

UNCLASSIFIED

AD 406 145

DEFENSE DOCUMENTATION CENTER

FOR

SCIENTIFIC AND TECHNICAL INFORMATION

CAMERON STATION, ALEXANDRIA, VIRGINIA



UNCLASSIFIED

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

NOTICES

When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or patented invention that may in any way be related thereto.

FOREWORD

The displays of metals fatigue data presented in this report have been prepared by the Technical Information Systems Division of Belfour Engineering Company under U.S.A.F. Contract No. AF33(657)-9149. This contract was initiated under Project No. 7381, Materials Application, Task No. 738103, Data Collection and Correlation. Administration of the project is under the direction of the Application Laboratory, Directorate of Materials and Processes, Aeronautical Systems Division, Wright-Patterson Air Force Base with D. M. Ingels, Lt/USAF acting as project engineer.

This report is one of a series being prepared for periodic dissemination.

ABSTRACT

The graphs presented herein display metals fatigue information from various sources of published and unpublished test reports which have been processed and regenerated through a semi-automatic data processing system. Each graph includes a legend which identifies the material, test procedure, test conditions and the most significant test and/or material variables associated with the plotted data. The data displayed on these graphs are intended to answer very general "questions" and to serve as a guide to further investigation of specific areas within the subject presented.

PUBLICATION REVIEW

This report has been reviewed and is approved.

FOR THE COMMANDER:



D.A. Shinn
Chief, Materials Information Branch
Application Laboratory
Materials Central

TABLE OF CONTENTS

					Page
Introduction					1
S/N diagrams showing the effect of notch factors (and types) on the fatigue behavior of 7075-T6 sheet aluminum specimens axially loaded and tested at various mean stress levels.					
<u>Graph No.</u>	<u>Notch Type</u>	<u>Notch Factor, K_t</u>	<u>Mean Stress, ksi</u>	<u>Ultimate Ten. Strength, ksi</u>	
1	Unnotched	1.0	0	82 & 83	2
2	Edge	1.5	0 - 30	82	4
3	Edge	2.0	0 - 30	87	6
4	Fillet	2.0	0 - 30	82	8
5	Hole	2.0	0 - 30	82	10
6	Hole	2.2	0 & 10	79 - 82	12
7	Hole	2.4	0 & 10	84	14
8	Hole	2.8 & 2.9	0 & 10	78 - 83	16
9	Edge	4.0	0 & 20	76 & 80	18
10	Edge	4.0	0 - 30	82 & 83	20
11	Fillet	4.0	0 - 30	80	22
12	Edge	5.0	0 - 30	82	24
Reference List					26

INTRODUCTION

This is one of a series of reports presenting compilations of test results pertaining to fatigue of metals.

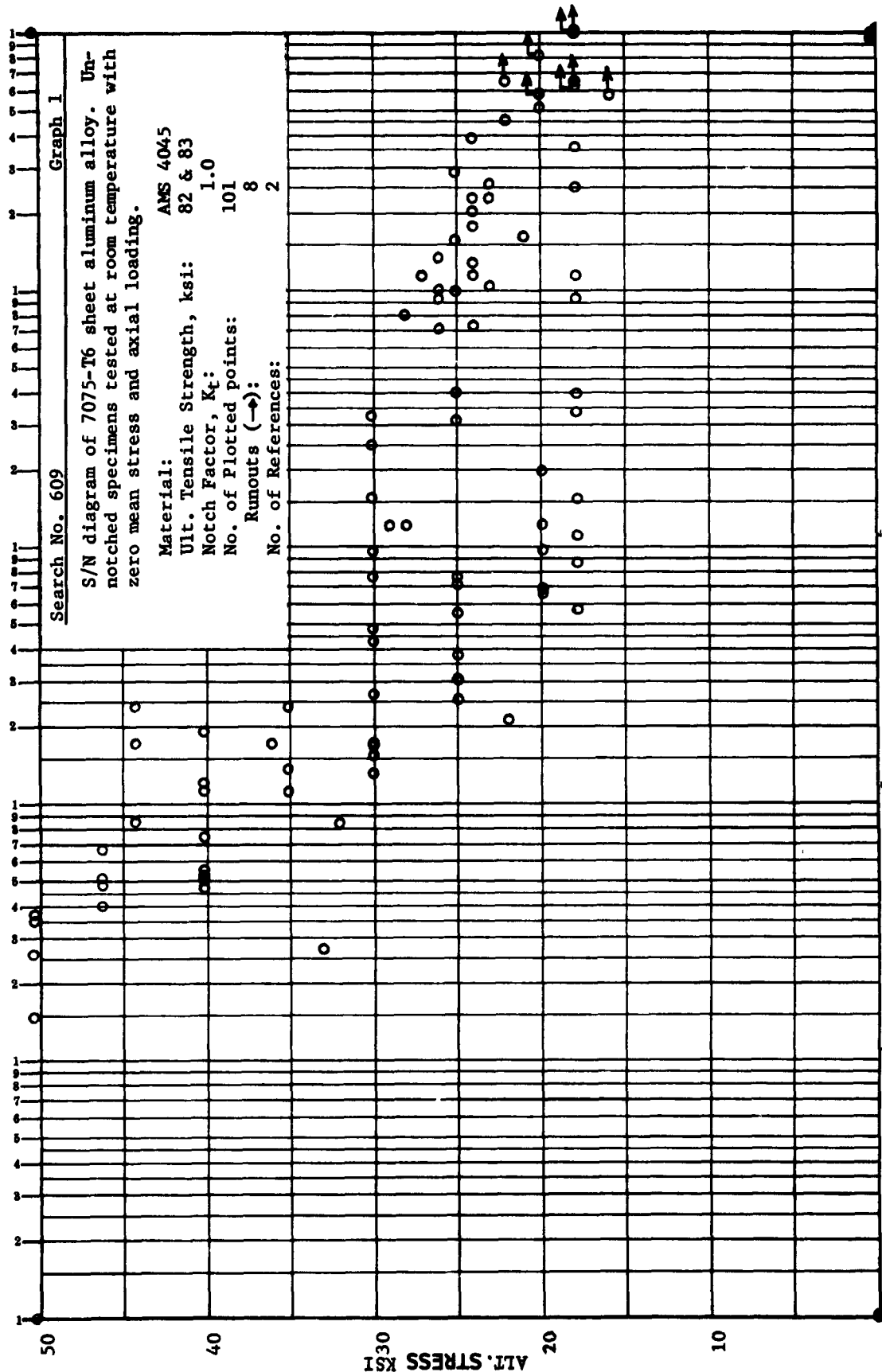
The information contained in each set of graphs is the result of a relatively general "question" asked of a semi-automatic data processing system which stores, processes, and regenerates the information in the requested form. More specific and detailed presentations and analyses are usually possible. These are available upon request. The graphic form in which this information is presented is only one of various types of output of which this mechanized system is capable. Tabulations and listings may also be generated by the system.

These data are intended to assist in the determination of reliable and efficient materials properties. The information contained herein should be used with due consideration to applicable specifications and established organizational procedures.

