DOCUMENT RESUME

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ABSTRACT

This publication consists of three sections: facilitator's guide--train the trainer, facilitator's guide sample--Basic Blueprint Reading (Chapter 1), and participant's guide sample--basic blueprint reading (chapter 1). Section I addresses why the trainer should learn new classroom techniques; lecturing versus facilitating; learning styles inventory; suggestions for tactile, visual, and auditory learners; ideas for interactive training; and arranging the room. Section II contains the curriculum for chapter 1 on basic blueprint reading. Introductory facilitator materials include a one-page summary of course basics, objective, and course overview with blueprint reading content and learning strategies; and checklist of materials needed. Information and exercises are provided on learning strategies, study strategies, reading strategies, key terms, note taking, job aids, memory aids, organization, and classroom strategies. Symbols that represent the various terms and ideas are presented in a side column and used in the curriculum to alert the trainer and/or student that certain activities or responses are recommended. Throughout the sample curriculum, facilitator pages provide tips for the facilitator. The guide provides objectives, learning materials, activities, chapter review, answer keys, Checkpoint 1, and participant score sheet. Section III contains a complete set of learner's materials suitable for duplication. (YLB)

Train the Trainer

Facilitator Guide Sample

Basic Blueprint Reading (Chapter One)

St. Louis Community College

Community Development Division/Workplace Literacy Services Center

The contents of this publication were developed under a grant from the Department of Education. However, those contents do not necessarily represent the policy of the Department of Education, and you should not assume endorsement by the Federal Government.

Contents

Facilitator's Guide — Train the Trainer

Facilitator's Guide Sample — Basic Blueprint Reading (Chapter 1)

Participant's Guide Sample — Basic Blueprint Reading (Chapter 1)

Facilitator's Guide — Train the Trainer

Facilitator

Introduction

Why Should You Learn New Techniques for the Classroom?

Ask yourself the following questions and check one appropriate box for each.

	Yes	No
• Would you like to improve the results of your classes?	☐	☐
• Do you believe all learners can succeed?	☐	☐
• Are you looking for more interactive training methods?	☐	☐

- If you answered *yes* to any of these questions, then this manual is for you.

Lecturing vs. Facilitating

Which do you believe is more effective: lecturing or facilitating?

Based on adult learning theory, effective facilitation with adult learners relies on some important facts:

- Facilitators should ask questions throughout training.
- Facilitators should use a variety of presentation methods allowing all learners to use their learning strengths (visual, auditory, and tactile).
- Adult learners must understand how the training ties into their lives.
- Adults learners must have the opportunity to use what they are learning.

And remember: Of all teaching strategies, *lecturing* produces the lowest retention rate.

This curriculum is designed to maximize participant retention through an interactive approach to learning. The facilitator guide pages, printed on colored paper, provide tips for the facilitator.

Getting Results

Do you:

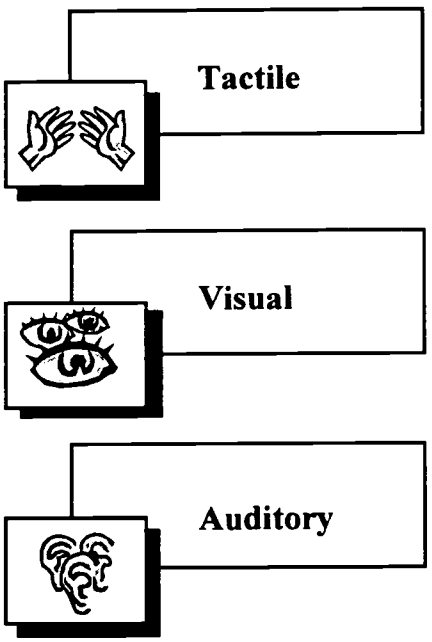
- Prepare the overheads, flip charts, and class agenda prior to class?
- Organize?
- Make smooth transitions between topics?
- Move around the classroom?
- Involve the participants through questions?
- Keep lecture to a minimum?
- Pause to allow thinking time?
- Try to be creative with your class materials?
- Use visual aids often?
- Speak clearly and use appropriate vocabulary?
- Provide learning opportunities for all learning styles?

The information on the following pages will help you approach your classes with confidence and with a better understanding of adult learners.

Facilitator

Assuring Learner Success

Have you ever been frustrated when learning a new skill? If so, perhaps your learning style was not addressed. Do you know which of these three primary styles best describes the way you learn?



- Identify your learning style by taking the inventory on the following page.
- Consider giving the inventory to your participants at the beginning of your course.

Facilitator

Learning Styles Inventory

Your ***learning style*** is your preferred way to process, recall, and remember information.
Place a check next to the activities below that best describe *you.*

I like to/I:	I:	I:
☐ fold paper when told to make columns.	☐ love to talk.	☐ ignore spoken directions.
☐ rock in a chair.	☐ love to listen to someone read or talk.	☐ ask for repeated directions.
☐ shake my leg.	☐ talk to myself.	☐ look to see what others are doing.
☐ tap or wiggle pens, pencils, etc.	☐ read aloud.	☐ get the words to a song wrong.
☐ reach out to touch everything.	☐ am distracted by noises.	☐ turn the radio or TV up very loud.
☐ do not trust my eyes or ears until I touch something.	☐ use my finger to read.	☐ write lots of notes.
☐ collect "things."	☐ put my head near my work.	☐ watch the speaker's mouth.
☐ have a low interest in reading.	☐ hood my eyes with my hand.	☐ don't like to talk on the phone.
☐ break up toothpicks or play with straws.	☐ don't do well with charts & graphs.	☐ go off into another world when lectured to.
☐ take things apart, put things together.	☐ need words to go with a cartoon.	☐ enjoy reading.
☐ dress for comfort.	☐ can't draw without something to copy.	☐ do well with charts and graphs.
☐ take lots of baths or showers.	☐ can't use maps; need oral directions.	☐ need maps; get lost with oral directions.
☐ talk fast, using my hands.	☐ use jingles to learn things.	☐ have good handwriting.
☐ tend to interrupt.	☐ don't do well with symbols.	☐ am good at puzzles.
☐ like to try new things.	☐ can't stand silences; need to talk and need others to talk.	☐ am organized; like things neat.
Total = _____ (Tactile)	**Total =** _____ (Auditory)	**Total =** _____ (Visual)

Count the check marks in each column and place the total at the bottom. The column with the most checks indicates your ***primary learning style.***

My primary learning style is _____.

Facilitator

Suggestions for Tactile Learners

Highlight the tips that you can apply to your work.

Tactile

- Demonstrate something instead of simply talking about it.
- Allow students to move around and/or interact with concepts.
- Use props to illustrate ideas.
- Include opportunities for learners to write and speak during class through partnered and small-group activities.
- Use logs or journals for reflective feedback.
- Give tactile learners an opportunity to teach whenever possible.

Add other tips that work for you:

-
-
-

Facilitator

Suggestions for Visual Learners

Highlight the tips that you can apply to your work.

Visual

- Show visuals when discussing information, e.g., overheads, drawings, pictures, props, etc.
- Use and ask learners to create visual material, e.g., art, graphs, and games for problem solving.
- Assign reading prior to presenting information in class.
- Use logs or journals for reflective feedback.
- Videotape learners and ask for learner assessment.

Add other tips that work for you:

-
-
-

Facilitator

Suggestions for Auditory Learners

Highlight the tips that you can apply to your work.

Auditory

- Allow students to record your class, or record yourself and allow learners to check out recordings.
- Use activities that encourage conversation, e.g., brainstorming, interviews, study groups, games, etc.
- Ask open-ended questions to stimulate discussion when using visual information.
- Use individual conferences to touch base with students.

Add other tips that work for you:

•

•

•

Facilitation Activity

Read the paragraph below and answer the following questions to practice identifying learning styles.

> Steve is a renegade you have in one of your classes. Your first encounter with Steve occurred when he asked you, in the middle of class, if you were married and persisted in asking personal questions. Steve also has numerous ideas for how you should teach the class. Steve's limited attention span is obvious in his intense pencil tapping, his obsession with his baseball hat, and his frequent and inappropriate talking.

1. What is Steve's learning style? _____
2. What clues helped you identify his style? _____

_____

_____

3. What techniques would you use with Steve? _____

_____

_____

_____

Facilitator

Ideas for Interactive Training

Interactive training can address all learning styles. Which of the following techniques will increase participants' understanding of the content material?

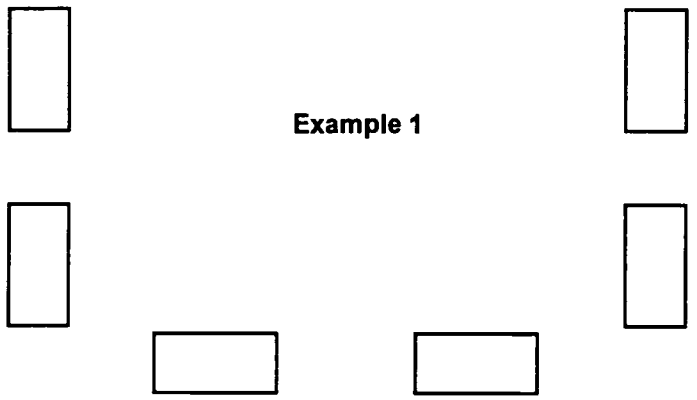
- Partnered or small-group problem-solving activities
- Colorful visuals
- Use of questions throughout presentations
- Use of highlighters with written materials
- Discussions and brainstorming
- Debates
- Participant-generated questions that stimulate discussions
- Allowing participants to teach sessions

What interactive training ideas would work with your learners?

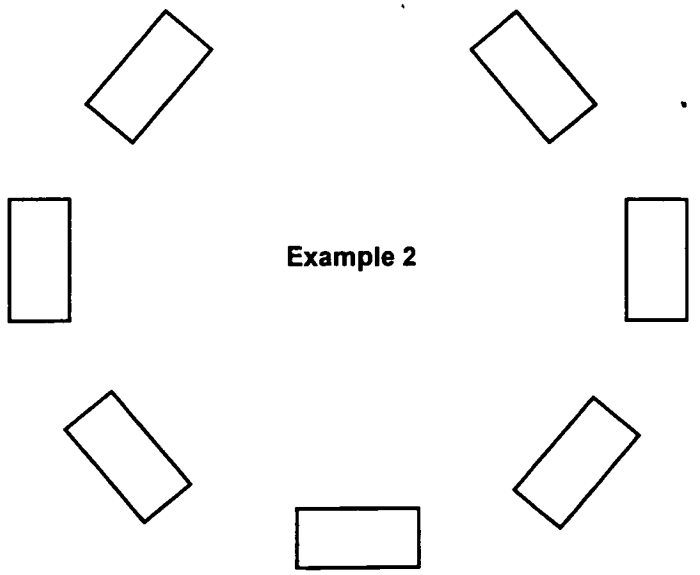
Facilitator

Arranging the Room

Room arrangement has a tremendous impact on learning. Try to arrange your training room like one of the following examples.



Example 1



Example 2

Facilitator's Guide Sample

Train the Trainer

Course Basics and Objective

Time = 24 Hours [1 Hour Classes, 2 Times per Week (Optimal)]

The objective of this course is twofold: the understanding of Blueprint Reading combined with learning strategies.

Course Overview

The Blueprint Reading content and the learning strategies work together.

Blueprint Reading Content	Learning Strategies*
Chapter 1—Title Block and Alphanumerics Components of Title Block Numbering System for Parts and Prints **Chapter 2—Departmental Documentation** Forms That Compliment Blueprints: Parts Lists, Work Orders, Schedules, Modifications **Chapter 3—Math and Measurement** Decimals Tolerances Fractions Geometric Formulas Measurement & Tools Machinist Terminology **Chapter 4—Visuals** Line Types Views	**Reading Strategies** Previewing Questioning Skimming **Study Strategies** Key Terms Note Taking Job Aids Memory Skills Organization Skills **Classroom Strategies** Group Activities Feedback *learning strategies are integrated with Blueprint Reading content material throughout the course

Materials Needed

Checklists

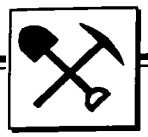
Facilitator's Materials

- ☐ Facilitator's Guide—Includes Overheads
- ☐ Overhead Projector and Screen
- ☐ Set of Blank Overhead Film
- ☐ Set of Overhead Markers
- ☐ Blackboard or Marker Board
- ☐ Flip Chart
- ☐ Machinist Scale
- ☐ 10–15 Copies of Blueprints
- ☐ Calculator
- ☐ Objects From the Company to Measure in Chapter 3
- ☐ 6–8 Meter Sticks
- ☐ Three-Dimensional Geometric Shapes

Participant's Materials

- ☐ 1 Learner's Guide*
- ☐ Highlighter(s)*
- ☐ 2–3 Pencils*
- ☐ 1 Name Tent/Tag*
- ☐ 1 Calculator*
- ☐ 1 Machinist Scale*
- ☐ Plenty of Scrap Paper

*items/participant



Tools for Learning

Learning Strategies

Study Strategies

Key Term

1. Key Term

Look for new words, abbreviations, main ideas, definitions, and formulas.

Note Taking

2. Note Taking

Identify your study strengths and develop a system that works for you (i.e., use highlighters, abbreviations, shorthand, outlines, etc.)

Job Aid

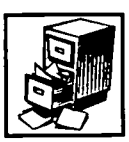
3. Job Aid

Create and use visual tools to help you on the job.

Memory Aid

4. Memory Aid

Use tips, formulas, and memory tricks.



Organization

5. Organization

Manage your documents, duties, ideas, and time.

Tools for Learning

Key Term

A key term is a new idea, definition, or formula that you need to remember. This is the ***key term*** symbol used throughout the course. When you see it, note all of the key terms on the page.

Key Term

When learning a new skill, you sometimes need to learn a new "language." Key terms are the basics of a language. They are often underlined, **bold**, or *italicized* and can frequently be found in a book's ***glossary***.

What can you do to help yourself remember key terms?

In Chapter 1, what are four key terms?

Note Taking

Note Taking

Note taking is identifying a system that helps you remember information. This is the ***note taking*** symbol used throughout the text. When you see it, use these tips to get the most out of taking notes:

Draw pictures. Repeat information out loud. Ask the speaker to repeat information. Tape record the information to take notes at a later time. Highlight written material to ***skim*** faster. Abbreviate for margin notes and outline notes. Develop your own shorthand. Abbreviate w/o losing meaning.

