     | .100 ± .015                     | .123 ± .015                     |
| L MAXIMUM VALUE=E-(H+G)                                               | .065 MAX.                       | .084 MAX.                       | .085 MAX.                       |
| M MAXIMUM APERTURE                                                    | .787                            | 1.004                           | 1.203                           |
| N SPEED RANGE INCLUDING T & B                                         | 1 TO 1/400                      | 1 TO 1/400                      | 1 TO 1/200                      |
| P RETAINING RING DIAMETER MAXIMUM<br>(OR NAME PLATE OPENING, MINIMUM) | 1.255                           | 1.575                           | 1.830                           |

# LENS SPECIFICATION INQUIRY

Date \_\_\_\_\_ Customer \_\_\_\_\_

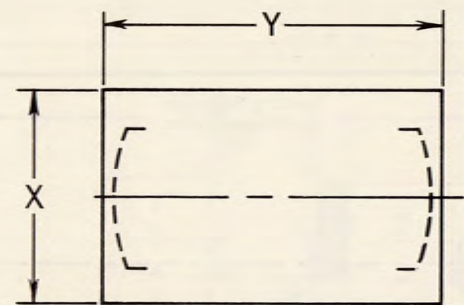
Address \_\_\_\_\_



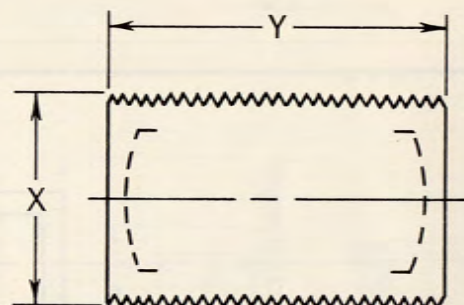
- 1 Focal Length Desired \_\_\_\_\_ Acceptable \_\_\_\_\_ Tolerance \_\_\_\_\_  $\pm 2\%$  unless otherwise specified
- 2 Speed (f/No.) Desired \_\_\_\_\_ Acceptable \_\_\_\_\_
- 3 Iris Diaphragm Required \_\_\_\_\_ (3.1) What Stops \_\_\_\_\_ (3.2) Click Stops \_\_\_\_\_
- 4 Angular Coverage OR (4.1) Object Size \_\_\_\_\_ Image Size \_\_\_\_\_
- 5 Magnification OR Reduction Ratio \_\_\_\_\_
- 6 Resolution Desired \_\_\_\_\_ Acceptable \_\_\_\_\_ On Film \_\_\_\_\_ Other \_\_\_\_\_
- 7 Distortion \_\_\_\_\_ (7.1) Field Curvature \_\_\_\_\_
- 8 Object Distance "A" \_\_\_\_\_ (8.1) Fixed \_\_\_\_\_ Variable \_\_\_\_\_
- 9 Image Distance "B" \_\_\_\_\_ (9.1) Fixed \_\_\_\_\_ Variable \_\_\_\_\_
- 10 Object to Image Distance "C" \_\_\_\_\_ Fixed \_\_\_\_\_ Variable \_\_\_\_\_
- 11 Spectral Range \_\_\_\_\_
- 12 Application (Taking, Projection, etc.) \_\_\_\_\_
- 13 Type of Mounting \_\_\_\_\_
- 14 Seating Shoulder to Film Plane "D" \_\_\_\_\_
- 15 Physical Size Limitations \_\_\_\_\_
- 16 What Lens is Currently Being Used \_\_\_\_\_
- 17 Are Drawings, Sketches, Specs., or Samples Available \_\_\_\_\_
- 18 Quantity: Now \_\_\_\_\_ Future \_\_\_\_\_
- 19 Cost Limitations \_\_\_\_\_
- 20 Other Specs. \_\_\_\_\_

**NOTE:** 1) Those items marked ☐ must be filled in order to make even a general recommendation and quote.  
 2) If the EFL is not known, it can be determined from items 10 and 5.  
 3) Filling in all items will insure the most intelligent recommendation and aid in expediting the quotation.