All graphs are labeled with a "search number". These serve to identify a broad block of information associated with a particular (internal) data processing pattern. Graph numbers are assigned in sequence within any search for the purpose of separating and identifying sub-groups of useful information. There is no requirement for graphs in any number sequence to have any relationship other than being the product of the same search. The unlimited number of combinations available for display and analysis dictates that these presentations be limited to relatively general subject matter. Detailed studies can be performed on request.

A legend on each graph describes the material, test type, and other variables necessary to identify the plotted data. Additional description of material, processing, and testing is provided by a Summary Data Sheet for each display of data. All references, identified by code numbers on the Summary Data Sheets, are completely identified on the Reference List.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

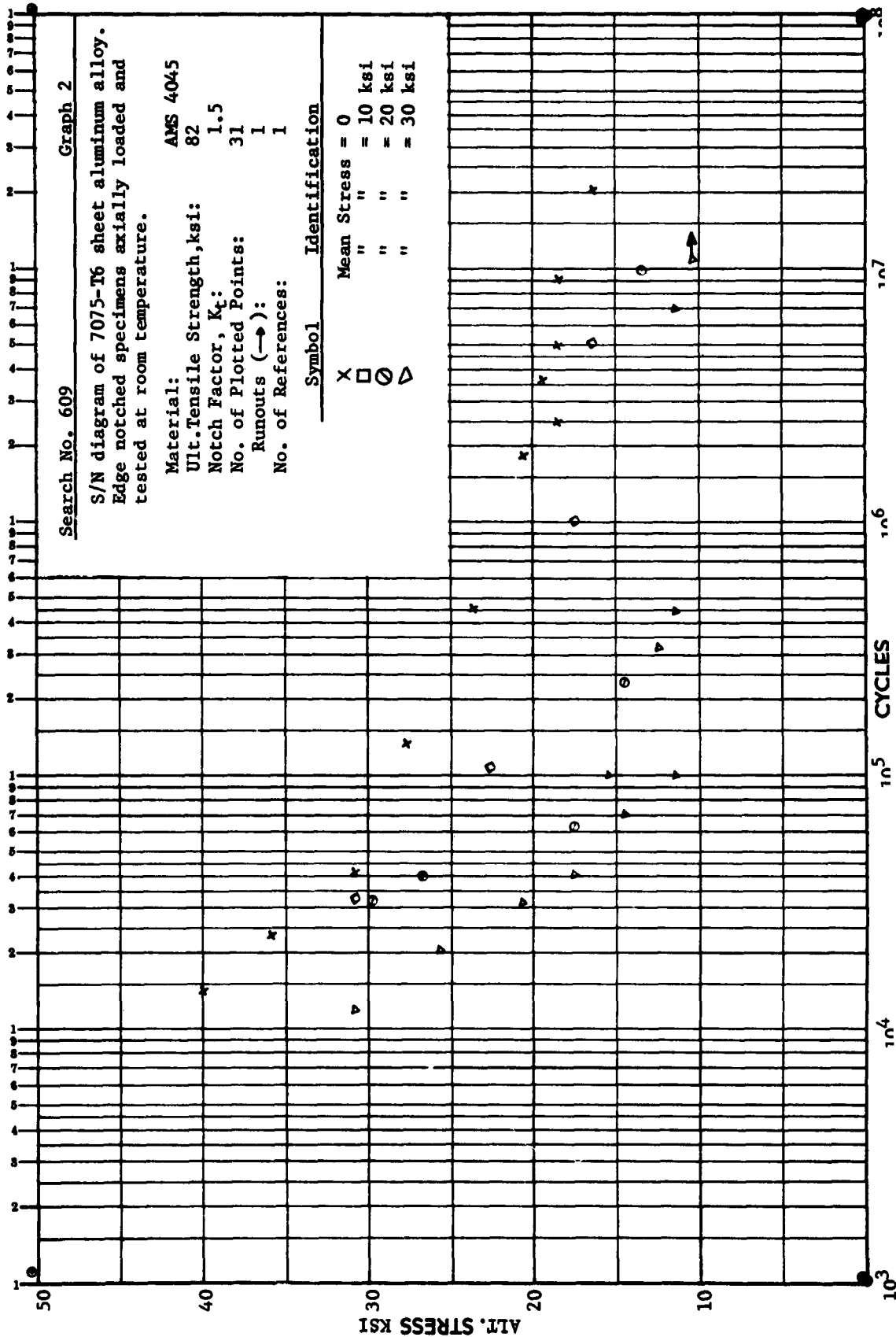
Search 609

Graph 1

Reference Code No.:	* 076 & 088
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	74 ± 2
Elongation:	11% & 12%, 2 inch gage
Hardness Test & No.:	Not Recorded
Surface Condition:	Electro or Mechanical Polished
Surface Finish:	Not Recorded
Primary Fabrication:	Hot or Cold Rolled
Secondary Operation:	Milled Edges or Not Recorded
Specimen Type:	Unnotched Sheet Specimens Less than 0.125 inches thick.
Cyclic Speed:	18 or 31 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