& ..... and	2 ..... *to*
@ ..... *at*	^ ..... *up*
$ ..... *cash, cost, or money*	wh/ ..... *which*
ea ..... *each*	w/ ..... *with*
ex ..... *example*	w/o ..... *without*
/ ..... *no*	u ..... *you*
# ..... *number*	

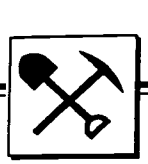
- Listening = Tune in 2 the speaker's motions, vocal tone, & rhythm 2 know what's important.
  Tip! Bored? Ask a question or make a comment!

- Analyzing = Think of the speaker's outline. Practice thinking like the speaker.
  Tip! Answer the questions who?, what?, where?, when?, why?, & how?

- Selecting = Highlight w/ colors 2 pull headlines & important facts off the page.
  Tip! Find & highlight the 5 Ws & How.

- Writing = Divide paper in 2 lengthwise; write notes on the left & headlines on the right.
  Tip! Make small drawings in the margins 2 lift key ideas off the page. Write legibly.

Highlight the information on this page that you want to remember.



Tools for Learning

Job Aid

Job Aid

A job aid can be a drawing, chart, memory device, or instructions — almost anything that makes a task easier to remember. This is the ***job aid*** symbol used in the course. When you see it, use the included job aid used in class or create one of your own.

- A job aid can be created by anyone. Have you ever created a to-do list, a chart for household chores, or a flashcard for learning new ideas? These are all job aids.

What other job aids have you created? _____

_____

Do you have any ideas for a work-related job aid? _____

_____

_____

_____

_____

Memory Aid

Memory Aid

A memory aid is a device that helps you remember information. This is the ***memory aid*** symbol used throughout the course. When you see it, practice the given memory aid or create one of your own.

A memory aid can be created by anyone and can be used for almost anything. For example, one way to remember the five Great Lakes is the word "HOMES."

Huron **O**ntario **M**ichigan **E**rie **S**uperior

What are some memory devices you already know?

_____

_____

_____

In small groups, share your memory aids. Write the ones which are new to you. _____

_____

_____

Discuss with your group what is needed to create a good memory aid.

Tools for Learning

Organization

Organization

Organization is keeping track of ideas, papers, things that need to be done, and time in a systematic way. How you organize may be different than how someone else organizes. This is the ***organization*** symbol used in the course. When you see it, check how organized you are.

Studies show that one of the keys to success is being organized. On a scale of 1 to 10 (1 being low, and 10 being high) how would you rate your organization skills?

_____

In terms of organization, what is your greatest strength? _____

_____

What is your greatest weakness? _____

_____

_____

What can you do to improve? _____

_____

_____

_____

_____

Tools for Learning

Reading Strategies

Preview

1. ***Preview***

   Look over the text. Look at the title, subtitles, table of contents, index, glossary, and illustrations.

Question

2. ***Question***

   Answer "What do I need to know?" by asking the 5 W's (Who, What, When, Where, Why) and How.

Skim

3. ***Skim***

   Read information quickly to get the main idea.

   Skim Text

   - Look for words that are **bold**, in *italics*, or <u>underlined</u>.
   - Read the first and last sentences in each paragraph.

   Skim Graphics (charts, tables...)

   - Look for titles, keys, legends, and other blocks of information in columns, rows, and corners.

Preview

Preview

This is the ***preview*** symbol used throughout the course. When you see it, practice previewing the chapter.

Preview by reading the titles and subtitles in a document or chapter to find the major concepts. Previewing also includes asking yourself what you know and don't know about these major concepts.

1. Take five minutes and preview the entire manual. List the major concepts.

_____

_____

_____

2. Compare your list with a partner. Did you come up with the same list? Why or why not? _____

_____

_____

_____

3. Which concepts on your list are unfamiliar to you? Highlight these.

Question

Question

This is the ***question*** symbol used throughout the course. When you see it, answer the stated question or come up with a question of your own.

Question what you need to know by identifying the 5 W's and How: Who? What? When? Where? Why? How?

- Preview this manual and create some questions using the 5 W's and How.

  Ask, for example, "What do I need to know? Where can I use this information? How can I use this information?"
- Create your own questions with the 5 W's and How.

Who _____

_____ ?

What _____

_____ ?

When _____

_____ ?

Where _____

_____ ?

Why _____

_____ ?

How _____

_____ ?

Skim

Skim

This is the ***skim*** symbol used throughout the text. When you see it, practice skimming the information instead of reading it thoroughly.

Skim by reading information quickly to get the main idea.

Imagine that the following is a whole page of text. The blanks are the words you don't read when you are skimming.

> Usually, the first paragraph will be read all the way through at average speed. It will contain an overview of what will be talked about in the following paragraphs.
>
> Sometimes the second paragraph contains some important information, so read this as well.
>
> Read the first … … … … … … … … … … … … … … …
> … … and last sentences of the rest of the paragraphs.
>
> After the first sentence, … … … … … … … … … … … …
> … … … … … watch for **bold** … … … … … … … … … …
> … … … … … … … … … and *italicized* … … … … … … …
> and <u>underlined</u> … … … … … … key words.

What information do you usually skim? ____________________

____

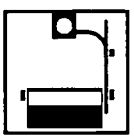
Facilitator

Classroom Strategies

Facilitator

1. Facilitator Guide

Tips and instructions for facilitators.



Overhead

2. Overhead

Used to emphasize and clarify concepts.

Activity

3. Activity

Individual, partner, or group skill-building exercise.

Participant Feedback

4. Participant Feedback

For confidential communication between facilitator and participant.

Facilitator

Facilitator Guide Pages

Facilitator

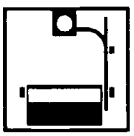
When you see this symbol, use these ideas in your training, or come up with your own.

Facilitator guide pages are blue. They are inserted into the facilitator's guide to offer suggestions and guidance.

These pages are structured to help you facilitate the course information.

> Facilitator tips are included on each of the pages. Use these pages and tips, but don't hesitate to be creative when adapting them to your particular learning environment.

Facilitator



Overhead

Overhead

When you see this symbol, use the enclosed overheads or make your own.

An ***overhead*** is a transparency copied from the text and used with an overhead machine. It provides a visual for examining details.

- Use overheads to emphasize, illustrate, or introduce a concept. Visuals are more effective than discussion only.
- Use colored transparency markers to highlight information.
- Ask *volunteer* participants to point out important information on overheads. (Peer teaching is a valuable learning strategy.)
- Make certain that all overheads can be read by *everyone* in the room.

Facilitator

Activity

Activity

When you see this symbol, allow the participants to complete the text activity or create another.

Use an ***activity*** to challenge learners and provide opportunities for learners to solve problems together.

- Alternate participant activity setups. Use whole group, small group, partnered, and individual activities.

- Be creative! Come up with your own activities or use suggestions from the participants if the activities are too short, too long, or not appropriate for you participants.

- Think about the activities that have worked well for you in your own learning. Why have they worked? Transfer those elements to the activities of the participants.

Facilitator

Participant Feedback

Participant Feedback

When you see this symbol, usually at the end of a chapter, give each participant a feedback sheet.

Participant Feedback sheets enable participants to assess both their own learning and the facilitation of course material. Feedback is essential for effective communication both in training and work.

- Collect the completed Feedback sheets, initial, date, and write responses on each form. This technique allows the learners to have ongoing, one-on-one communication with the facilitator.

- Encourage participants to communicate their thoughts and feelings, and to be honest. Positive feedback is great, but negative feedback can be the basis for improved facilitation. Do the negative comments have merit? If so, what can you do to improve? You can change the pace of a class, develop more practice exercises, and defuse any negative thought or feelings.

Introductory Activity

Have participants choose partners.

Ask: *What do you already know about this print just by skimming? Make a list with your partner.*

Do one example as a group first.

Ask: *For example, what company owns this print?*

If participants have difficulty getting started, prompt them with the following questions.

Ask:
- *Are there tolerances given on this print?*
- *Have you seen this part before? What is it?*
- *Has the print been revised?*
- *Do you know any of the line types?*
- *What's the material used in this part?*

> **Facilitator Tip**
>
> Some participants will know more than others. Try to have these experts explain ideas as much or even more than you do. Peer tutoring is a powerful learning tool.

Tools for Learning

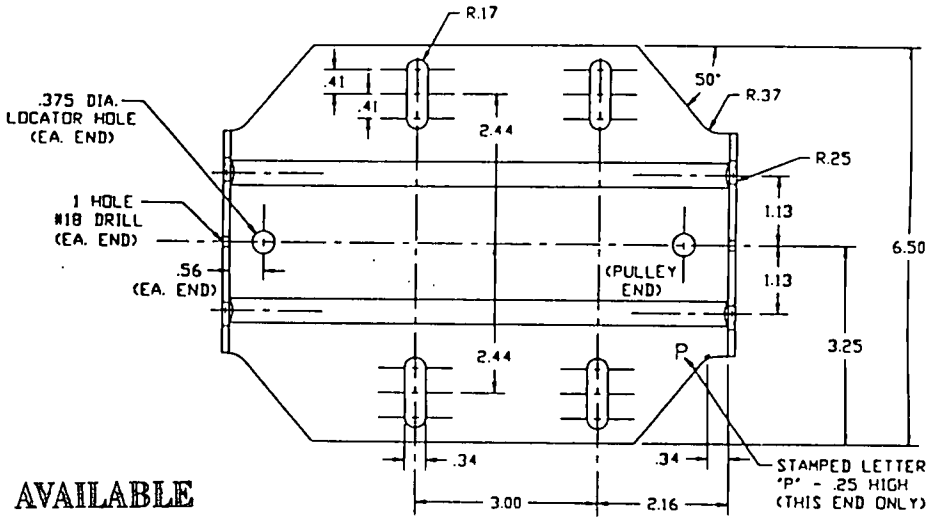
Introductory Activity

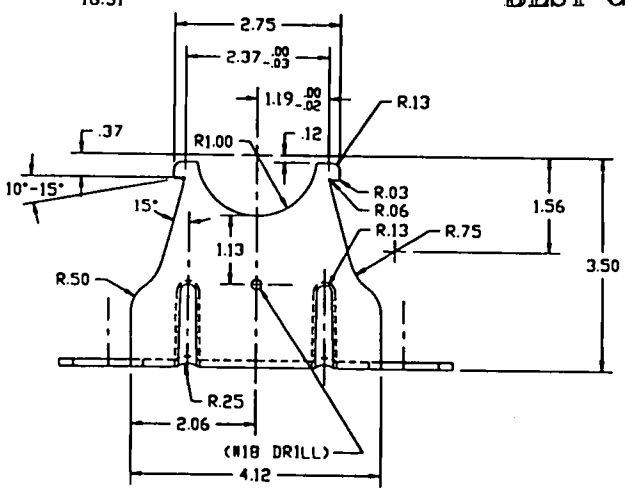
Tell Us What You Know

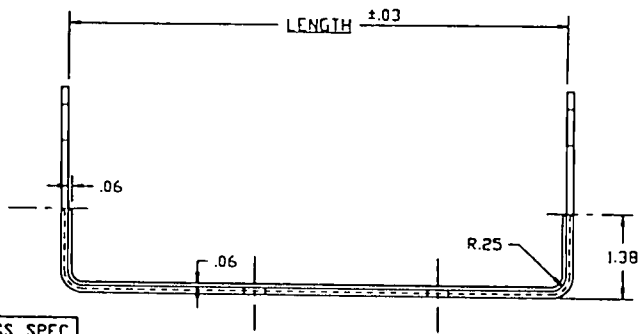
With a partner, locate anything that you already know something about from the print on the following page. List below.

34BA4003

PART NO.	* LENGTH ±.03	SHEARED LENGTH
34BA4003A01	8.22	14.56
34BA4003B01	9.22	15.56
34BA4003C01	10.22	16.56
34BA4003D01	8.81	15.15
34BA4003E01	9.81	16.15
34BA4003F01	10.81	17.15
34BA4003G01	9.72	16.06
34BA4003H01	8.72	15.06
34BA4003J01	8.84	15.18
34BA4003K01	8.13	14.46
34BA4003L01	8.38	14.71
34BA4003M01	8.75	15.09
34BA4003N01	9.63	15.96
34BA4003P01	10.13	16.43
34BA4003R01	7.97	14.31
34BA4003S01	8.59	14.93
34BA4003T01	9.47	15.81
34BA4003W01	9.97	16.31







MACH. TOL UNLESS SPEC.
2 PLC DECIMALS = ±.020
3 PLC DECIMALS = ±.005
ANG=±.5° RADII=.015

* TOOLING LIMITS: MIN = 7.72
MAX. = 10.22

39

34BA4003

MATL: 11 GA. (.1196) MILD H.R. STEEL - PICKLED AND OILED		
REV: J	REDUCE SHEARED LENGTH -.100 ON ALL LENGTHS	
SCALE: .50	BY: MEB	REVISED: 03/22/95
FILE: AAA00011016		TDR: D071189

XYZ Company

RESILIENT BASE - NEMA 56

BEST COPY AVAILABLE

Preview

Preview the chapter with the participants. Refer to the Preview Process Page in the process section at the beginning of the text.

Ask: *Why are these guidelines important?*

Brainstorm answers on a flipchart and ask participants to list the responses on the back of their page.

> **Facilitator Tip**
>
> Don't be afraid to make errors. Create an environment where it's okay for both participants and facilitators to make and correct mistakes. Both are important parts of the learning process.

Tools for Learning

The Title Block and Alphanumerics

Preview

Objectives

- To identify the title block on a blueprint and know what each title block component means.
- To become familiar with an alphanumeric system.

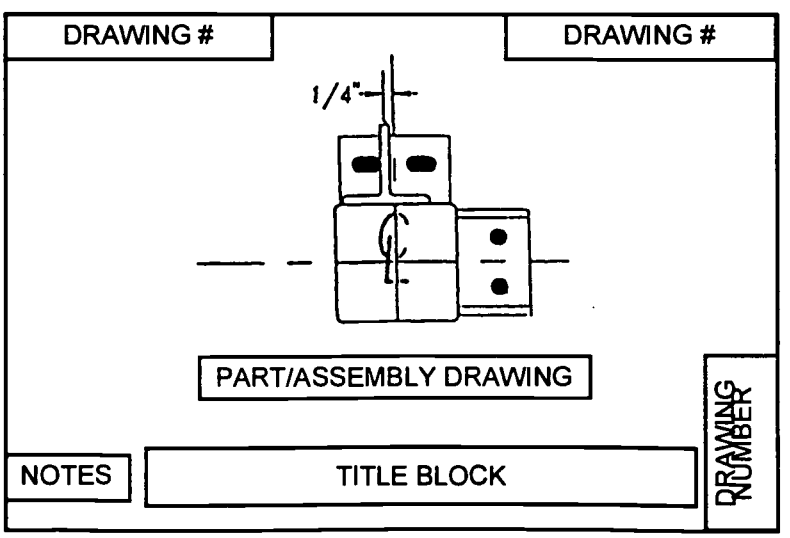
Key Term

The ***title block*** is framed information on a blueprint that gives specific facts about that print. Always examine the title block *first* when looking at a print.