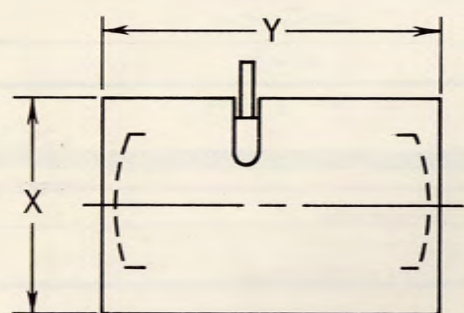
# BASIC LENS MOUNTING



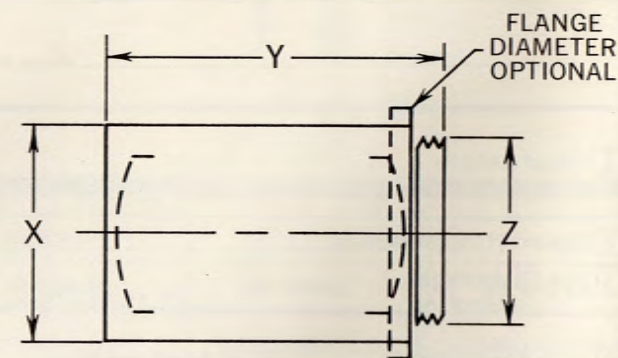
PLAIN TUBE/FIXED STOP  
FIG. I



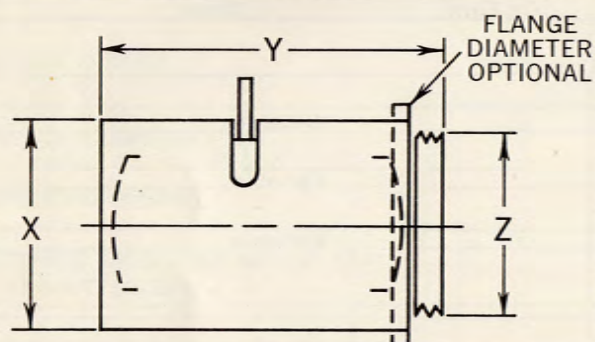
THREADED TUBE/FIXED STOP  
FIG. II



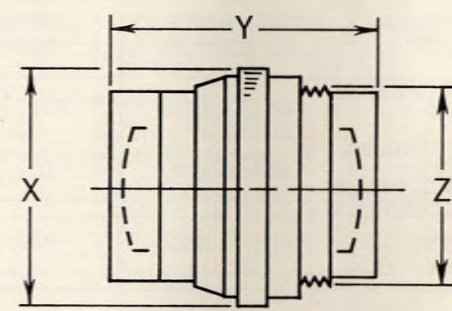
PLAIN TUBE/IRIS DIAPHRAGM  
FIG. III



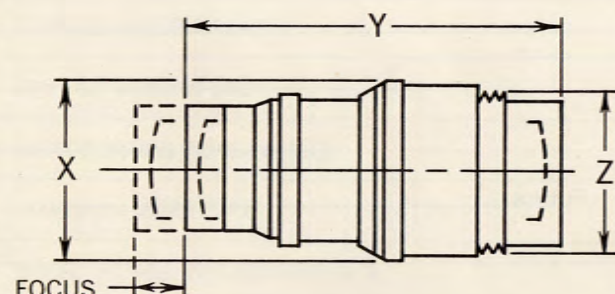
PLAIN BARREL/FLANGE/FIXED STOP  
FIG. IV



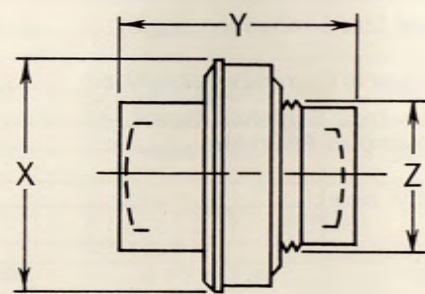
PLAIN BARREL/FLANGE/IRIS DIAPHRAGM  
FIG. V