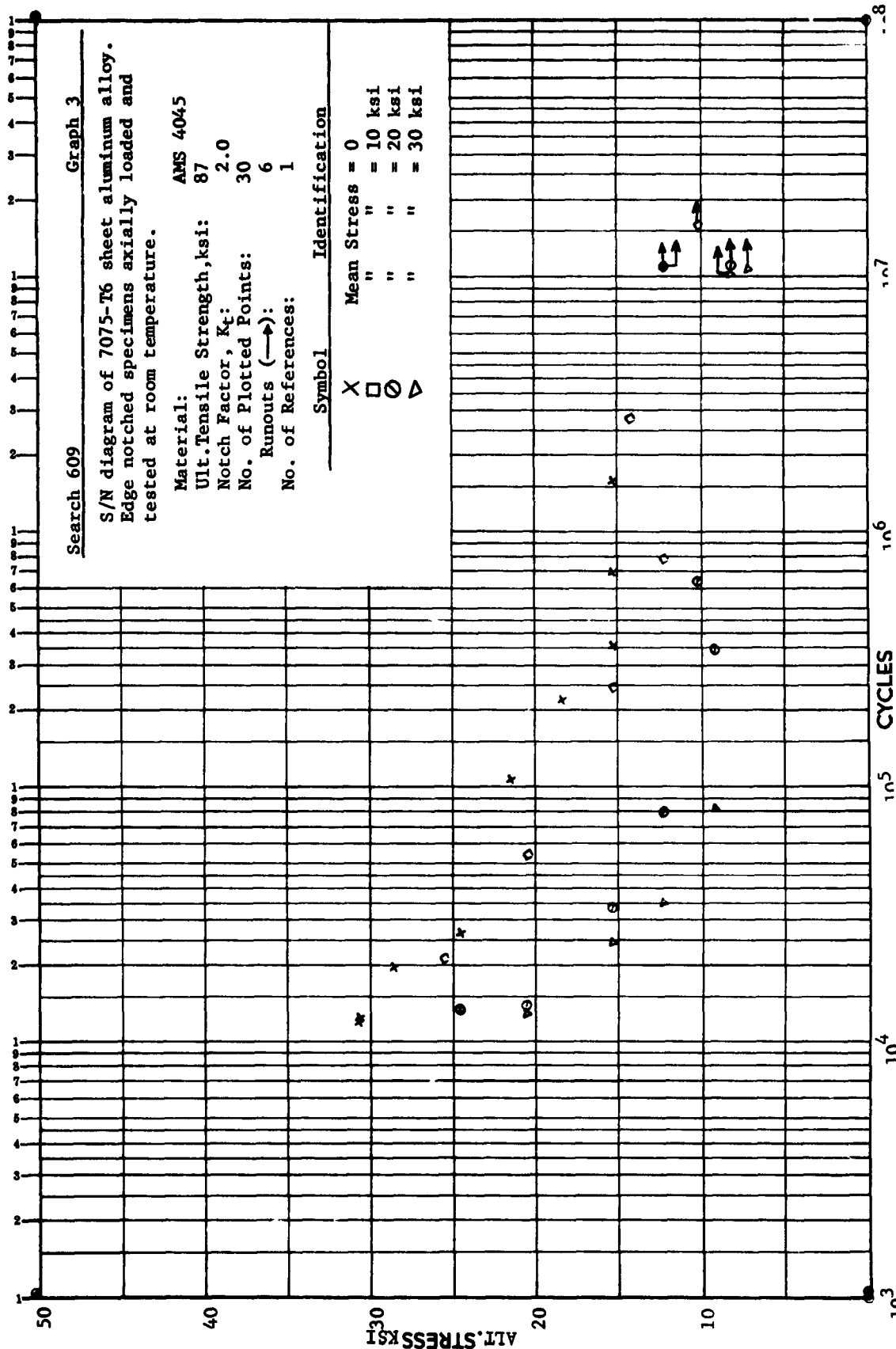
Search 609

Graph 2

Reference Code No.:	* 079
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	76
Elongation:	11%, 2 inch gage
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Recorded
Primary Fabrication:	Hot Rolled
Secondary Operation:	Milled Edges
Specimen Type:	Edge Notched Sheet Specimens Less than 0.125 inches thick.
Cyclic Speed:	25 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

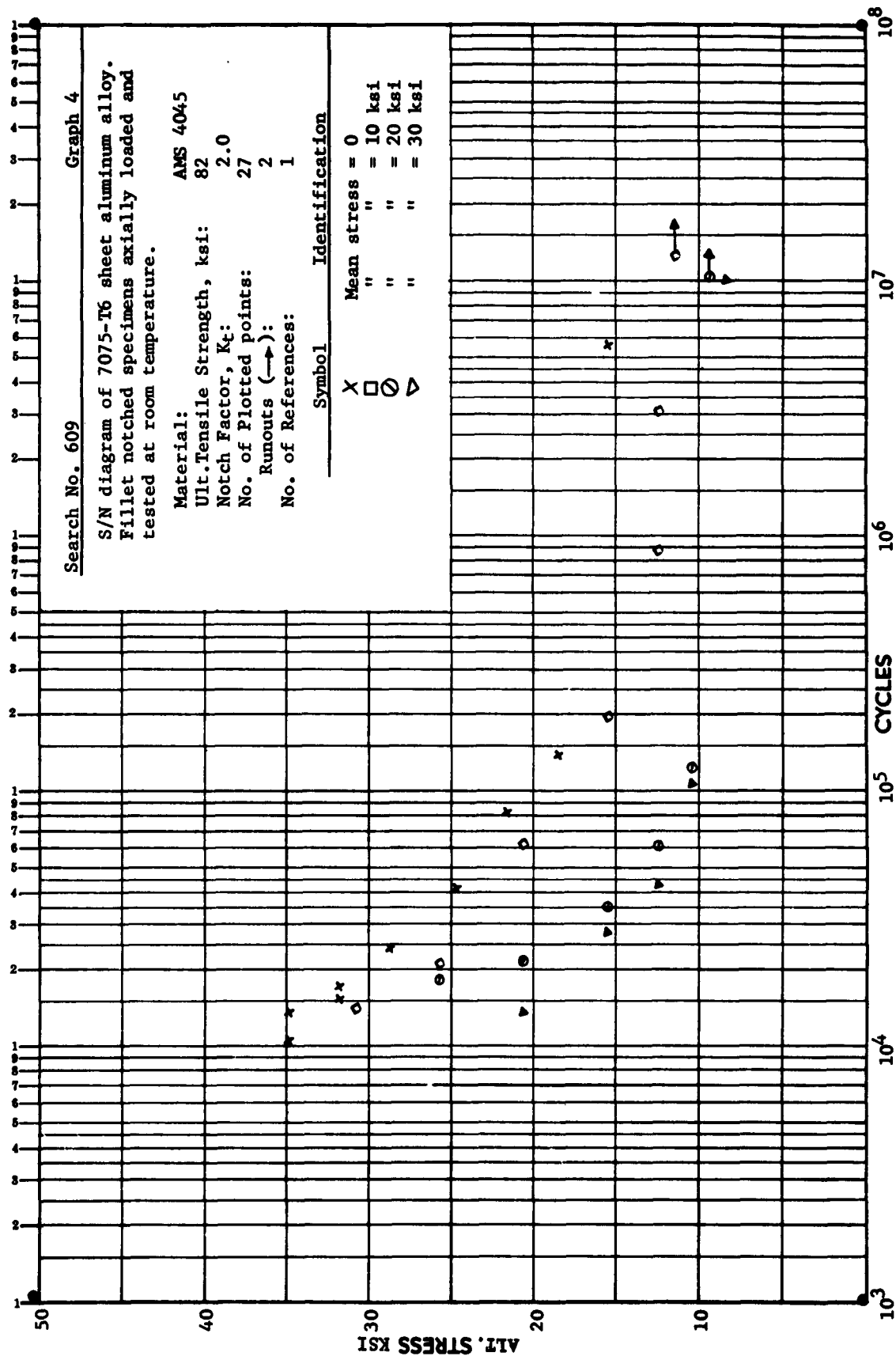
Search 609

Graph 3

Reference Code No.:	*077
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	76
Elongation:	11%, 2 inch gage
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Given
Primary Fabrication:	Hot Rolled
Secondary Operation:	Milled Edges
Specimen Type:	Edge Notched Sheet Specimens Less than 0.125 inches thick.
Cyclic Speed:	25 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