Alphanumerics are letters and numbers organized in a systematic way. An alphanumeric system helps a company keep track of information.

Blueprint Guidelines

- *Never* get in the habit of *memorizing* a drawing.
- *Always* keep *only the latest* change drawing in the file.
- *Always* read and understand *all notes* on a print before you start working.
- *Always* examine the title block first.



Facilitator

Key Words

Refer participants to Key Word Learning Strategies section page at the beginning of the Facilitator Guide Sample.

Key Term

Note Taking

Ask: *Why do you need to know the information on the Title Block?*

What information is given on a Title Block?

As participants answer, have them highlight the main words from each definition (Example: #3 Revisions = *changes*) Do not have them highlight whole definitions, paragraphs, or pages.

Facilitator Tips

Encourage participants to use highlighters *selectively*. Highlighting every bit of text has the same effect as not highlighting anything at all.

Of all classroom strategies, lecturing provides for the lowest retention rate. *Ask questions!* Do what you can to get the participants talking about the content.

Tools for Learning

Key Term

Note Taking

The Title Block

The ***title block*** consists of sub-blocks of information and is similar from company to company. The numbers below correspond to the drawing on the next page.

1. ***Tolerance Block***—Space that provides tolerances on the print.

2. ***Material (MATL)***—Item used to make part.

3. ***Revisions (REV)***—Changes made to original drawing. Letter of the alphabet indicates the number of revisions. A = 1, B = 2, C = 3 . . . . Revision Blocks list revisions.

4. ***File***—Indicates drawing control number.

5. ***TDR***—Technical Data Release.

6. ***Drawing Number***—Alphanumeric code for drawing.

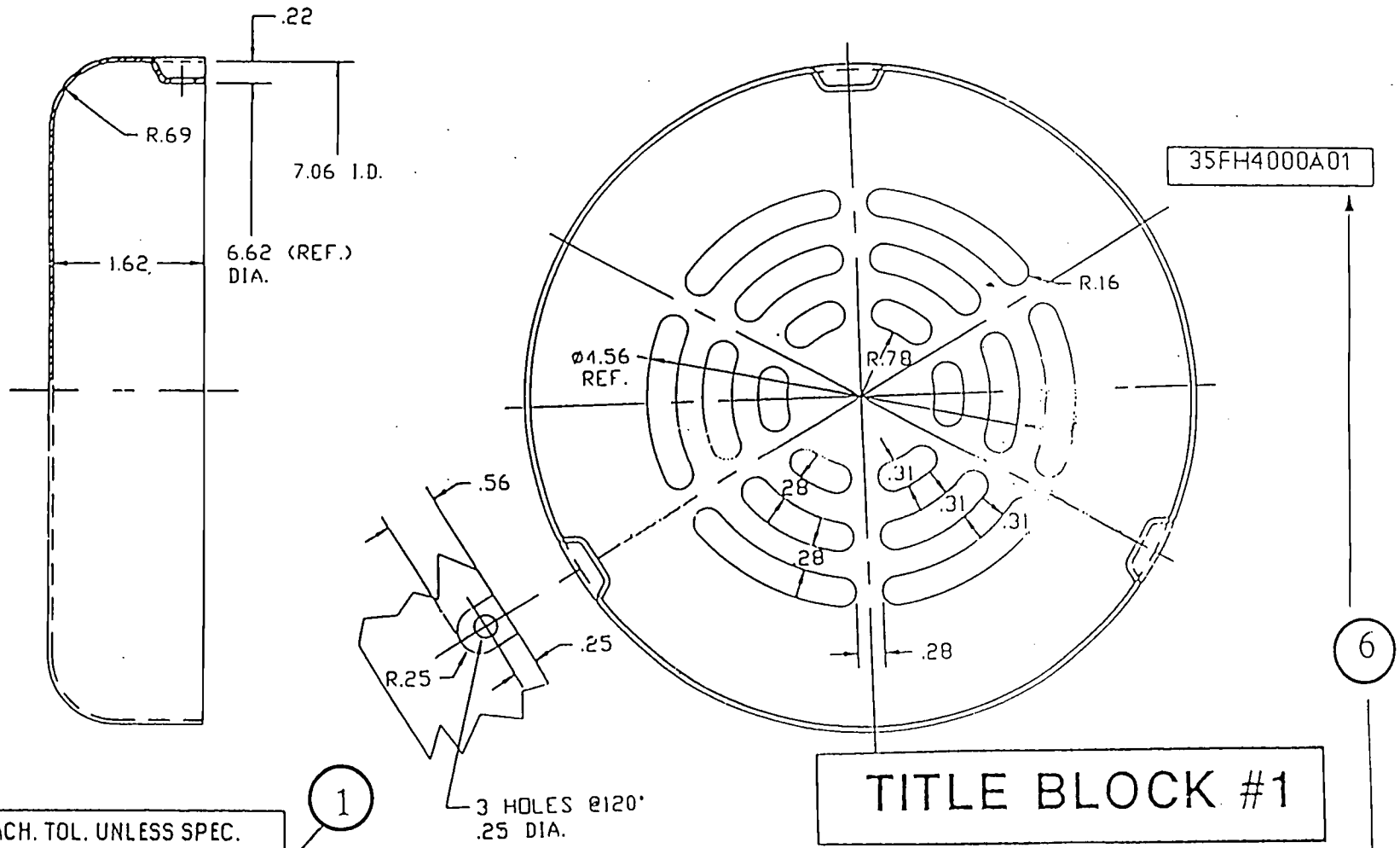
7. ***Drafter (BY)***—Initials of person who created blueprint.

8. ***Scale***—The relationship of the size of the image on the drawing to the actual object.

9. ***Title of Drawing***—The complete name of the drawing.

10. ***Company Name***—The name of the company that produced the drawing.

11. ***Revision Date***—The date of the latest revision.



TITLE BLOCK #1

MACH. TOL. UNLESS SPEC.
2 PLC DECIMALS = ±.020 3 PLC DECIMALS = ±.005
ANG=.5° RADII=.015

MATL: 18GA C.R. STEEL (.0478)

REV:		
	C	UPDATED LY'S AND ADDED MTG. SCREW GRAPHICS

35FH4000A01	SCALE: .6	BY: PGM
	FILE: AAA00003659	TDR: 0045283

REVISED: 08/11/93

XYZ Company

FAN HOUSING FOR 35 FRAME VERT MOTORS
W/O GREASER SLOT

35FH4000A01

1 2 3 4 5 6 7 8 9 10 11

Activity

Title Block #1 Activity—Drawing #35FH4000A01

1. What are the allowable tolerances for making this part?

   A. Angle allowance = _____

   B. Decimals to three places = _____

   C. Decimals to two places = _____

2. What is the material used for fabrication? _____

3. How many times has the drawing has been revised? _____

4. What is the relationship of the size of the drawing to the real object? _____

   _____

5. Who is the drafter? _____

6. What is the date of the latest revision? _____

7. What is the file number, for drawing control? _____

8. What is the function of the TDR number (Technical Data Release)? _____

9. What is the company name? _____

10. Is this a piece-part or subassembly drawing? _____

11. What is the drawing number? _____

Tools for Learning

Title Block #2 Activity—Drawing #54FE5000

Turn to Drawing #54FE5000, End Cap Brush Assembly. All title blocks have some features in common and some differences. For example, Title Block #1 refers to a ***piece-part***, a drawing which illustrates one part. Title Block #2 refers to a ***sub-assembly,*** a drawing which illustrates several components.

Key Term

Make a list of the similarities and differences between Title Blocks #1 and #2.

Title Blocks #1 & #2 Activity

Activity

Similarities:

_____

_____

_____

_____

Differences:

_____

_____

_____

_____

Facilitator

Activity

Similarities and Differences Activity

Have participants divide into pairs. Allow the pairs ten minutes to find as many similarities and differences as possible. When ten minutes are up, ask the following questions to the entire group.

Ask: *First, what similarities did you find between the two prints?*

As participants answer, record their responses on the overhead.

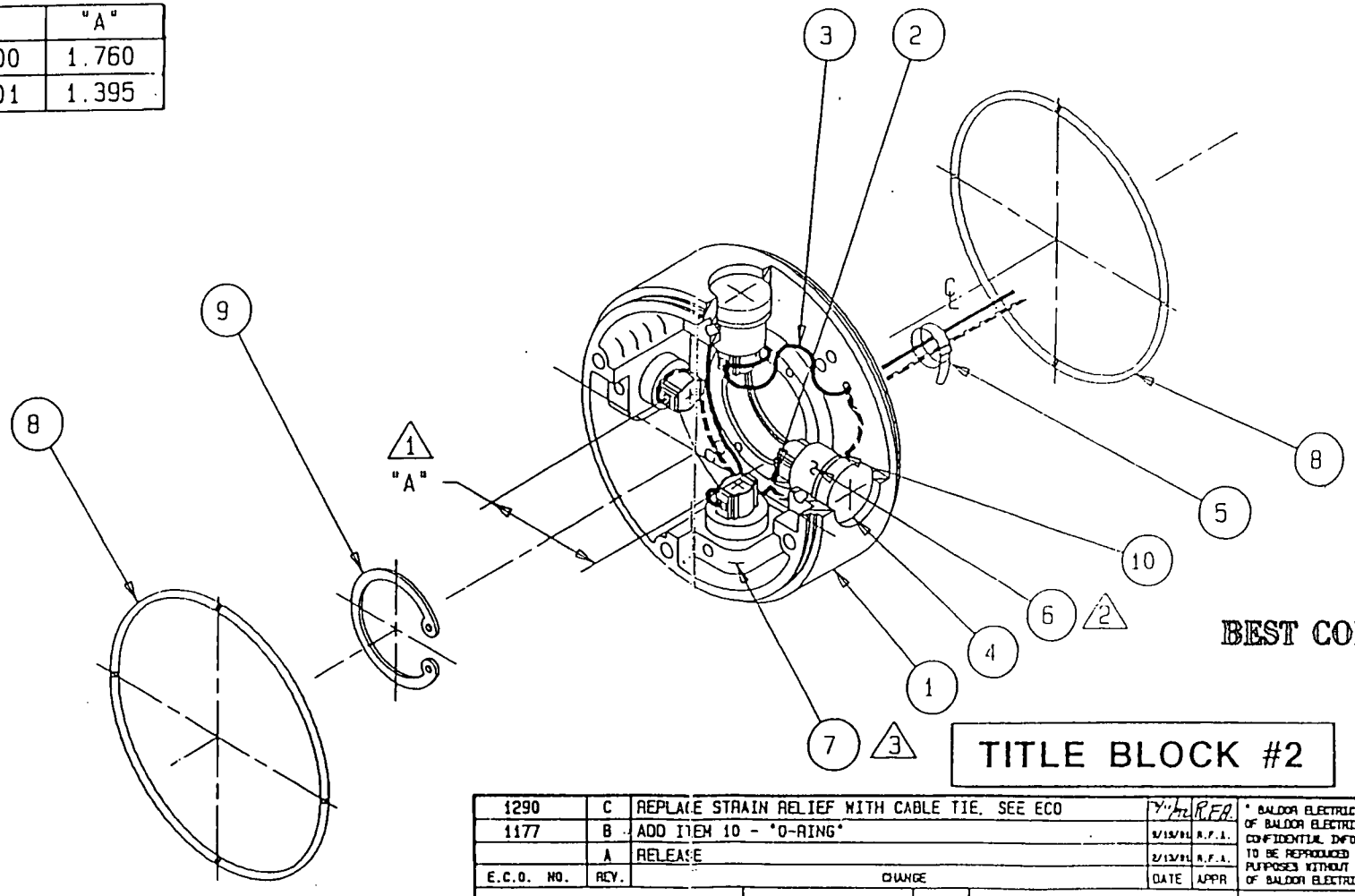
Ask: *What differences did you find?* (Record these also)

Ask: *What does this tell you about title blocks in general?*

Facilitator Tip

Try partnered activities as a way to encourage teamwork. If the partnered activities aren't successful, try whole group and/or individual ones. Variety in how you conduct activities is essential.

PART NO.	"A"
EB000058-00	1.760
EB000058-01	1.395



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TITLE BLOCK #2

E.C.O. NO.	REV.	CHANGE	DATE	APPR
1290	C	REPLACE STRAIN RELIEF WITH CABLE TIE. SEE ECO	9/15/91	R.F.A.
1177	B	ADD ITEM 10 - "O-RING"	2/13/91	R.F.A.
	A	RELEASE		

TOLERANCES		SIGNATURES		DATE	TITLE
UNLESS OTHERWISE SPECIFIED		DR BY	J. ELSING	02/04/91	END CAP, BRUSH ASSEMBLY
ENGLISH	METRIC	CHK BY	J.M.	02/11/91	
DEC. [.00] ±.01	MM. [0.00] ±0.25	MFG	D.S.	02/13/91	MATERIAL
DEC. [.000] ±.005	MM. [0.000] ±0.127	MS	H.B.	02/13/91	HARDNESS
ANGLES DEG. ±1/2°	FRAC. ±1/32	QC	S.P.H.	02/13/91	NEXT ASSY. FINAL ASSEMBLY
ALL RADIUS .015 BREAK ALL SHARP EDGES .015 MACHINED SURFACES 100 / R.M.S. MAX.		APPR	R.F.A.	02/13/91	USED ON MT, MTB, MTE, MTES - 4000

XYZ Company

DWG. NO. 54FE5000 REV. C

SCALE NONE SHEET 50

NOTES:

1. DIMENSION "A" IS SYMETRICAL WITH C_L OF END CAP.
2. APPLY SMALL BEAD OF ITEM (6) AROUND EACH BRUSH HOLDER BEFORE INSTALLING.
3. APPLY ITEM (7) TO INSIDE OF END CAP BEFORE ASSEMBLY.

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Tools for Learning

Notes

Notes contain special instructions and appear outside the title block.

Look to the left of the title block on drawing #54FE5000 for two circles (balloons) and three triangles (flags). What do these shapes mean?

Key Term

Balloons and Flags

Balloons. Some companies use a ***balloon system*** to illustrate how the piece-parts from the Bill of Materials work together.

Note Taking

1. How many piece-parts are in this sub-assembly?_____

Flags. Some companies use triangular flags to highlight either a work procedure, a nontypical material, or a note.

2. In Flag #2 (under Notes) what do you suppose Item 6 might be?

_____

3. What is the assembler in Flag #3 being instructed to do? _____

_____

Facilitator

Balloon and Flag Activity

For the balloon and flag activity, highlight the balloons in one color and the flags in another on the transparency.