IRIS DIAPHRAGM BARREL  
FIG. VI



FOCUSING MOUNT  
FIG. VII



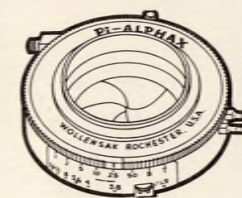
SHUTTER  
FIG. VIII



# 3M WOLLENSAK FOCAL POINTS

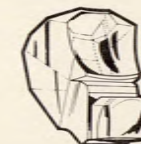
From prism components for recording systems in jet fighters to a lens and beam splitter assembly for cameras that simultaneously records three events, 3M Wollensak solves almost any optical problem. We design and produce optical systems and components as if your finest job depended upon them. And we meet your production deadline as if it were our own.

## The shutter you can't shock



Do your requirements call for a heavy duty shutter that is accurate in all attitudes and over its entire speed range? Then you need our "Pi-Alpha" shutter, an automatic or single stroke type providing speeds of 1/50, 1/25, 1/10, 1/5, 1/2 and 1 second plus T&B. It is available either with synchronization (X type), or without (N/S). Only one size is offered—No. 3, with an aperture measuring 1 3/8". Standard scales are placed on the side for ease of operation. Front scales are optional. Finish is satin. This is truly a heavy duty shutter. A die-cast backcase gives the shutter durability and it will withstand repeated shocks. It was made for industrial test instrument use in oscillographic cameras and radar scope recorders, but it is ideal for other applications where hard service is a requirement. These include identification cameras, tachistoscopes, and other visual training devices, and a number of scientific instruments utilizing a precisely timed interval.

## Free prisms



To do its job, a prism must be free of irregularities, contain precise angles and exact polished surfaces, flat to a few millionths of an inch or less. These are the hallmarks of prism quality. Anti-reflection and/or special coatings and the skill with which prisms are cemented together also are important to the performance of a prism or prism cluster. If your specifications require tolerances to 1/10th of a wave length, angular resolution to 5 seconds, spherical power down to 10 millidiopters, astigmatism down to 5 millidiopters or angular tolerances to two seconds between any prism faces, we can do the job for you. But, we caution you that you shouldn't specify tolerances you don't need. That's like buying a hi-fi stereo when you only want to listen to a basketball game. Here at 3M Wollensak we make all types of prisms. Some are as small as a quarter of an inch in size. We've made another 15 inches long. And we design prisms as well as manufacture prisms designed by you.

## CRT recording lens solves "problem optics"

Several years ago, we made a lens for a satellite-borne photo electric image system. It required high transmission (better than 80%) of all wave lengths from the ultra-violet region (0.25μ) through the visible portion of the spectrum and into the infrared (0.75μ). This spectral transmission precluded the use of conventional optical glasses and called for a design which

had elements made of quartz and calcium fluoride. To further complicate the design problems, the photo receptive surface had a backward curvature which the lens image field had to match over the 16-degree format, with a clear aperture of 1.9 inches. The lens we supplied exceeded the design parameters called for—both with respect to transmission and resolution. This is another example of 3M Wollensak capability in the area of "problem optics." If you want more information, write and ask us about our 63mm f1.3 CRT recording lens. And a similar design is available with 20° angular coverage and a clear aperture of 1.3 inches. This is our 44.1mm f1.3 CRT recording lens.

## Need a projection lens for high magnification ratios?

We have a 32mm f/2.0 lens with on-axis resolution exceeding 300 line pairs per millimeter and resolution above 200 lines at a 17° (1/2) angle. It was developed for high information content display applications. Because of its excellent spectral transmission characteristics throughout a wide range from 350 to 700μ, it is well suited for use with P-11 and P-16 phosphor displays. While it was designed as a projection lens for use at high magnification ratios, this lens is equally suited to use in micro-miniaturization applications.

For more information about 3M Wollensak optical systems and components, write: Edward Wollensak, 3M Wollensak, Dept. FML-28, 850 Hudson Avenue, Rochester, New York 14621.

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