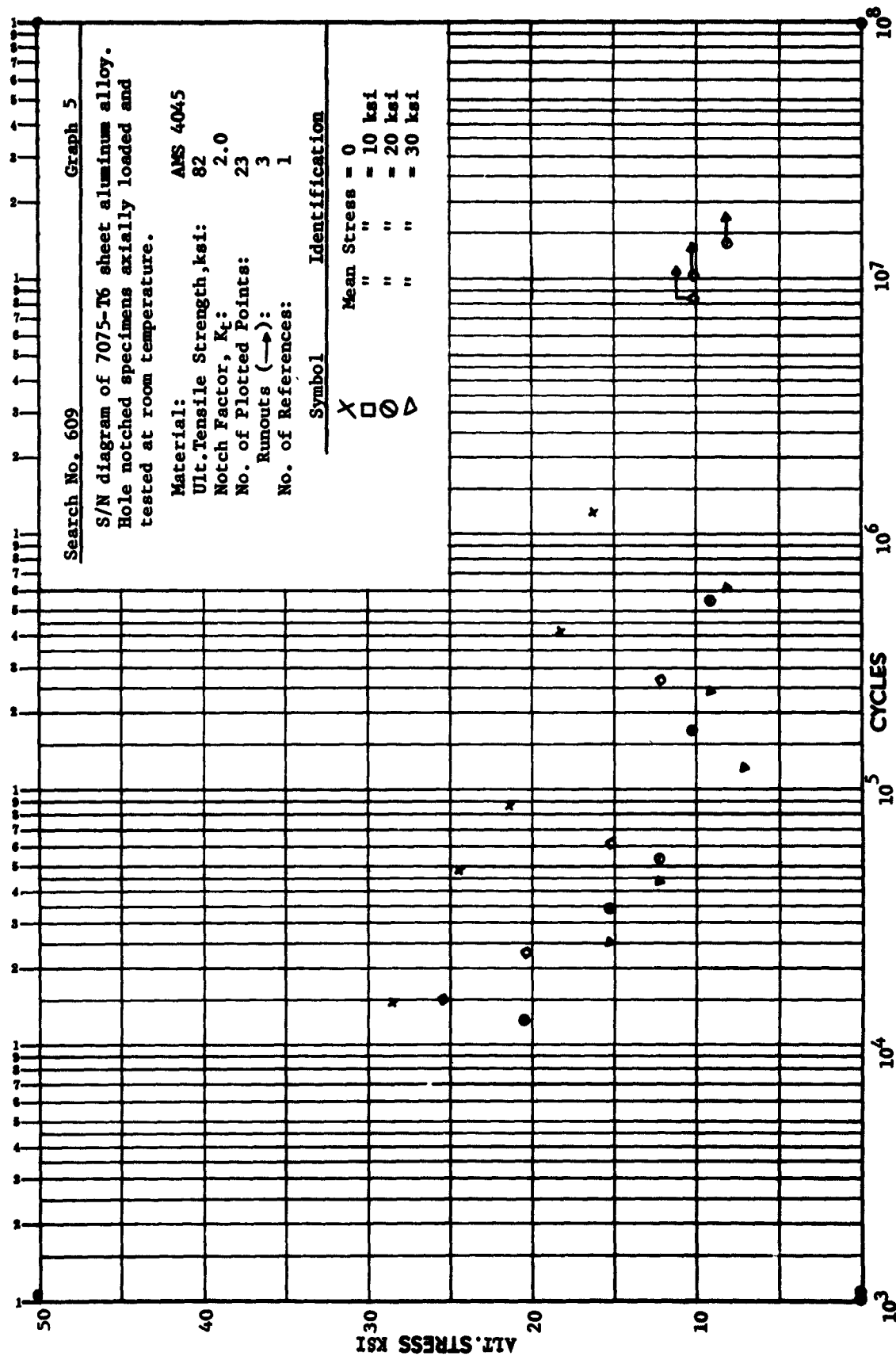
Search 609

Graph 4

Reference Code No.:	* 077
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	76
Elongation:	11%, 2 inch gage
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Recorded
Primary Fabrication:	Hot Rolled
Secondary Operation:	Milled Edges
Specimen Type:	Fillet Notched Sheet Specimen Less than 0.125 inches thick.
Cyclic Speed:	25 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

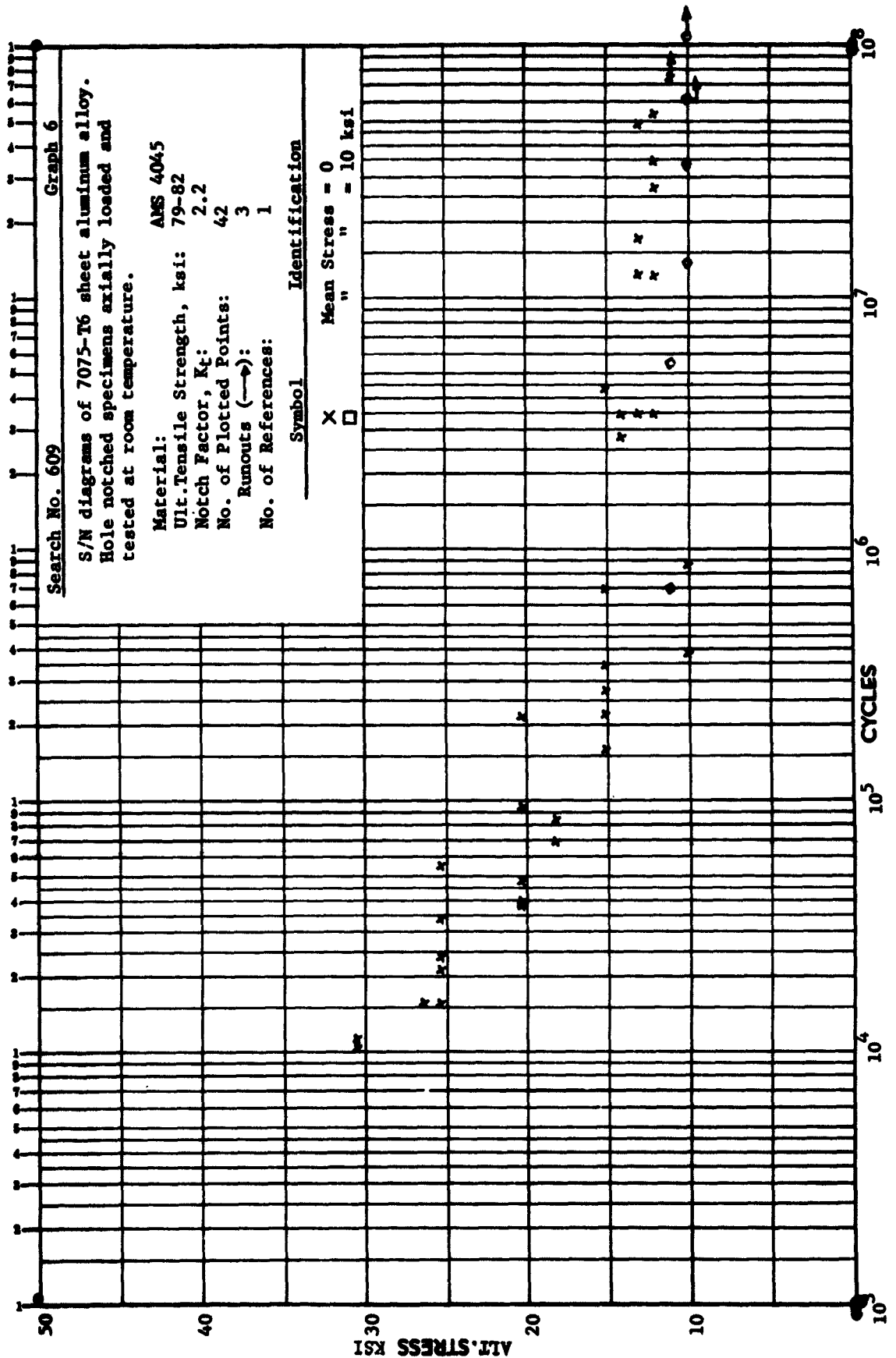
Search 609

Graph 5

Reference Code No.:	* 077
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	Not Recorded
Elongation:	11%, 2 inch gage
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Recorded
Primary Fabrication:	Hot Rolled
Secondary Operation:	Milled Edges
Specimen Type:	Hole Notched Sheet Specimens Less than 0.125 inches thick .
Cyclic Speed:	25 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