Note Taking

Have participants highlight the balloons and flags in the same way on their copy.

Ask:

- *When would you see a flag on a print?*
- *When would you see a balloon?*
- *How is flag #2 connected to balloon #6?*
- *Have you ever seen a balloon in a piece-part drawing? Why or why not?*

Facilitator Tip

Use color as much as possible. According to one study, color increases retention by 55%.

Tools for Learning

Question

Title Block #3 Activity—Frame Information

Note the four columns of numbers and letters immediately above the title block on Drawing #35RC0002. Column 3 is entitled, "Finished 'A' Length," and Column 4 is entitled "Cut-Off 'A' Length." For Frame 516, the cut-off length is 2.14 and the finished length is 2.090.

1. What is the difference in length between the two? _____

2. Why is there a difference in the length? _____

   _____

3. Who is the drafter of this drawing? _____

4. What part is being illustrated? _____

5. What material is being used? _____

   _____

6. How many revisions has this drawing gone through? _____

7. What is the largest frame size? _____

Challenge

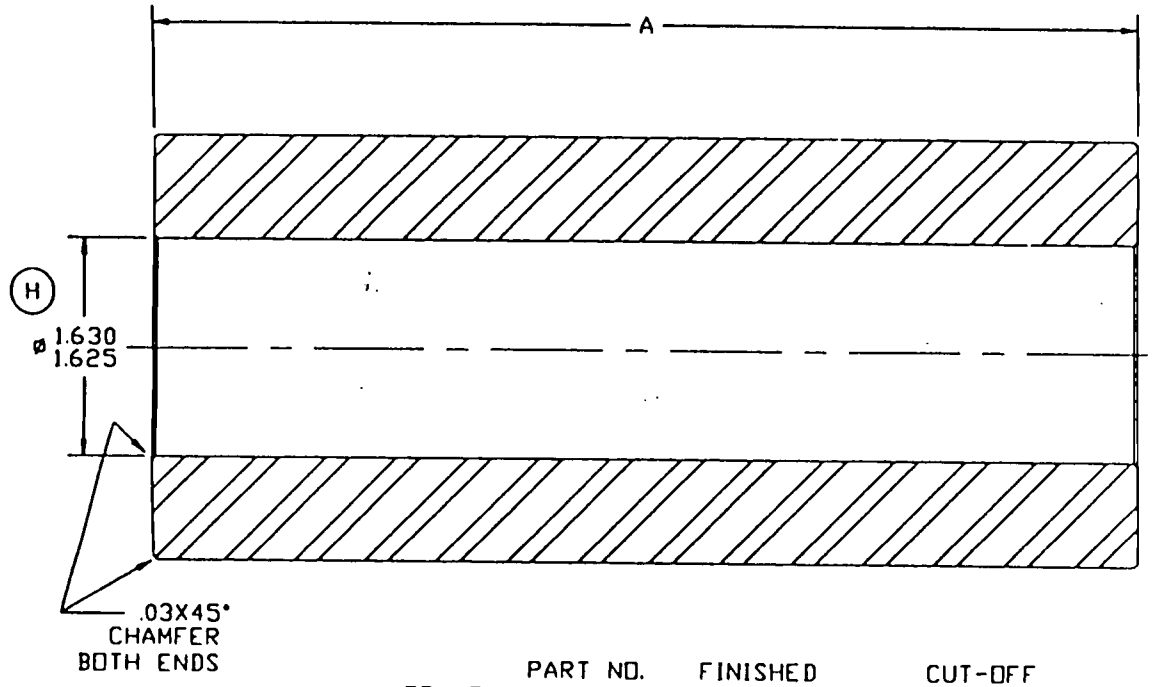
8. Why are there eight different frame sizes listed on this print?

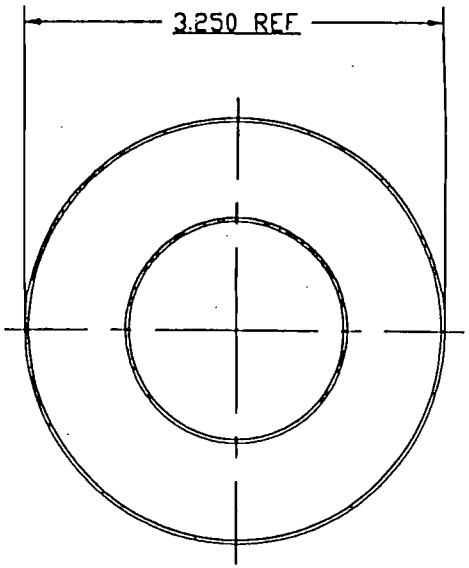
   _____

   _____

   _____

35RC0002





FRAME	PART NO. SUFFIX	FINISHED 'A' LENGTH	CUT-OFF 'A' LENGTH
516	A01	2.090	2.14
524	A02	3.177	3.22
532	A03	4.185	4.23
540	A04	5.272	5.32
548	A05	6.359	6.41
556	A06	7.367	7.41
564	A07	8.454	8.50
580	A08	10.549	10.60

APR 1 8 1994

TITLE BLOCK #3

MATL: HOT DRAWN SEAMLESS STEEL TUBING			
REV: H	CORRECTED TOLERANCES		
35RC0002	SCALE: 3/4	BY: DMB	REVISED: 04/08/94
	FILE: AAA00000083 DB		TDR: 0055069

XYZ Company

35B ROTOR CORE

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Tools for Learning

Activity

Blueprint Activity

Answer the following questions with Drawing #37FH4000A01 on the next page.

1. What is the part number? _____

2. What is the name of this part? _____

3. Who made this drawing? _____

4. How many revisions has this drawing had? _____

5. Is this drawing a piece-part or a sub-assembly? _____

6. What is the date of the last revision? _____

7. What is the scale of this drawing? _____

Challenge

8. What does the FH stand for? _____

Facilitator

Alphanumeric Activities

Key Term

If participants have difficulty guessing what these terms mean,

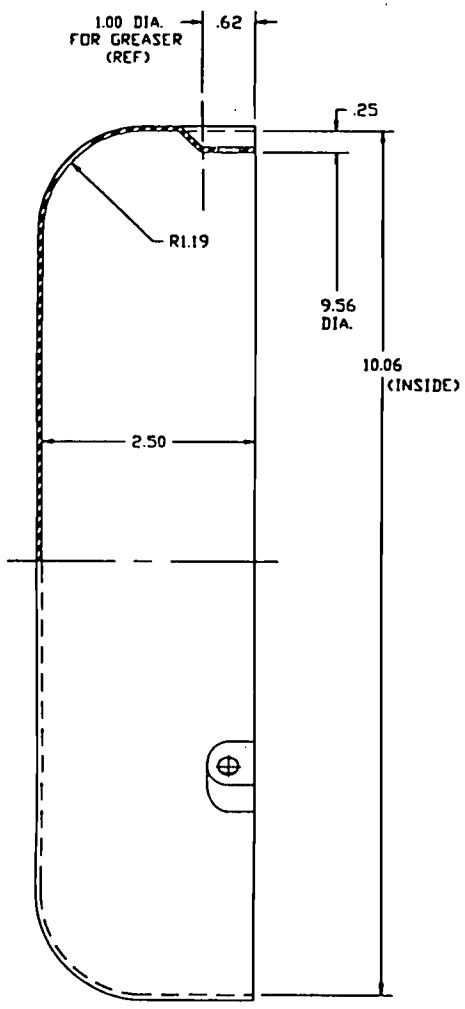
Ask:

- *What other words include the term alpha?* (alphabet)
- *Does the term numeric remind you of another word?* (number)
- *What does sequential mean? What is a sequence?* (1, 2, 3, order)
- *What is something that is significant?* (has meaning of its own)
- *What examples of significant numbers do you see every day? What sequential numbers do you see every day?*

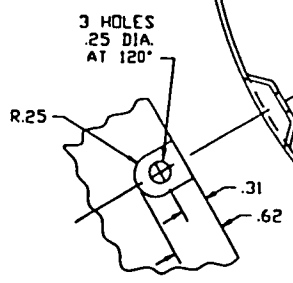
Facilitator Tip

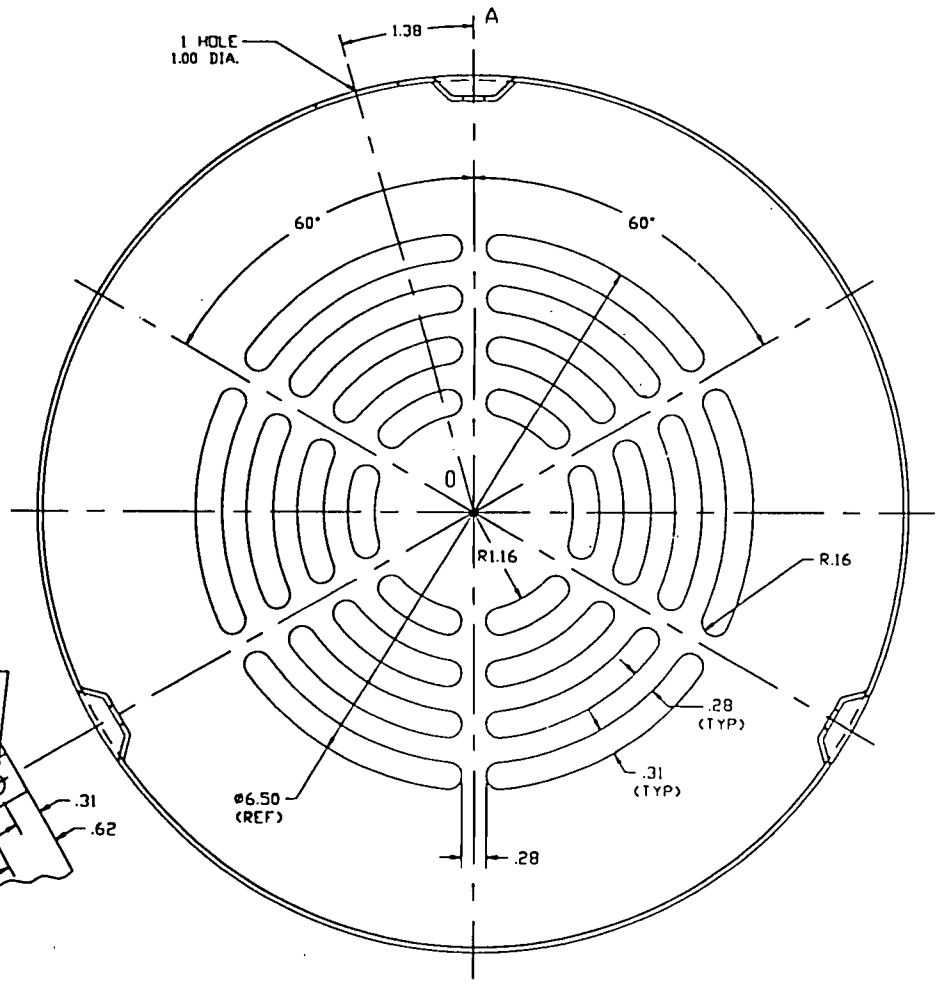
Encourage participants to use word associations early in the training. These will be used again in the chapter 3 discussion of tolerances.

37FH4000A01



SECTION A-0





MACH. TOL UNLESS SPEC.
2 PLC DECIMALS = ±.020
3 PLC DECIMALS = ±.005
ANG=±.5° RADII=.015

NOTE:
GRILLE, DIMPLES & 3 MOUNTING HOLES BY BALDOR.

58

MATL: #16 GA. (.0598) C.R. STEEL			XYZ Company
REV: E	DELETED CVD LAYERS TO CORRECT ACAD		
SCALE: .7	BY: BGM	REVISED: 10/11/94	FAN COVER 37/307 FRAME W/GREASER
FILE: AAA00002397		TDR: 0062626	

37FH4000A01

59

Tools for Learning

Alphanumeric Systems

Many companies use several ***alphanumeric*** systems.

Question

What does ***alpha*** mean? _____

What does ***numeric*** mean? _____

Key Term

The numbers in an alphanumeric system can be either ***sequential*** or ***significant***. ***Sequential*** means that whatever is being categorized is listed in "1, 2, 3..." order.

Significant means that the numbers and letters in the system have meaning. Drawing 35RC0002 illustrates how numbers and letters are used together: 35 and RC are ***significant. The*** 0002 is ***sequential***.

Are the following numbers significant or sequential?

Area Code _____

Zip Code _____

The Dewey Decimal System _____

Check Numbers _____

Tools for Learning

Key Term

Skim

Abbreviations

Knowing company ***abbreviations*** can help to quickly identify what is on a drawing. The XYZ abbreviations, which are significant, are divided into three categories (by department):

Motor

SH	Shaft
RC	Rotor Core
EP	Endplate
SC	Stator Core
WS	Wound Stator
SB	Stator Band
SA	Stator Assembly
RA	Rotor Assembly
AA	Armature Assembly
NS	Insulation
CM	Commutator
LD	Lead Assembly
CL	Coil
BP	Brush/Brush Holder
RK	Rocker Arm

Tools for Learning

Key Term

Parts

BA	Base
FH	Fan Housing
CB	Conduit Box
CV	Inspection Cover
RB	Bearing Retainers
FN	Fan
HA	Hardware or Housing Adaptor

Lamination

RL	Rotor Lamination
SL	Stator Lamination
AL	Armature Lamination
FL	Field Lamination
MM	Master Coil Lamination
T###	Tool Number

Note Taking

Highlight the abbreviations which are unfamiliar to you.

Tools for Learning

Memory Aid

Memory Tricks

Because there may be many abbreviations in a company's alphanumeric system, creating memory tricks can be helpful.

For example, the directions on a compass can be remembered by:

Never Eat Shredded Wheat.

(North, East, South, West)

XYZ's Alphanumeric MM for Master Coil Lamination can be thought of as:

MCL (the name Michael) likes **MMs** (the candy).

(MCL = MM)

Look at the list of abbreviations. Choose one and create a saying to help you remember it.

Tools for Learning

Note Taking

Part Number/Drawing Number

An XYZ part number and drawing number are often the same. This type of alphanumeric system is not used in all companies.

Once you are familiar with how to break down a part number in one department, you will be better able to understand the alphanumerics in other departments.

For example, Drawing 34FH4000A01 can be broken down into the following categories:

34 = Frame

FH = Fan Cover or Housing

4000 = Material Used (steel)

A01 = Sequential number for variations to 34FH4000

A drawing number in Laminations would break down as:

09 = Frame

RL = Rotor Lamination

5 = Pole Number

64 = Number of Slots

1–9 or E = A sequential number or E (experimental)

Tools for Learning

Another variation to this system is number 27A01W234:

27 = Frame

A01 = Mechanical Layout

W234 = Electrical Layout

Question

What drawing number are you most familiar with in your department?