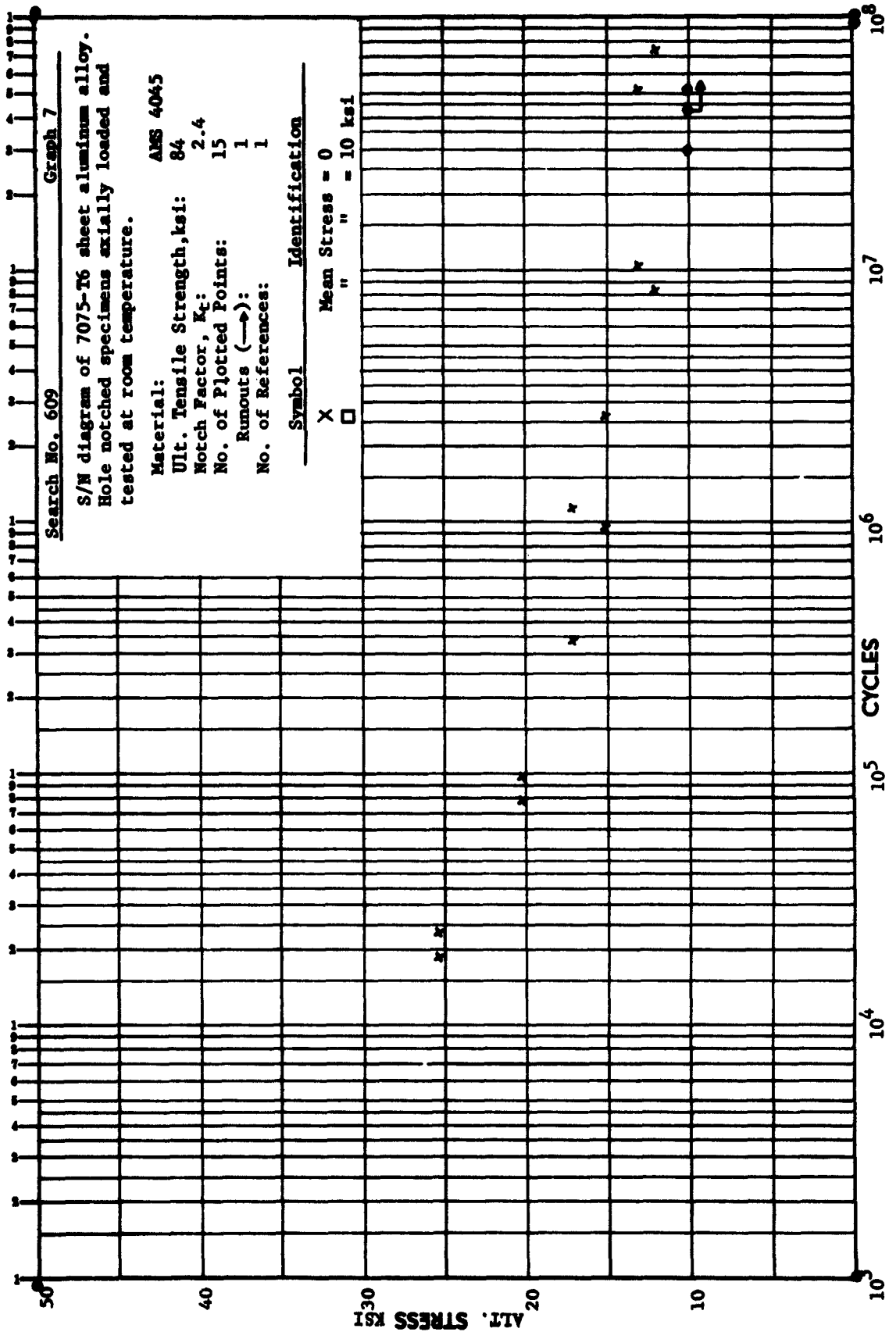
Search 609

Graph 6

Reference Code No.:	* 046
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	Not Recorded
Elongation:	Not Recorded
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Recorded
Primary Fabrication:	Not Recorded
Secondary Operation:	Machined
Specimen Type:	Hole Notched Sheet Specimens Less than 0.125 inches thick .
Cyclic Speed:	6 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