_____

Break down this alphanumeric like the examples above. What do the numbers and letters mean?

_____

_____

_____

_____

Circle the sequential numbers in your example. Box the significant numbers.

In the examples, two different meanings are given for an A01. How will you know which is which?

_____

_____

Questions and Exceptions to the Alphanumeric System

Questions and exceptions to the alphanumeric system are bound to come up in discussion. As with any training, have a contact person at the company who can be available to answer your questions.

Some of the XYZ part numbers won't match the system outlined in Chapter 1. For example, the Charlotte plant was recently purchased and operates under a different alphanumeric system.

Facilitator Tip

How can you encourage participants to learn all the company abbreviations?

- Allow small groups of participants to create a mini-quiz for other teams. Have teams trade questions and see which team knows the most answers.
- Sponsor an abbreviation contest. Give participants time in or out of class to create memory aids. Award the winning creator or team of creators a prize. Have a panel of participant judges if possible.
- Create a job aid with the abbreviations. Copy information on 3 x 5 inch cards and distribute to all participants. Or have participants create this job aid.

Tools for Learning

Activity

Activity

Chapter 1 of this course included the following prints.

1. Break down each of these alphanumerics.

   A. 35FH4000A01

   _____

   _____

   _____

   _____

   B. 35RC0002

   _____

   _____

   _____

2. Where would you look to find the exact material type for the 4000 in question 1? _____

3. What is that material type? _____

4. What is the 0002 material type in question 2? _____

   _____

5. How would you break down 29FL4240?

   _____

   _____

   _____

   _____

   _____

   _____

Basic Blueprint Reading Chapter 1 Review

1. How is a piece-part drawing different from a sub-assembly drawing?

_____

_____

2. What information does a Title Block provide? (at least three)

a. _____

b. _____

c. _____

3. Answer the questions with the blueprint on the following page.

a. What is the drawing number? _____

b. What does the "SH" mean? _____

c. When was the original print drawn? _____

d. How many revisions has it had? _____

e. Who approved this drawing? _____

f. How many flags are on this drawing? _____

g. How much tolerance is allowed to two decimal places under the English system?

_____

h. What material is used in this part? _____

4. Identify the following abbreviations.

a. RC _____

b. BA _____

c. EP _____

d. SL _____

e. MM _____

f. AL _____

g. RK _____

h. CV _____

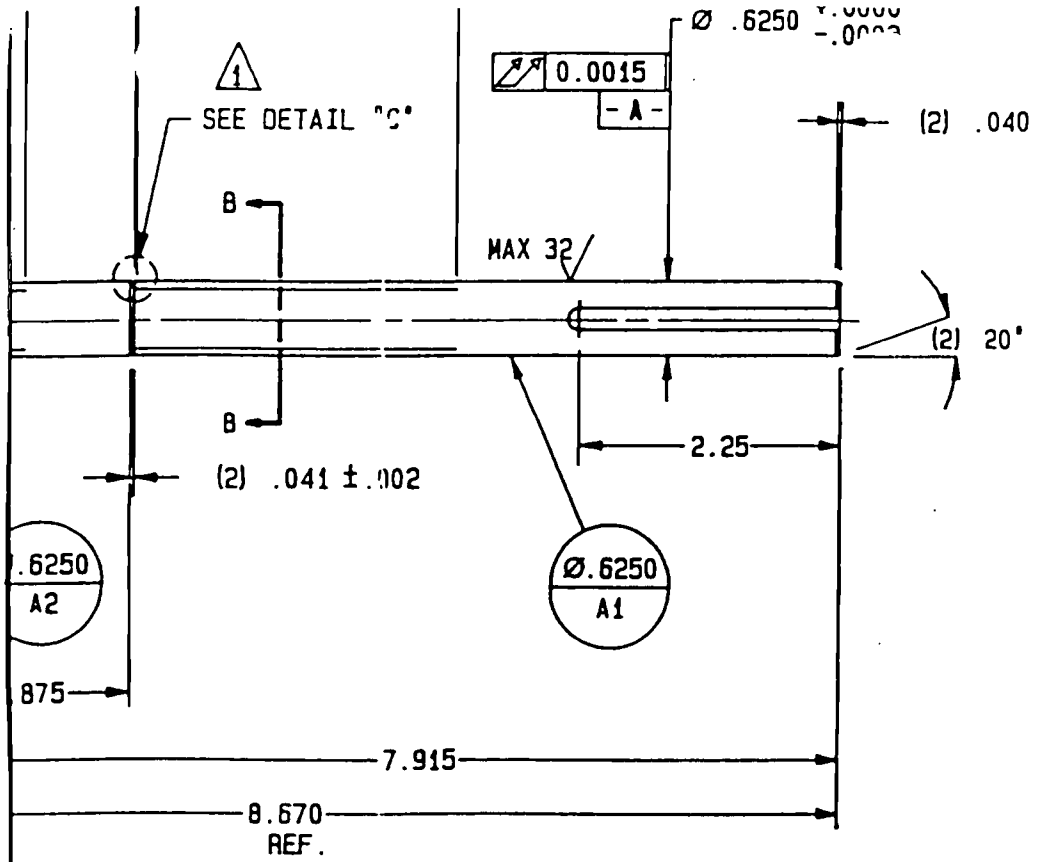
i. SH _____

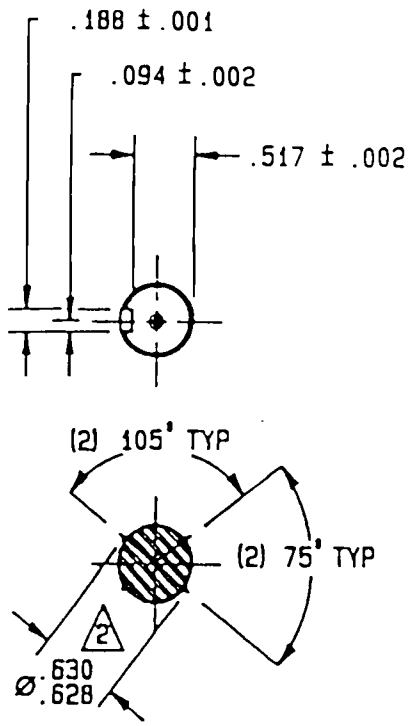
j. FH _____

5. Break down the following part numbers:

a. 34BA4003

b. 14RL2401





SECTION B - B
(RECORDING DETAILS)

1173	T	REVISE GEOMETRIC DIMENSIONS, SEE ECO REPORT	8/1/91	R.F.A.
E.C.O. NO.	REV.	CHANGE	DATE	APPR

TOLERANCES		SIGNATURES		DATE	TITLE
UNLESS OTHERWISE SPECIFIED		DR BY	J. MERCHANT	11/15/88	SHAFT
ENGLISH	METRIC	CHK BY	J.M.	2/14/89	
DEC. (.00) ± .01	MM. (0.00) ± 0.25	MFG	D.S.	2/14/89	MATERIAL STRESSPROOF STEEL A-311 OR 1144
DEC. (.000) ± .005	MM. (0.000) ± 0.127	MS	H.B.	2/14/89	HARDNESS
ANGLES DEG. ± 1/2°	FRAC. ± 1/32	QC	S.P.H.	2/14/89	NEXT ASSY.
ALL RADIUS .015 BREAK ALL SHARP EDGES .015 MACHINED SURFACES 100 / R.M.S. MAX.		APPR BY	R.F.A.	2/14/89	USED ON: 4060

XYZ Company

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DWG. NO.	REV.
54SHCCC3GC1	T
SCALE NONE	SHEET OF

Chapter 1 Answers

Title Block #1 Activity, Page 3

1. A. Bend radius: 015
   B. Angle: .5
   C. Two-place decimals: +/- .020
2. 18 Gage C.R. Steel (.0478)
3. C = 3 times
4. The drawing is .6 to the fan housing's true size.
5. PGM
6. 8/11/93
7. AAA00003659
8. To match this print to the actual TDR documents
9. XYZ Electric Company
10. Piece-part. If other parts were shown and how they work together, this print would be a sub-assembly.
11. 35FH4000A01

Title Block #2 Activity, Page 4

1. Similarities: (Answers may vary.)
   Both have a title block.
   Both list tolerances.
   Both have had same # of revisions.
   Both have numbers in decimal form.
   Both have drafter's initials given.
   (etc.)
2. Differences: (Answers may vary.)
   Different scales
   Metric tolerances are given on one print.
   One has a "checked by" box.
   One has balloons and flags.
   (etc.)

Balloons and Flags, Page 5

1. 11
2. Adhesive
3. Apply Item 7 to insides of end cap before assembly.

Title Block #3 Activity, Page 6

1. .05
2. The finished length has been machined.
3. DMB
4. Rotor core

(Continued at top of the next column)

Title Block #3 Activity, Cont'd, Page 6

5. Hot drawn seamless steel tubing
6. 8
7. 580
8. To save the company from having to create 8 different prints for the same part.

Blueprint Activity, Page 7

1. 37FH4000A01
2. Fan cover 37/307 Frame w/greaser
3. BGM
4. 5
5. piece-part
6. 10/11/94
7. 7
8. Fan housing or fan cover

Alphanumeric Systems, Page 8

1. *Alpha* refers to ordering information by *letter order.*
2. *Numeric* refers to ordering information by *number.*

Part Number Activity, Page 14

1. A. 35 = Frame
   FH = Fan Housing or Cover
   4000 = Material Type
   A01 = Variations
   B. 35 = Frame
   RC = Rotor Core
   0002 = Material Type
2. On the title block
3. 18 gauge C.R. Steel
4. Hot Drawn Seamless Steel Tubing
5. 29 = Frame
   FL = Field Lamination
   4 = Poles
   24 = Number of Slots
   0 = Family Group (a sequential number 1-9 or E for experimental)

Tools for Learning

Chapter 1 Answers

Chapter 1 Review, Page 15

1. A piece-part drawing displays a part which may include several views. A sub-assembly displays how multiple parts fit together.

2. (Answers may vary.)
   a. Company Name
   b. Revisions
   c. Drafter's Initials

3. a. 54SH0003G01
   b. Shaft
   c. 11/15/88
   d. 20
   e. RFA
   f. 2
   g. +/- .01
   h. Stress-proof Steel

4. a. RC Rotor Core
   b. BA Base
   c. EP Endplate
   d. SL Stator Lamination
   e. MM Master Coil Lamination
   f. AL Armature Lamination
   g. RK Rocker Armature
   h. CV Inspection Cover
   i. SH Shaft
   j. FH Fan Housing or Cover

5. a. 34BA4003
      34 = Frame Size
      BA = Base
      4003 = Material

   b. 14RL2401
      14 = Frame Size
      RL = Rotor Lamination
      2 = Poles
      40 = Slots
      1 = Family Group

Facilitator

Participant Feedback

Checkpoints and Response Sheets

Checkpoints

Grade the checkpoints together in class and have participants score and correct their own answers.

Checkpoint answer sheets are not included in the *Participant's Guide*, but are included in the *Facilitator's Guide*.

Participants should keep their checkpoint quizzes for reviewing all chapters at the end of the course.

Response Sheets

At the end of each chapter, give participants time to complete response sheets. Collect and write brief notes on each participant's sheet. Hand back at next session.

Facilitator Tip

Carefully consider the participants' responses—the good, the bad, and the ugly. What changes can you make so that Chapter 2 will be even more effective?