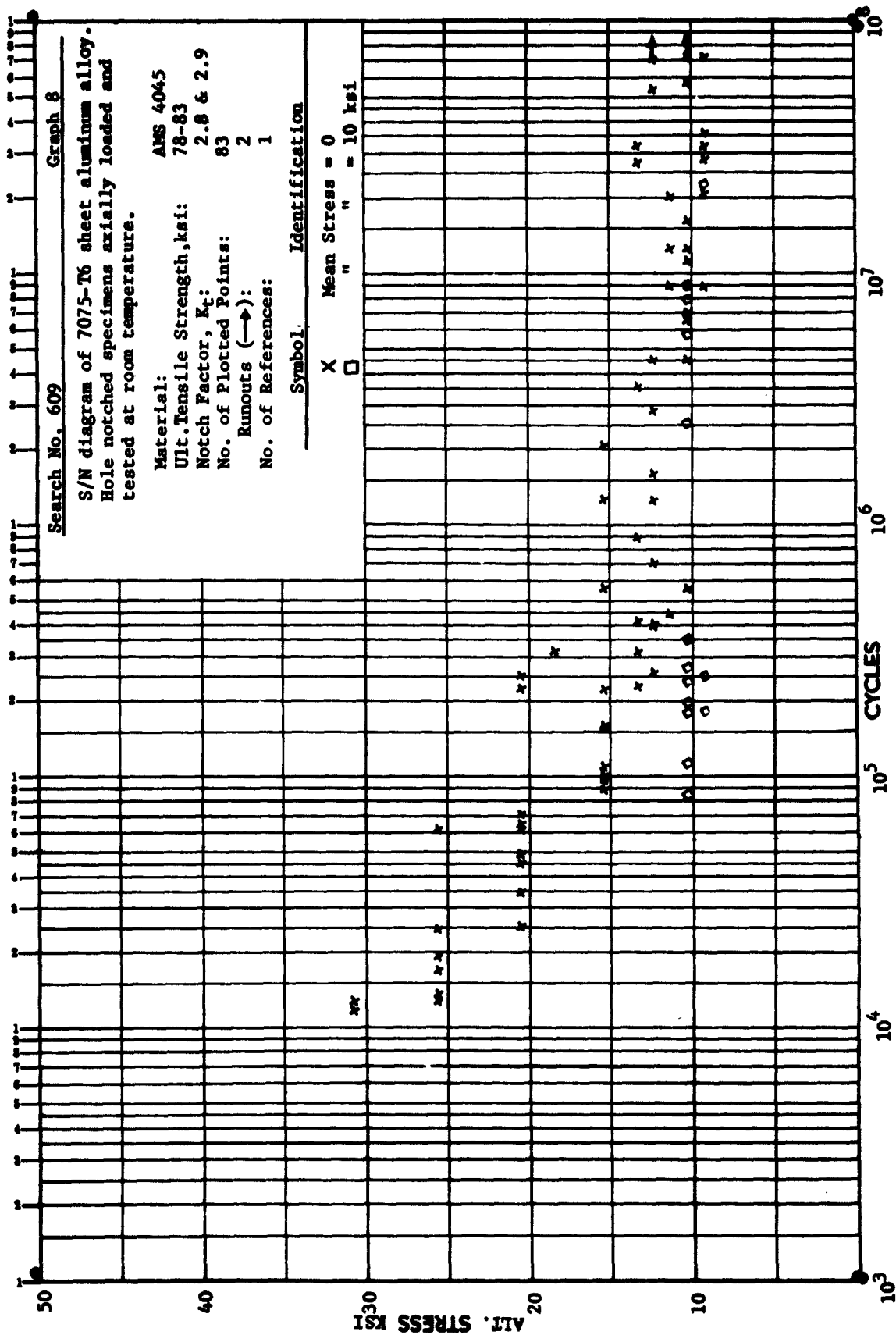
Search 609

Graph 7

Reference Code No.:	* 046
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	Not Recorded
Elongation:	Not Recorded
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Recorded
Primary Fabrication:	Not Recorded
Secondary Operation:	Machined
Specimen Type:	Hole Notched Sheet Specimen Less than 0.125 inches thick.
Cyclic Speed:	25 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

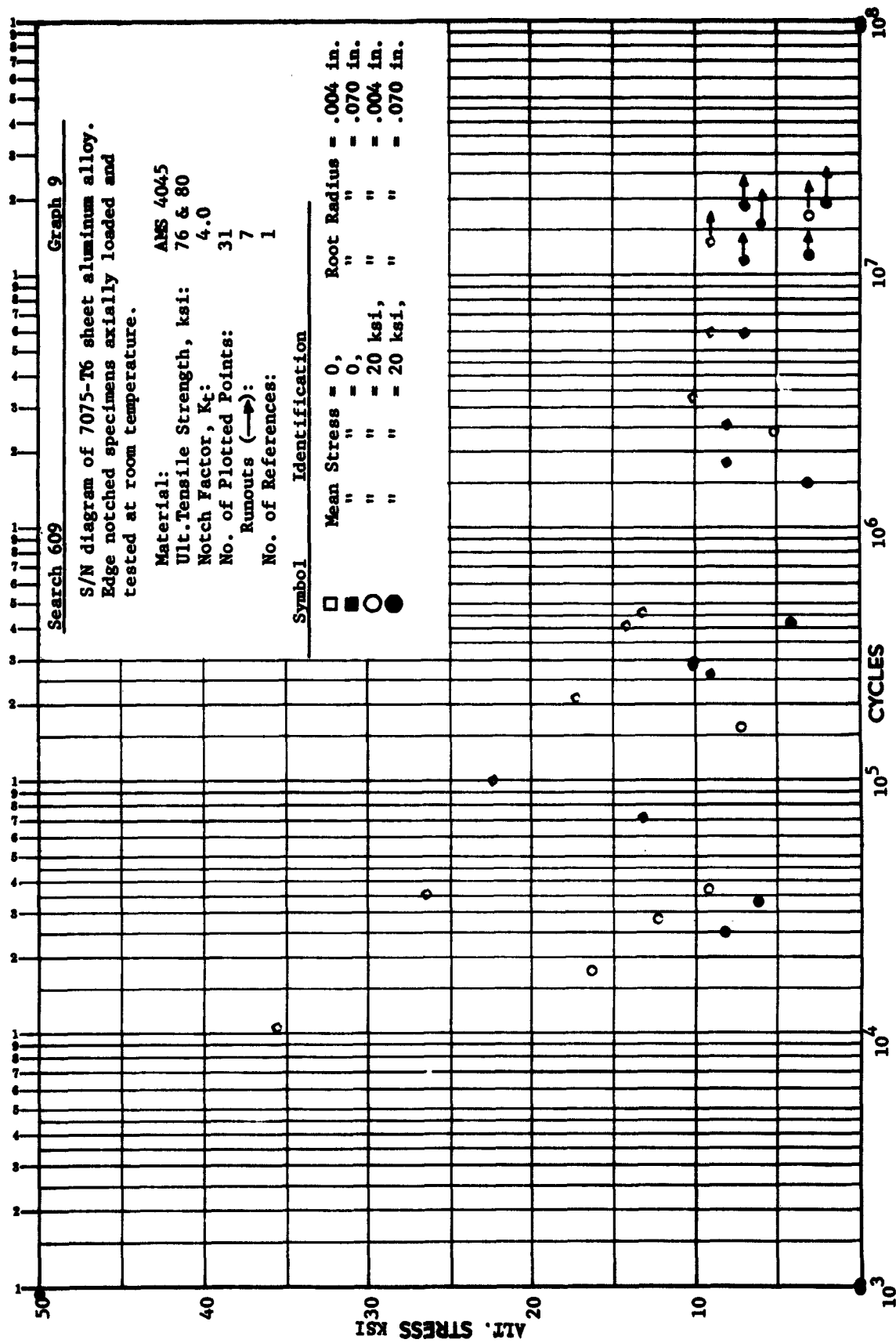
Search 609

Graph 8

Reference Code No.:	* 046
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	Not Recorded
Elongation:	Not Recorded
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Recorded
Primary Fabrication:	Not Recorded
Secondary Operation:	Machined
Specimen Type:	Hole Notched Sheet Specimen Less than 0.125 inches thick.
Cyclic Speed:	30 $\pm$ 7 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