Checkpoint 1

The Title Block and Alphanumeric Systems

1. Answer the following questions with the attached blueprint.

a. What is the drawing number? _____

b. What does the "SH" in the drawing number mean? _____

c. When was the original drawing made? *(date)* _____

d. How many revisions has it undergone? _____

e. What is the name of this part? _____

f. What change was made in Rev. "D"? _____

g. When was Rev. D made? _____

h. How many frame sizes can shaft A01 have? _____

i. Which frame size is larger: C01 or B01? _____

j. What is the tolerance allowed to three decimal places? *(+/-)* _____

k. What drawing does this drawing replace? *(date)* _____

l. When did this drawing become effective for use in final assembly? _____

2. Identify the common abbreviations.

a. SH _____

b. AL _____

c. BA _____

d. MM _____

e. FH _____

3. Break down the following alphanumerics:

a. 28FL4041

_____

_____

_____

_____

_____

b. 36FH400A01

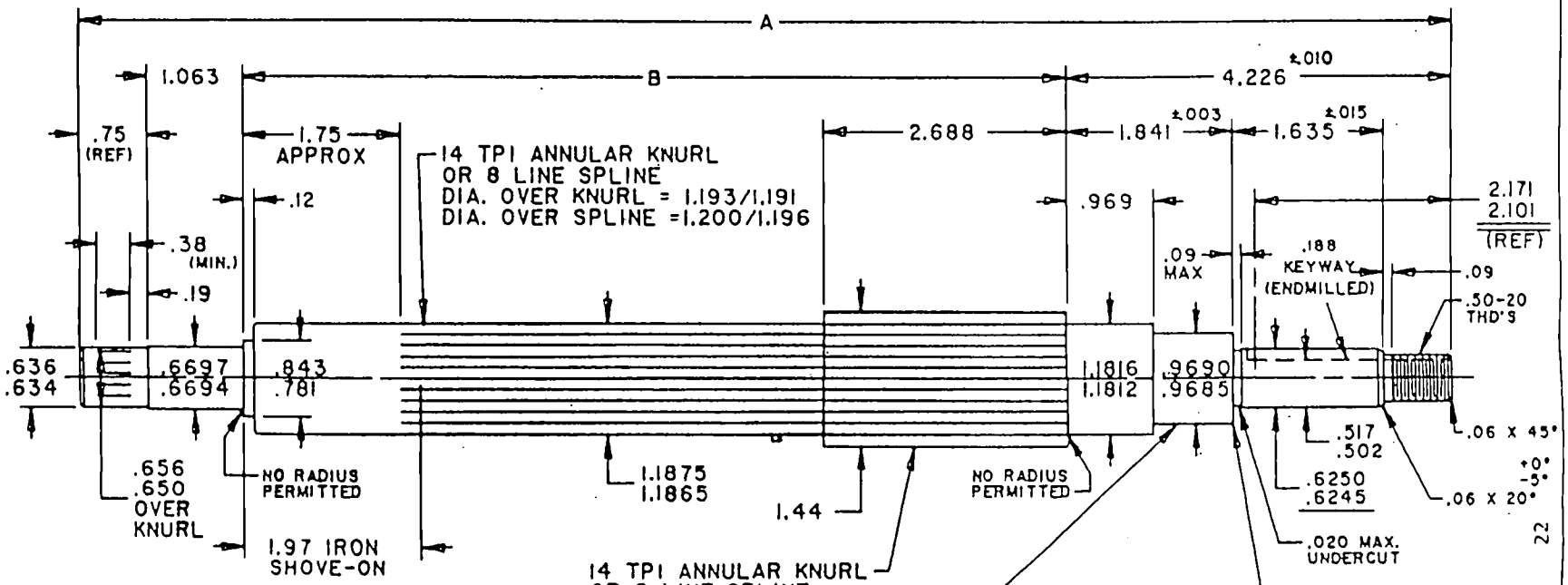
_____

_____

_____

_____

35SHI449

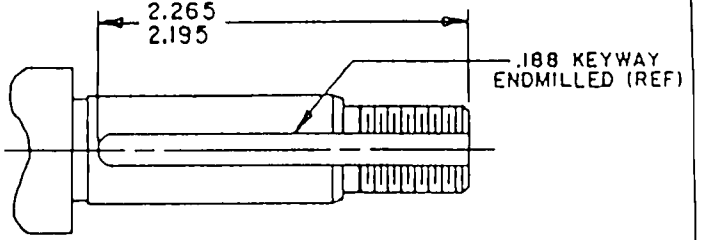


FRAME		±.0025 A	±.0025 B
510, 513, 516, 520	A01	13.1875	7.1562
524, 528	B01	14.1875	8.1562
535 –	C01	15.0625	9.0312

EFFECTIVE

NOV 26 1991

FINAL ASSEMBLY



KEYWAY DETAIL

REV.	DATE	BY	MATERIAL: 1.4375 DIA. STD. C.D. ST. PER S.P. #7
F	11-7-91	JO/TM	ADDED NOTE 'DO NOT BREAK SHARP EDGE ON...' (TDR#20414)
E	2-1-88	RAL	ADDED KEYWAY DETAIL
D	12-11-87	FH	CHG'D KEYWAY LENGTH FROM 2.12
C	8-8-87	RAL	ADDED ±.0025 TOL. TO 'A' & 'B' LENGTHS
B	6-26-86	FH	ADDED 510-520 & 524-528 STACKS
A	1-18-86	RAL	REDRAWN REPLACES DRAWING OF 7-25-83

35SHI449

TOL. ON FRAC. DIMS: ± | TOL. ON ANGULAR DIMS. ± | PATT. NO:

TOL. ON DEC. DIMS: ±.020 (2 PLACES) ±.005 (3 PLACES) | REF. NO:

XYZ Company

SPECIAL SHAFT - TEFC

MODEL 35M - NEMA 56CZ

DFTM: RAL	DATE: 1-18-86
ENGR:	DATE:
MFR:	DATE:

Checkpoint 1 Answers

Chapter 1 — Title Block and Alphanumeric System

1a. 35SH1449

1b. Shaft

1c. 1/18/86

1d. 6

1e. Special Shaft - TEFC model 35M - NEMA 56CZ

1f. Keyway length was changed from 2.12

1g. 12/11/87

1h. 4

1i. C01

1j. .005

1k. 7/25/83

1l. November 26 1991

2a. SH = Shaft

2b. AL = Armature Lamination

2c. BA = Base

2d. MM = Master Coil Lamination

2e. FH = Fan Housing or Fan Cover

3a. 28 = Frame Size

FL = Field Lamination

4 = Poles

04 = Slots

1 = Family Group

3b. 36 = Frame Size

FH = Fan Housing or Fan Cover

400 = Material

A01 = Variations

25 questions = 4 points per question

Tools for Learning

Participant Score Sheet

Record your Checkpoint scores on this sheet for your own reference. (*Not* required.)

Organization

Chapter 1 Checkpoint Score _____

Chapter 1 Areas to Work on

_____

_____

Chapter 2 Checkpoint Score _____

Chapter 2 Areas to Work on

_____

_____

Chapter 3 Checkpoint Score _____

Chapter 3 Areas to Work on

_____

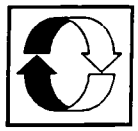
_____

Chapter 4 Checkpoint Score _____

Chapter 4 Areas to Work on

_____

_____



Participant Feedback

Participant Feedback

Chapter _____ Class Time and Date _____

Name _____

1. What problems are you having with this chapter? How can we help?

_____

_____

_____

_____

2. How will you be able to use this information on the floor?

_____

_____

_____

_____

3. What can be done to improve this course?

_____

_____

_____

_____

How Are You Doing?

Check the boxes of the habits you notice in the participants.

Do they:

- Listen effectively? ☐
- Make eye contact comfortably with you and other participants? ☐
- Share their ideas constructively? ☐
- Ask effective questions? ☐
- Help each other? ☐
- Appear to understand the content? ☐

If so, congratulations on your successful facilitation!

On the other hand, do participants:

- Tap pencils and fingers often? ☐
- Avoid eye contact? ☐
- Get off the subject? ☐
- Claim to have forgotten their glasses and not complete activities/assignments? ☐
- Refuse to participate? ☐

These may indicate a learning difficulty. Be a detective and try to find out more from the participant.

Follow-Up Checklist

Immediately after training:

- Do supervisors have access to blueprints? ☐
- Are prints available for all other employees? ☐
- Is there a current job board where prints are displayed? ☐
- Do the employees know whom to contact for answers to blueprint questions? ☐

One month after training:

- Have you scheduled a follow-up assessment to check retention? ☐
- Has the training impacted production? ☐
- Have you found a need for additional training? ☐

Are employees able to:

- Identify production problems? ☐
- Report problems accurately? ☐
- Solve problems using blueprint knowledge? ☐

Participant's Guide Sample

Train the Trainer

Assuring Learner Success

This section of the manual provides you with a complete set of learner's materials without the Facilitator's Guide pages. You may duplicate this set for your own classes.

Tools for Learning

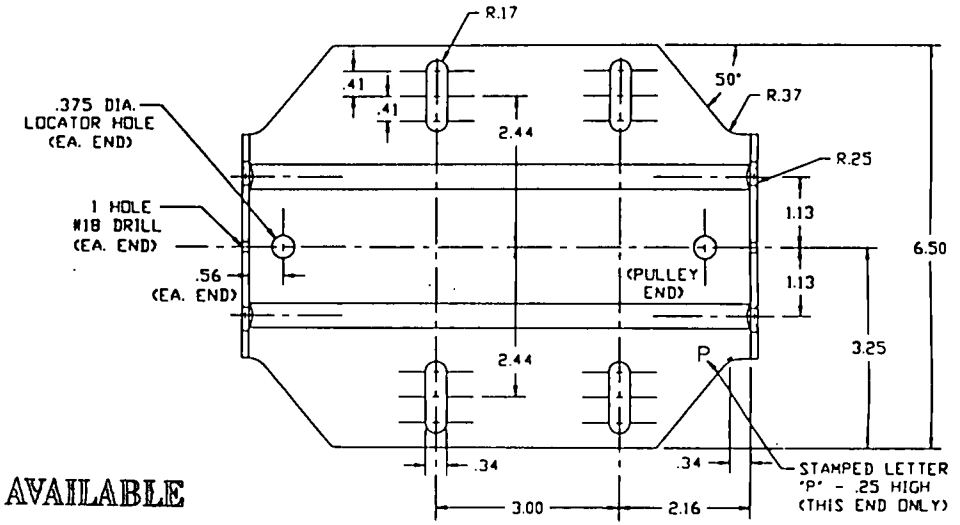
Introductory Activity

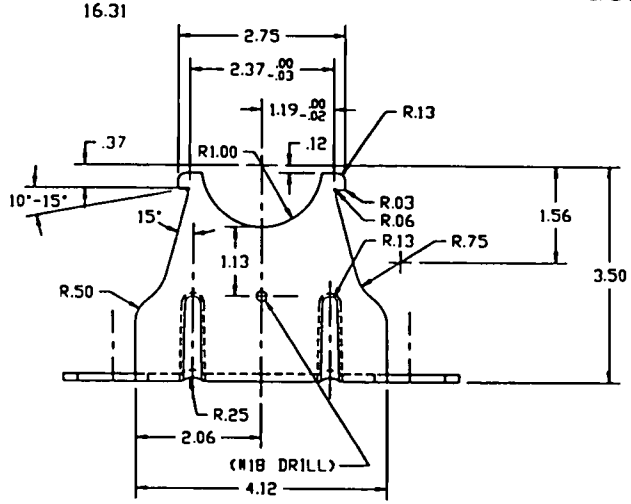
Tell Us What You Know

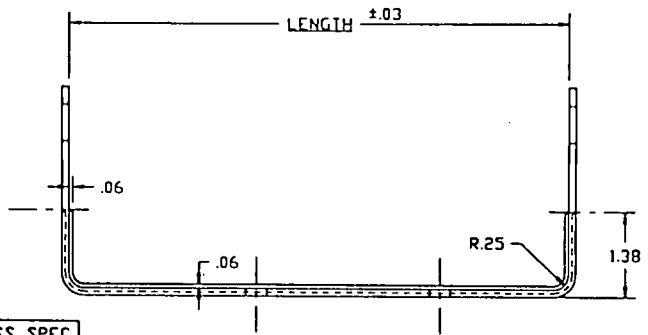
With a partner, locate anything that you already know something about from the print on the following page. List below.

34BA4003

PART NO.	* LENGTH ±.03	SHEARED LENGTH
34BA4003A01	8.22	14.56
34BA4003B01	9.22	15.56
34BA4003C01	10.22	16.56
34BA4003D01	8.81	15.15
34BA4003E01	9.81	16.15
34BA4003F01	10.81	17.15
34BA4003G01	9.72	16.06
34BA4003H01	8.72	15.06
34BA4003J01	8.84	15.18
34BA4003K01	8.13	14.46
34BA4003L01	8.38	14.71
34BA4003M01	8.75	15.09
34BA4003N01	9.63	15.96
34BA4003P01	10.13	16.43
34BA4003R01	7.97	14.31
34BA4003S01	8.59	14.93
34BA4003T01	9.47	15.81
34BA4003W01	9.97	16.31







MACH. TOL UNLESS SPEC.
2 PLC DECIMALS = ±.020
3 PLC DECIMALS = ±.005
ANG=±.5° RADII=.015

88

* TOOLING LIMITS: MIN = 7.72
MAX. = 10.22

MATL: 11 GA. (.1196) MILD H.R. STEEL - PICKLED AND OILED			
REV: J	REDUCE SHEARED LENGTH -.100 ON ALL LENGTHS		
SCALE: .50	BY: MEB	REVISED: 03/22/95	
FILE: AAA00011016		TDR: 0071189	

XYZ Company

RESILIENT BASE - NEMA 56

89

34BA4003

Tools for Learning

Preview

Key Term

The Title Block and Alphanumerics

Objectives

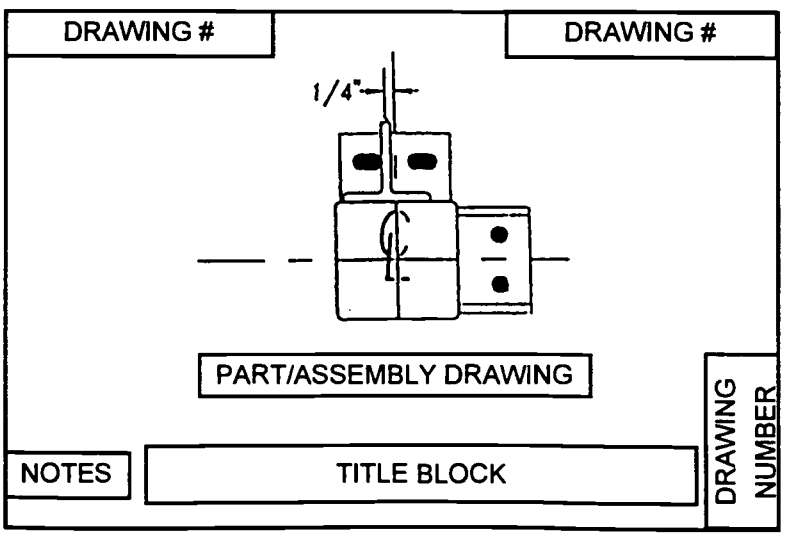
- To identify the title block on a blueprint and know what each title block component means.
- To become familiar with an alphanumeric system.

The ***title block*** is framed information on a blueprint that gives specific facts about that print. Always examine the title block *first* when looking at a print.

Alphanumerics are letters and numbers organized in a systematic way. An alphanumeric system helps a company keep track of information.

Blueprint Guidelines

- *Never* get in the habit of *memorizing* a drawing.
- *Always* keep *only the latest* change drawing in the file.
- *Always* read and understand *all notes* on a print before you start working.
- *Always* examine the title block first.



Tools for Learning

Key Term

Note Taking

The Title Block

The ***title block*** consists of sub-blocks of information and is similar from company to company. The numbers below correspond to the drawing on the next page.

1. ***Tolerance Block***—Space that provides tolerances on the print.

2. ***Material (MATL)***—Item used to make part.

3. ***Revisions (REV)***—Changes made to original drawing. Letter of the alphabet indicates the number of revisions. A = 1, B = 2, C = 3 . . . . Revision Blocks list revisions.

4. ***File***—Indicates drawing control number.

5. ***TDR***—Technical Data Release.

6. ***Drawing Number***—Alphanumeric code for drawing.

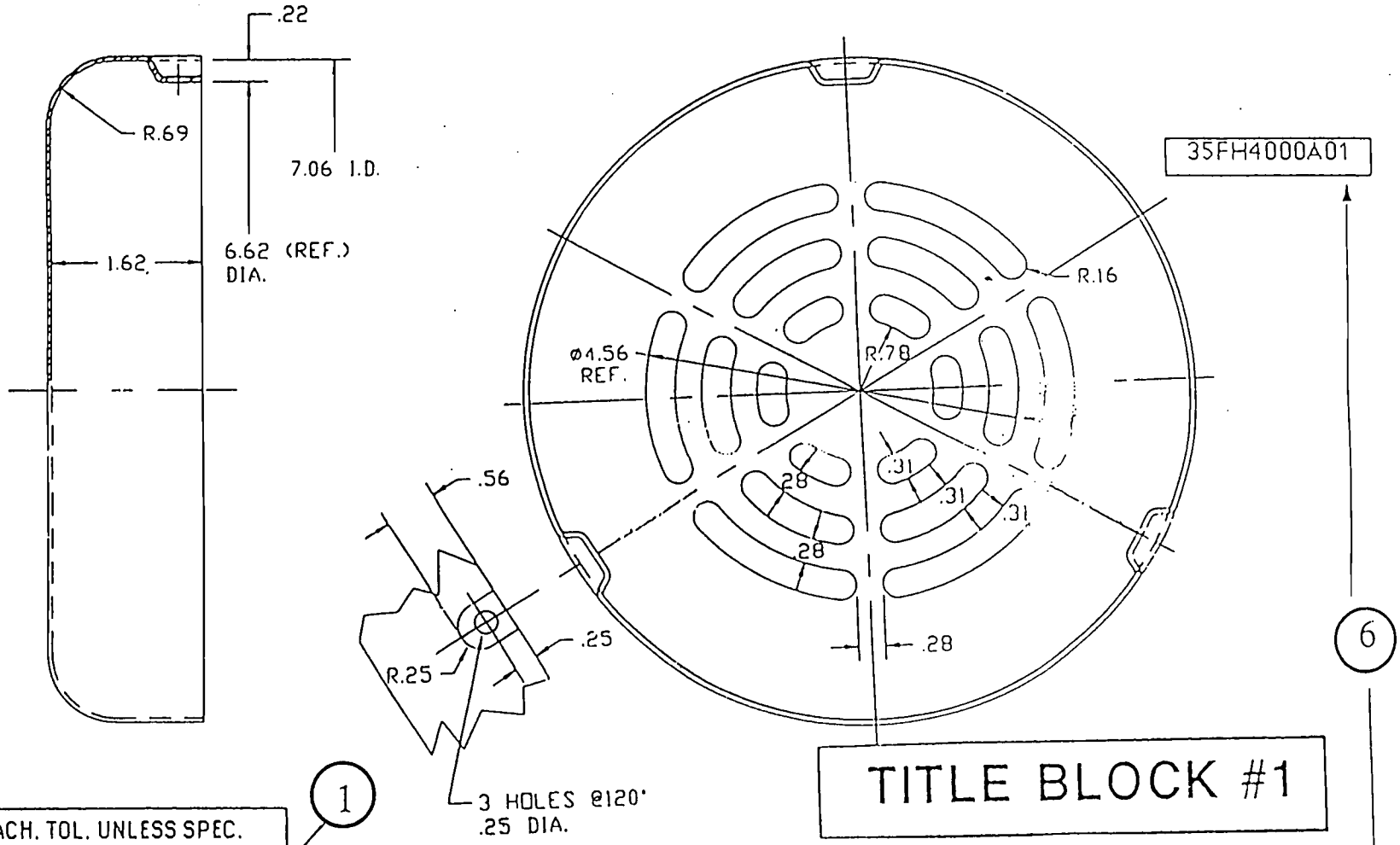
7. ***Drafter (BY)***—Initials of person who created blueprint.

8. ***Scale***—The relationship of the size of the image on the drawing to the actual object.

9. ***Title of Drawing***—The complete name of the drawing.

10. ***Company Name***—The name of the company that produced the drawing.

11. ***Revision Date***—The date of the latest revision.


.22
R.69
7.06 I.D.
1.62
6.62 (REF.)
DIA.
35FH4000A01
R.16
ø1.56
REF.
R.78
.56
.31
.28
.31
.31
.28
.25
R.25
.28
3 HOLES @120°
.25 DIA.
TITLE BLOCK #1
1
MACH. TOL. UNLESS SPEC.
2 PLC DECIMALS = ± .020
3 PLC DECIMALS = ± .005
ANG=.5° RADII=.015
2
8
7
11
10
9
6
MATL: 18 GA. C.R. STEEL (.047in)
REV: C
UPDATED LYS AND ADDED MTG. SCREW GRAPHICS
3
35FH4000A01
SCALE: .6
BY: PGM
REVISED: 08/11/93
FILE: AAA00003659
TDR: 0045283
4
5
XYZ Company
FAN HOUSING FOR 35 FRAME VERT MOTORS
W/O GREASER SLOT
35FH4000A01

Title Block #1 Activity—Drawing #35FH4000A01

1. What are the allowable tolerances for making this part?

   A. Angle allowance = _____

   B. Decimals to three places = _____

   C. Decimals to two places = _____

2. What is the material used for fabrication? _____

3. How many times has the drawing has been revised? _____

4. What is the relationship of the size of the drawing to the real object? _____

   _____

5. Who is the drafter? _____

6. What is the date of the latest revision? _____

7. What is the file number, for drawing control? _____

8. What is the function of the TDR number (Technical Data Release)? _____

9. What is the company name? _____

10. Is this a piece-part or subassembly drawing? _____

11. What is the drawing number? _____

Tools for Learning

Key Term

Activity

Title Block #2 Activity—Drawing #54FE5000

Turn to Drawing #54FE5000, End Cap Brush Assembly. All title blocks have some features in common and some differences. For example, Title Block #1 refers to a ***piece-part***, a drawing which illustrates one part. Title Block #2 refers to a ***sub-assembly,*** a drawing which illustrates several components.

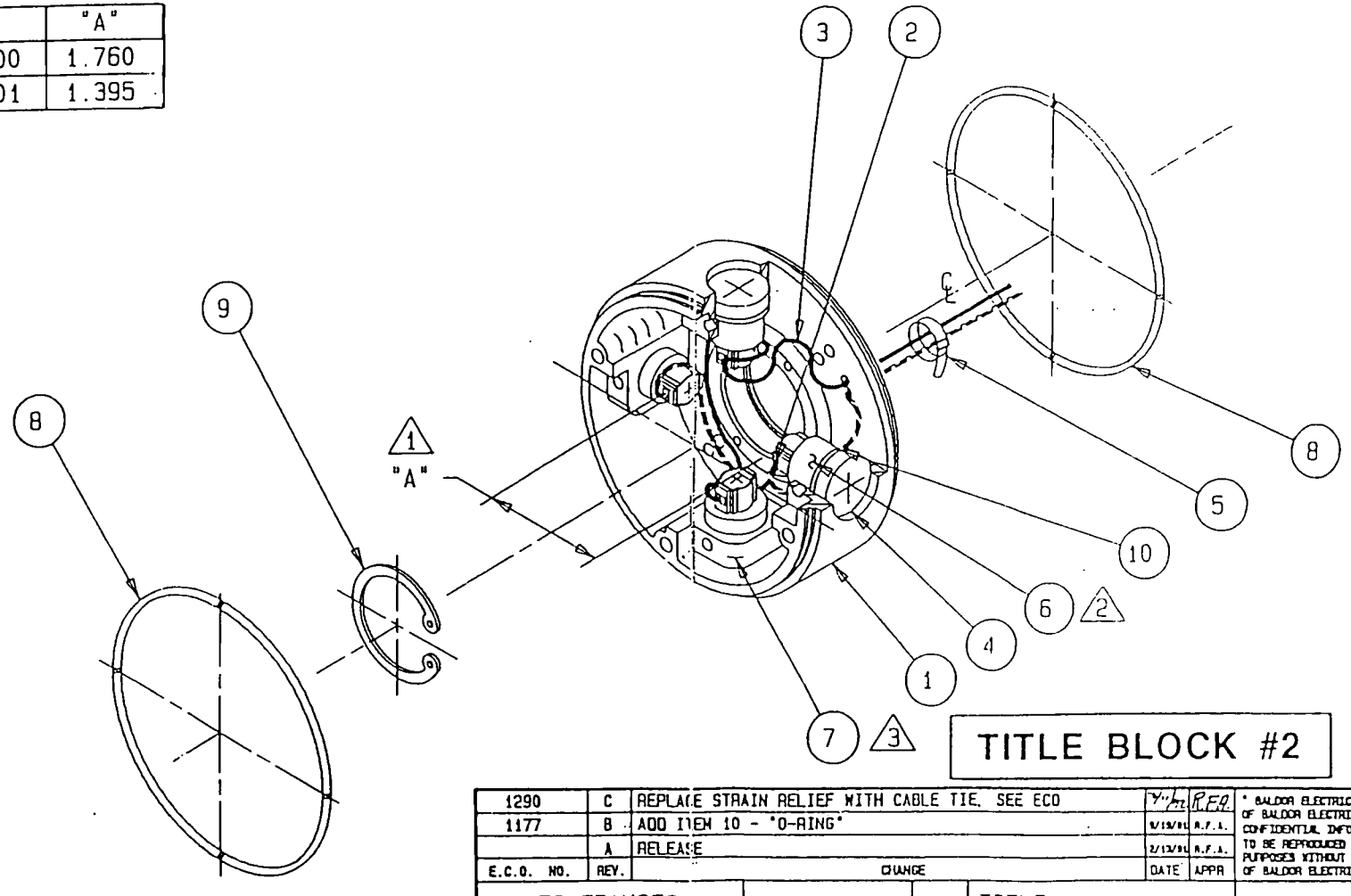
Make a list of the similarities and differences between Title Blocks #1 and #2.

Title Blocks #1 & #2 Activity

Similarities:

Differences:

PART NO.	"A"
EB00005B-00	1.760
EB00005B-01	1.395



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NOTES:

1. DIMENSION "A" IS SYMETRICAL WITH C_L OF END CAP.
2. APPLY SMALL BEAD OF ITEM (6) AROUND EACH BRUSH HOLDER BEFORE INSTALLING.
3. APPLY ITEM (7) TO INSIDE OF END CAP BEFORE ASSEMBLY.

96

TITLE BLOCK #2

E.C.O. NO.	REV.	CHANGE	DATE	APPR
1290	C	REPLACE STRAIN RELIEF WITH CABLE TIE. SEE ECO	4/4/91	R.F.E.
1177	B	ADD ITEM 10 - "O-RING"	3/19/91	R.F.A.
	A	RELEASE	2/13/91	R.F.A.

TOLERANCES		SIGNATURES		DATE	TITLE
UNLESS OTHERWISE SPECIFIED		DR BY	J. ELSING	02/04/91	END CAP, BRUSH ASSEMBLY
ENGLISH	METRIC	CHK BY	J.M.	02/11/91	
DEC. [.00] ±.01	MM. [0.00] ±0.25	MFG	O.S.	02/13/91	MATERIAL
DEC. [.000] ±.005	MM. [0.000] ±0.127	MS	H.B.	02/13/91	HARDNESS
ANGLES DEC. ±1/2°	FRAC. ±1/32	QC	S.P.H.	02/13/91	NEXT ASSY. FINAL ASSEMBLY
ALL RADIUS .015 BREAK ALL SHARP EDGES .015 MACHINED SURFACES 100 / R.M.S. MAX.		APPR	R.F.A.	02/13/91	USED ON MT, MTB, MTE, MTEB - 4000

XYZ Company

DWG. NO.	REV.
54FE5000	C

SCALE: NONE SHEET OF

97

Tools for Learning

Notes

Notes contain special instructions and appear outside the title block.

Look to the left of the title block on drawing #54FE5000 for two circles (balloons) and three triangles (flags). What do these shapes mean?

Key Term

Balloons and Flags

Balloons. Some companies use a ***balloon system*** to illustrate how the piece-parts from the Bill of Materials work together.

Note Taking

1. How many piece-parts are in this sub-assembly?_____

Flags. Some companies use triangular flags to highlight either a work procedure, a nontypical material, or a note.

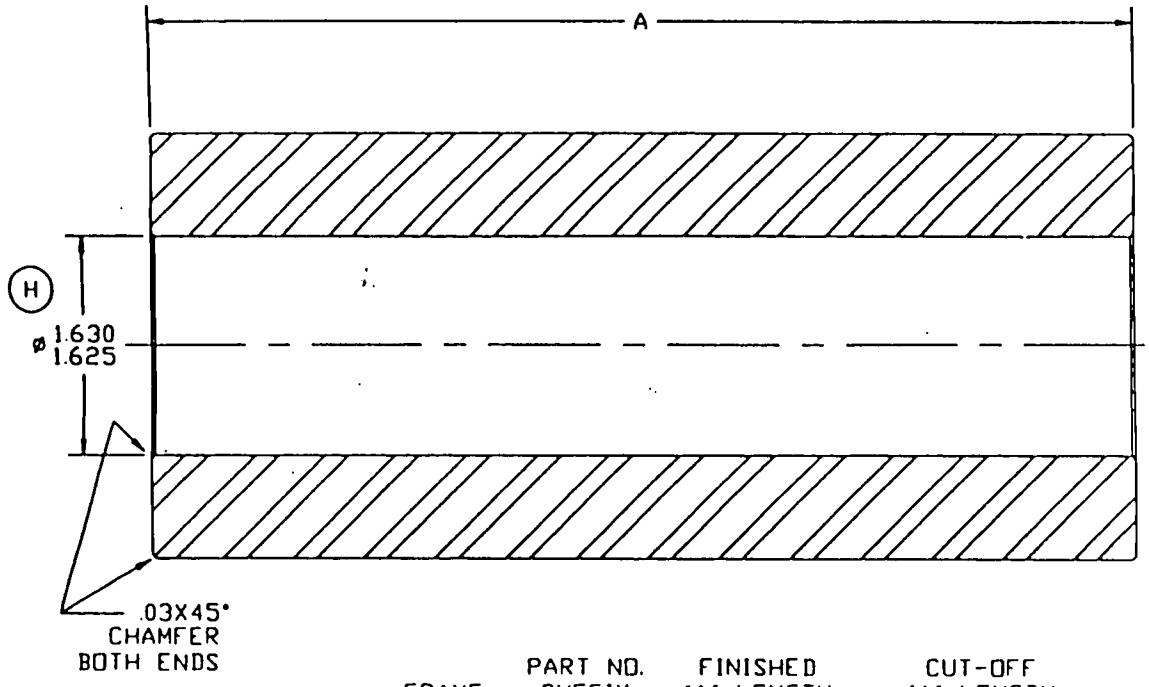
2. In Flag #2 (under Notes) what do you suppose Item 6 might be?