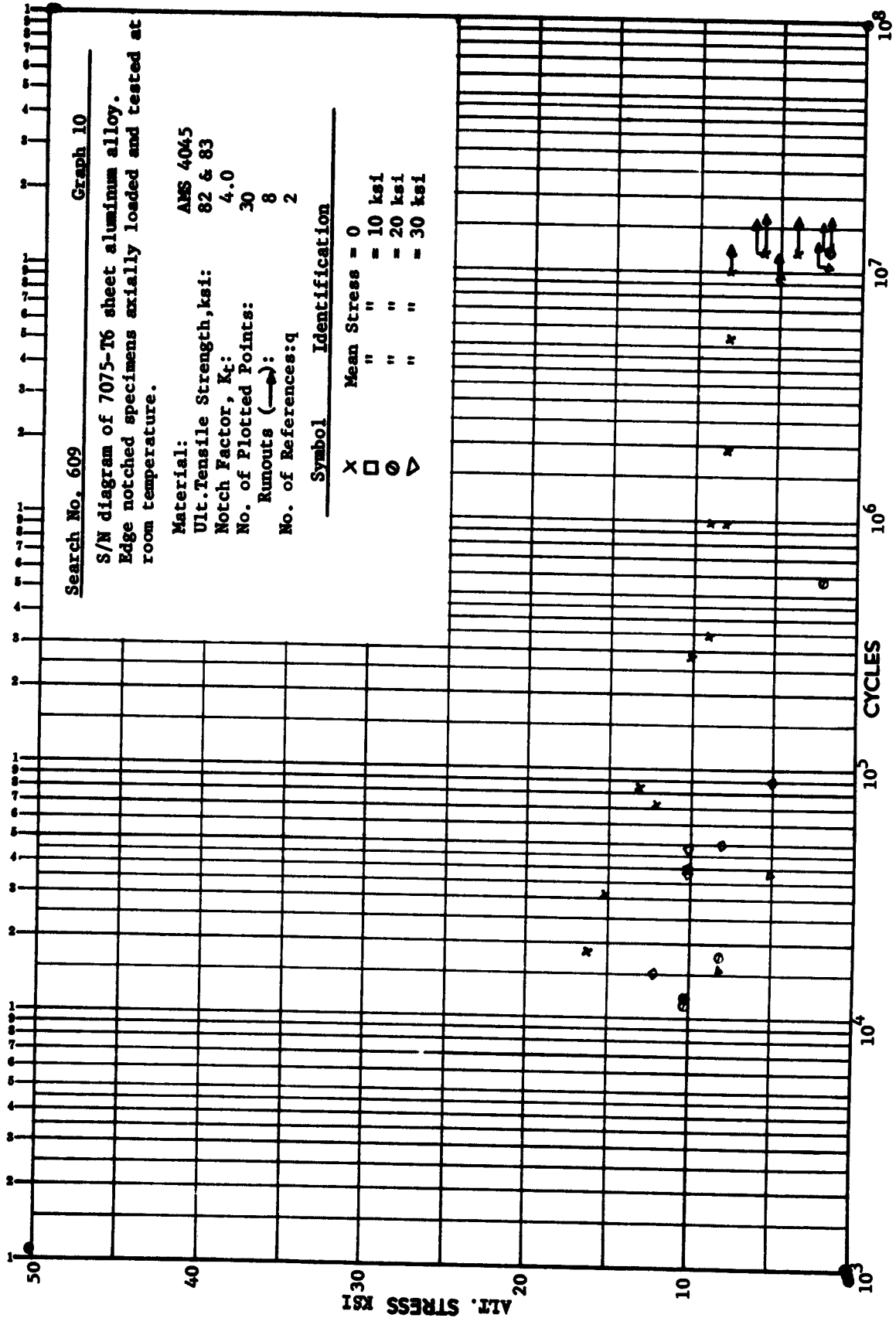
Search 609

Graph 9

Reference Code No.:	125
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	70 or 76
Elongation:	11%, 2 inch gage
Hardness Test & No.:	Not Recorded
Surface Condition:	Not Recorded
Surface Finish:	Not Recorded
Primary Fabrication:	Not Recorded
Secondary Operation:	Not Recorded
Specimen Type:	Edge Notched Sheet Specimen Less than 0.125 inches thick.
Cyclic Speed:	19 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

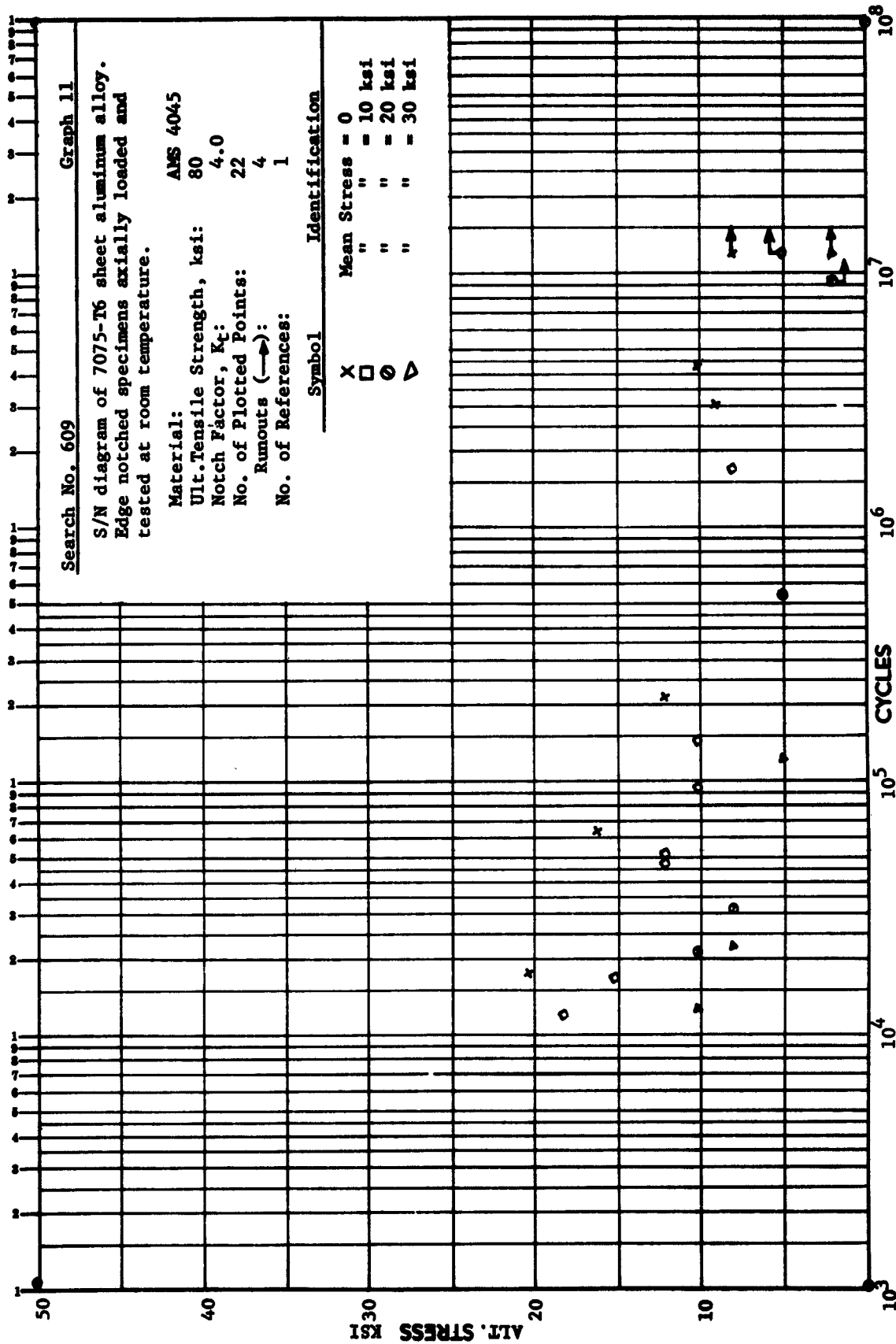
Search 609

Graph 10

Reference Code No.:	* 016 & 077
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	76 or Not Recorded
Elongation:	11%, 2 inch gage or Not Recorded
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished or Not Recorded
Surface Finish:	Not Recorded
Primary Fabrication:	Hot Rolled or Not Recorded
Secondary Operation:	Milled Edges
Specimen Type:	Edge Notched Sheet Specimens Less than 0.125 inches thick.
Cyclic Speed:	18.3, 25, 30 or 31.3 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

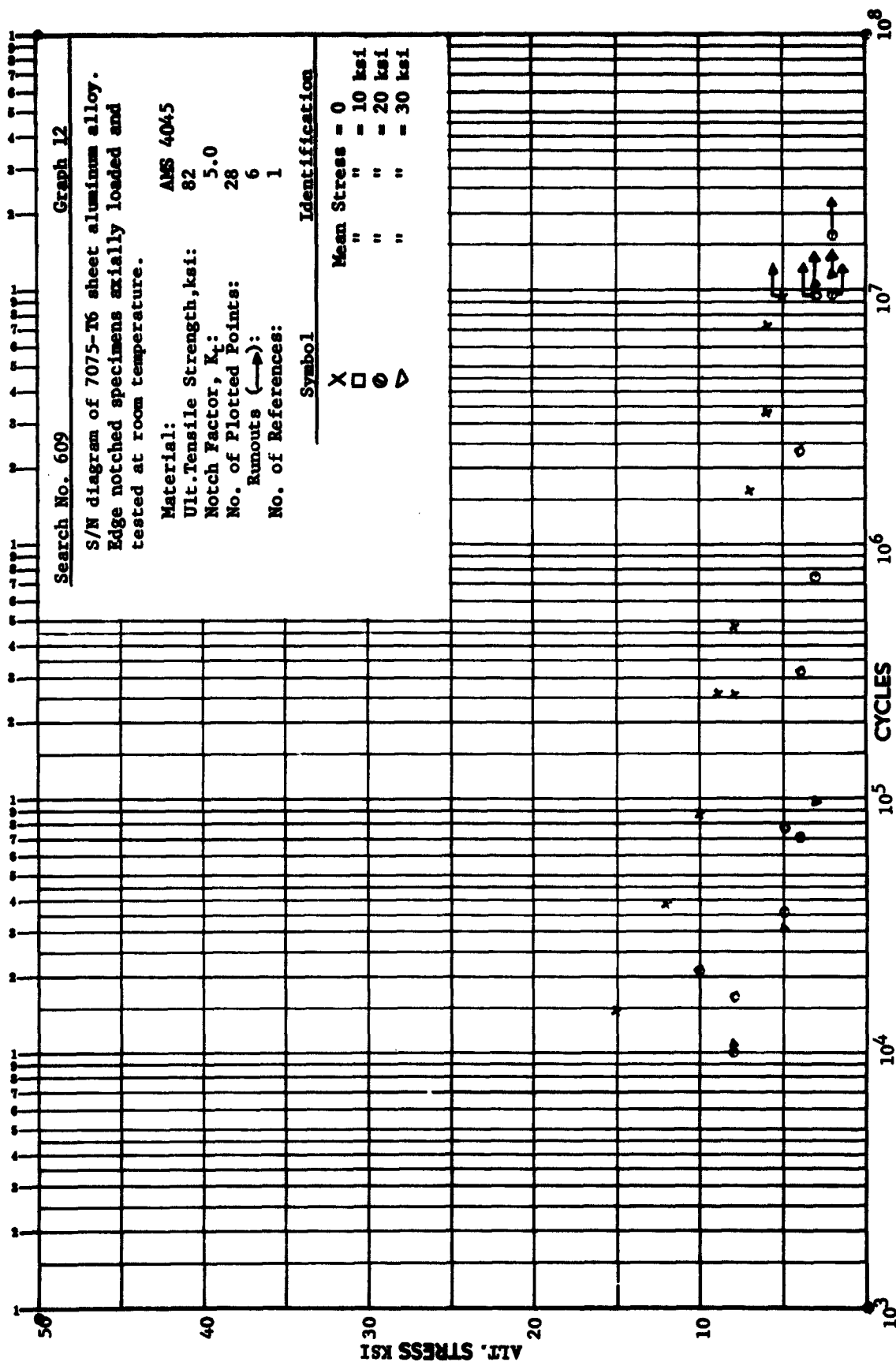
Search 609

Graph 11

Reference Code No.:	* 077
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	76
Elongation:	11%, 2 inch gage
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Recorded
Primary Fabrication:	Hot Rolled
Secondary Operation:	Milled Edges
Specimen Type:	Fillet Notched Sheet Specimens Less than 0.125 inches thick.
Cyclic Speed:	25 CPS

*See Reference List for complete identification of reference documents.

AUTOMATIC DATA ANALYSIS



SUMMARY DATA SHEET
METALS FATIGUE TESTS

Search 609

Graph 12

Reference Code No.:	* 078
Material:	AMS 4045 Aluminum Sheet & Plate
Melting Practice:	Not Recorded
Heat Treatment:	T-6
Yield Strength, ksi:	76
Elongation:	11%, 2 inch gage
Hardness Test & No.:	Not Recorded
Surface Condition:	Electropolished
Surface Finish:	Not Recorded
Primary Fabrication:	Hot Rolled
Secondary Operation:	Milled Edges
Specimen Type:	Edge Notched Sheet Specimens Less than 0.125 inches thick.
Cyclic Speed:	25 CPS

*See Reference List for complete identification of reference Documents.

REFERENCES --- SEARCH NO. 609

<u>Reference Code Number</u>	<u>Reference</u>
016	Hardrath, Herbert F., and Illg, Walter, "Fatigue Test at Stresses Producing Failure in 2 to 10,000 Cycles", NACA TN 3132 (Jan. 1954).
046	Landers, C.B.; Hardrath, H.F.; "Results of Axial-Load Tests on Electropolished 2024-T3 and 7075-T6 Aluminum Alloy Sheet Specimens With Central Holes". NACA TN 3631 (March 1956).
076	Grover, H.J.; Bishop, S.M.; Jackson, L.R.; "Fatigue Strengths of Aircraft Materials: Axial-Load Fatigue Tests on Unnotched Sheet Specimens of 24S-T3 and 75S-T6 Aluminum Alloys and of SAE 4130 Steel". NACA TN 2324 (March 1951).
077	Grover, H.J.; Bishop, W.M.; Jackson, L.R.; "Fatigue Strengths of Aircraft Materials: Axial-Load Fatigue Tests on Notched Sheet Specimens of 24S-T3 and 75S-T6 Aluminum Alloys and of SAE 4130 Steel With Stress-Concentration Factors of 2.0 and 4.0 NACA TN 2389 (June 1951).
078	Grover, H.J.; Bishop, S.M.; Jackson, L.R.; "Fatigue Strengths of Aircraft Materials: Axial-Load Fatigue Tests on Notched Sheet Specimens of 24S-T3 and 75S-T6 Aluminum Alloys and of SAE 4130 Steel with Stress-Concentration Factor of 5.0". NACA TN 2390 (June 1951).
079	Grover, H.J.; Hyler, W.S.; Jackson, L.R.; "Fatigue Strengths of Aircraft Materials: Axial-Load Fatigue Tests on Notched Sheet Specimens of 24S-T3 and 75S-T6 Aluminum Alloy and of SAE 4130 Steel with Stress-Concentration Factor of 1.5". NACA TN 2639 (February 1952).
088	Grover, H.J.; Hyler, W.S.; Kuhn, P.; Landers, C.B.; Howell, F.M.; "Axial-Load Fatigue Properties of 24S-T and 75S-T Alloy as Determined in Several Laboratories". NACA TN 2928 (May 1953).
125	Grover, H.J.; Hyler, W.S.; Jackson, L.R.; "Axial-Load Fatigue Tests of Edge-Notched Sheet Specimens of 2024-T3 and 7075-T6 Aluminum Alloys and of SAE 4130 Steel with Notch Radii of .004 & .070 inch.". NACA TN D-111 (September 1959).