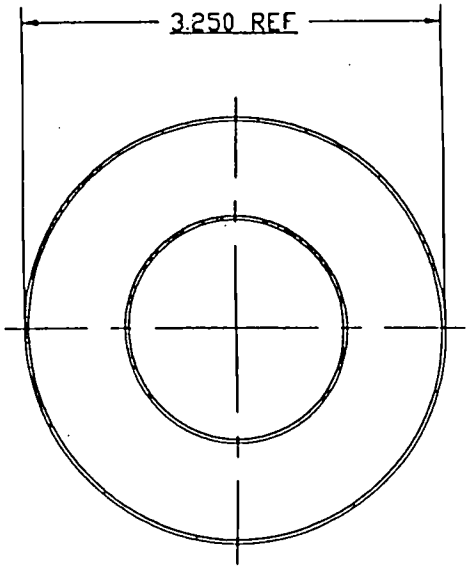
_____

3. What is the assembler in Flag #3 being instructed to do? _____

_____

35RC0002





FRAME	PART NO. SUFFIX	FINISHED 'A' LENGTH	CUT-OFF 'A' LENGTH
516	A01	2.090	2.14
524	A02	3.177	3.22
532	A03	4.185	4.23
540	A04	5.272	5.32
548	A05	6.359	6.41
556	A06	7.367	7.41
564	A07	8.454	8.50
580	A08	10.549	10.60

APR 18 1994

TITLE BLOCK #3

MATL: HOT DRAWN SEAMLESS STEEL TUBING			
REV: H	CORRECTED TOLERANCES		
SCALE: 3/4	BY: DMB	REVISED: 04/08/94	
FILE: AAA00000083 DB		TDR: 0055069	

XYZ Company

35B ROTOR CORE

35RC0002

Tools for Learning

Question

Title Block #3 Activity—Frame Information

Note the four columns of numbers and letters immediately above the title block on Drawing #35RC0002. Column 3 is entitled, "Finished 'A' Length," and Column 4 is entitled "Cut-Off 'A' Length." For Frame 516, the cut-off length is 2.14 and the finished length is 2.090.

1. What is the difference in length between the two? _____

2. Why is there a difference in the length? _____

_____

3. Who is the drafter of this drawing? _____

4. What part is being illustrated? _____

5. What material is being used? _____

_____

6. How many revisions has this drawing gone through? _____

7. What is the largest frame size? _____

Challenge

8. Why are there eight different frame sizes listed on this print?

_____

_____

_____

Tools for Learning

Activity

Blueprint Activity

Answer the following questions with Drawing #37FH4000A01 on the next page.

1. What is the part number? _____

2. What is the name of this part? _____

3. Who made this drawing? _____

4. How many revisions has this drawing had? _____

5. Is this drawing a piece-part or a sub-assembly? _____

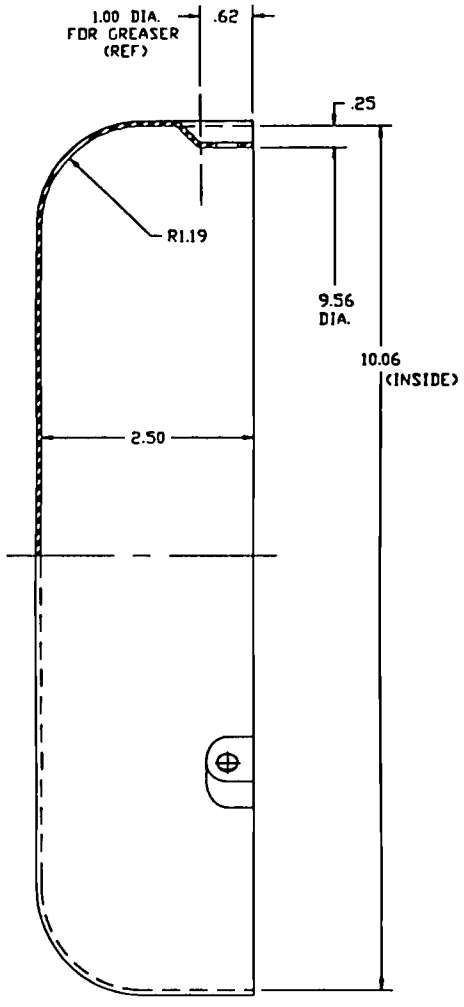
6. What is the date of the last revision? _____

7. What is the scale of this drawing? _____

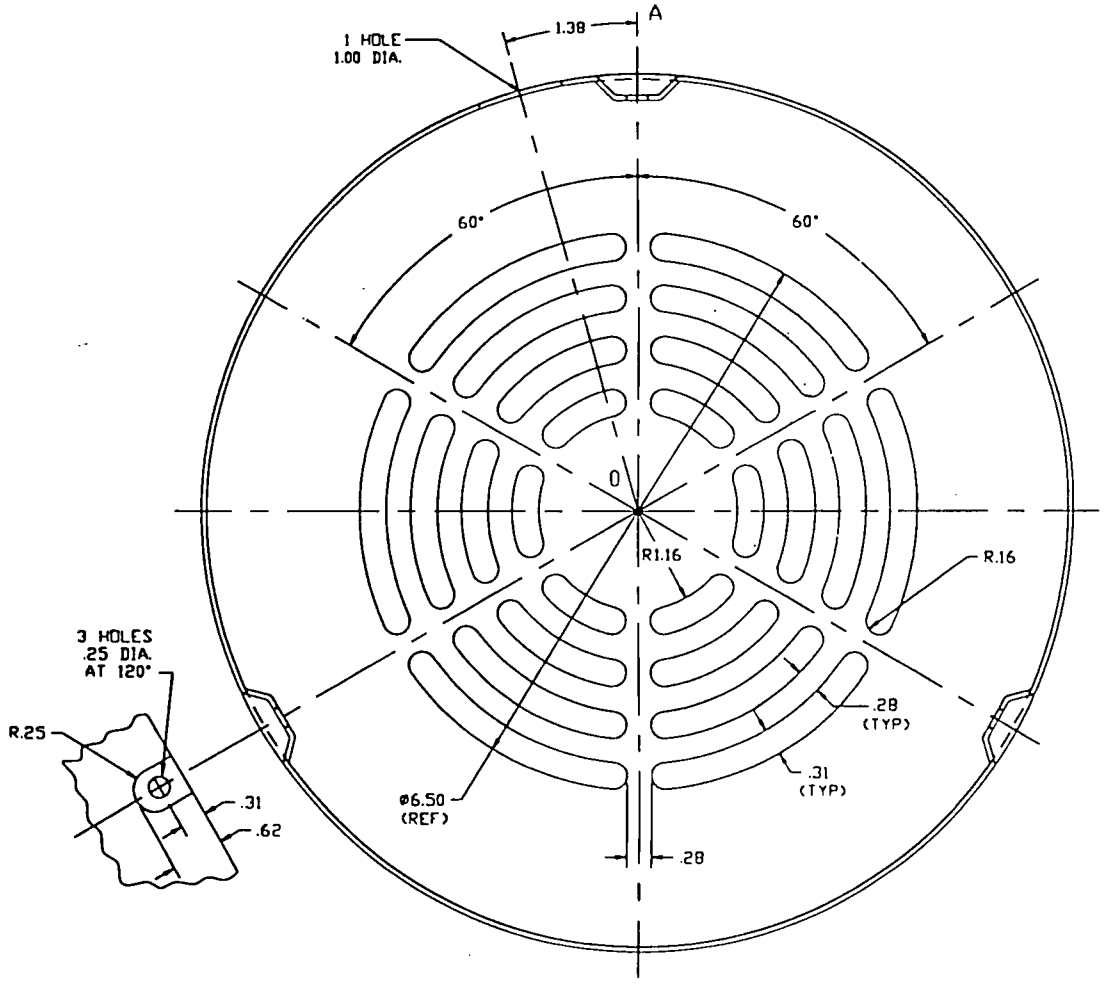
Challenge

8. What does the FH stand for? _____

37FH4000A01



SECTION A-0



MACH. TOL UNLESS SPEC.
2 PLC DECIMALS = ±.020
3 PLC DECIMALS = ±.005
ANG=±.5° RADII=.015

NOTE:
GRILLE, DIMPLES & 3 MOUNTING HOLES BY BALDOR.

MATL: #16 GA. (.0598) C.R. STEEL			XYZ Company
REV: E	DELETED CVO LAYERS TO CORRECT ACAD		
SCALE: .7	BY: BCM	REVISED: 10/11/94	FAN COVER 37/307 FRAME W/GREASER
FILE: AAA00002397		TDR: 0062626	

37FH4000A01

Tools for Learning

Alphanumeric Systems

Many companies use several ***alphanumeric*** systems.

Question

What does ***alpha*** mean? _____

What does ***numeric*** mean? _____

Key Term

The numbers in an alphanumeric system can be either ***sequential*** or ***significant***. ***Sequential*** means that whatever is being categorized is listed in "1, 2, 3..." order.

Significant means that the numbers and letters in the system have meaning. Drawing 35RC0002 illustrates how numbers and letters are used together: 35 and RC are ***significant.*** ***The*** 0002 is ***sequential***.

Are the following numbers significant or sequential?

Area Code _____

Zip Code _____

The Dewey Decimal System _____

Check Numbers _____

Tools for Learning

Key Term

Skim

Abbreviations

Knowing company ***abbreviations*** can help to quickly identify what is on a drawing. The XYZ abbreviations, which are significant, are divided into three categories (by department):

Motor

SH	Shaft
RC	Rotor Core
EP	Endplate
SC	Stator Core
WS	Wound Stator
SB	Stator Band
SA	Stator Assembly
RA	Rotor Assembly
AA	Armature Assembly
NS	Insulation
CM	Commutator
LD	Lead Assembly
CL	Coil
BP	Brush/Brush Holder
RK	Rocker Arm

Tools for Learning

Key Term

Parts

BA	Base
FH	Fan Housing
CB	Conduit Box
CV	Inspection Cover
RB	Bearing Retainers
FN	Fan
HA	Hardware or Housing Adaptor

Lamination

RL	Rotor Lamination
SL	Stator Lamination
AL	Armature Lamination
FL	Field Lamination
MM	Master Coil Lamination
T###	Tool Number

Note Taking

Highlight the abbreviations which are unfamiliar to you.

Tools for Learning

Memory Aid

Memory Tricks

Because there may be many abbreviations in a company's alphanumeric system, creating memory tricks can be helpful.

For example, the directions on a compass can be remembered by:

Never Eat Shredded Wheat.

(North, East, South, West)

XYZ's Alphanumeric MM for Master Coil Lamination can be thought of as:

MCL (the name Michael) likes **MM**s (the candy).

(MCL = MM)

Look at the list of abbreviations. Choose one and create a saying to help you remember it.

_____

_____

_____

Tools for Learning

Note Taking

Part Number/Drawing Number

An XYZ part number and drawing number are often the same. This type of alphanumeric system is not used in all companies.

Once you are familiar with how to break down a part number in one department, you will be better able to understand the alphanumerics in other departments.

For example, Drawing 34FH4000A01 can be broken down into the following categories:

34 = Frame

FH = Fan Cover or Housing

4000 = Material Used (steel)

A01 = Sequential number for variations to 34FH4000

A drawing number in Laminations would break down as:

09 = Frame

RL = Rotor Lamination

5 = Pole Number

64 = Number of Slots

1–9 or E = A sequential number or E (experimental)

Tools for Learning

Another variation to this system is number 27A01W234:

27 = Frame

A01 = Mechanical Layout

W234 = Electrical Layout

Question

What drawing number are you most familiar with in your department?

_____

Break down this alphanumeric like the examples above. What do the numbers and letters mean?

_____

_____

_____

_____

Circle the sequential numbers in your example. Box the significant numbers.

In the examples, two different meanings are given for an A01. How will you know which is which?

_____

_____

Tools for Learning

Activity

Activity

Chapter 1 of this course included the following prints.

1. Break down each of these alphanumerics.

   A. 35FH4000A01

   _____

   _____

   _____

   _____

   B. 35RC0002

   _____

   _____

   _____

2. Where would you look to find the exact material type for the 4000 in question 1? _____

3. What is that material type? _____

4. What is the 0002 material type in question 2? _____

   _____

5. How would you break down 29FL4240?

   _____

   _____

   _____

   _____

   _____

Basic Blueprint Reading Chapter 1 Review

1. How is a piece-part drawing different from a sub-assembly drawing?

_____

_____

2. What information does a Title Block provide? (at least three)

a. _____

b. _____

c. _____

3. Answer the questions with the blueprint on the following page.

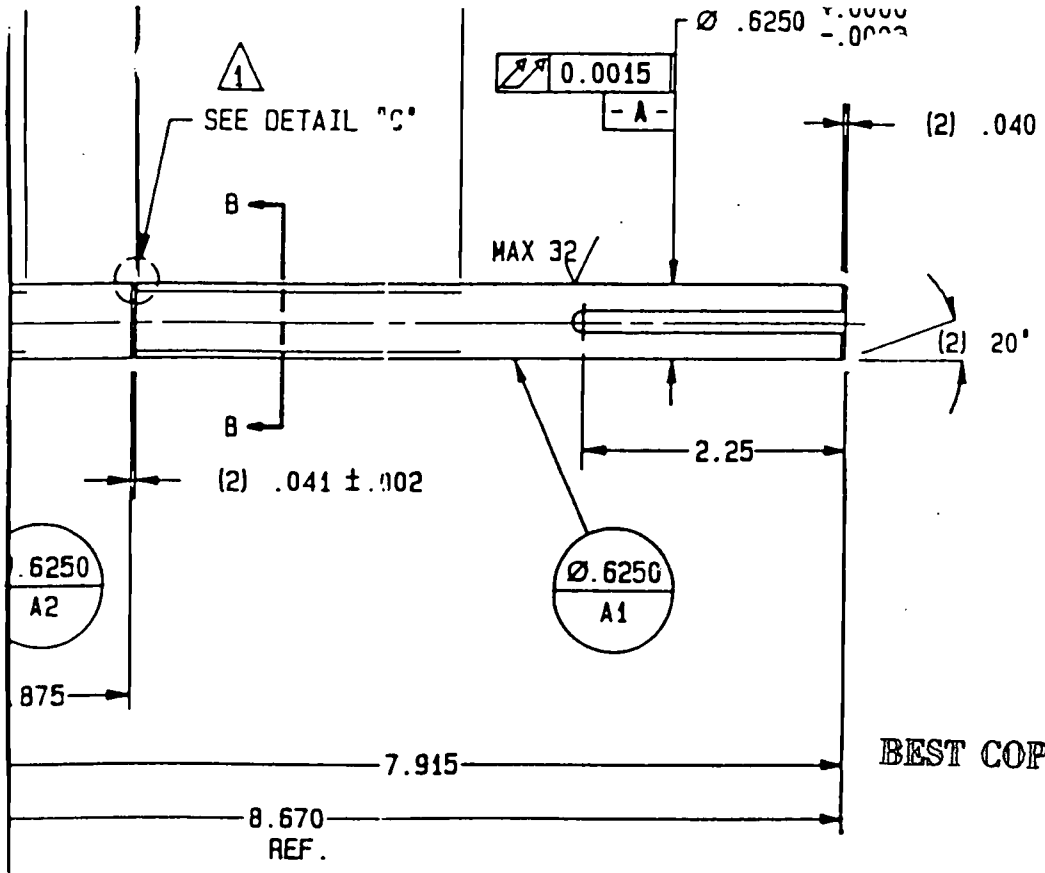
a. What is the drawing number? _____

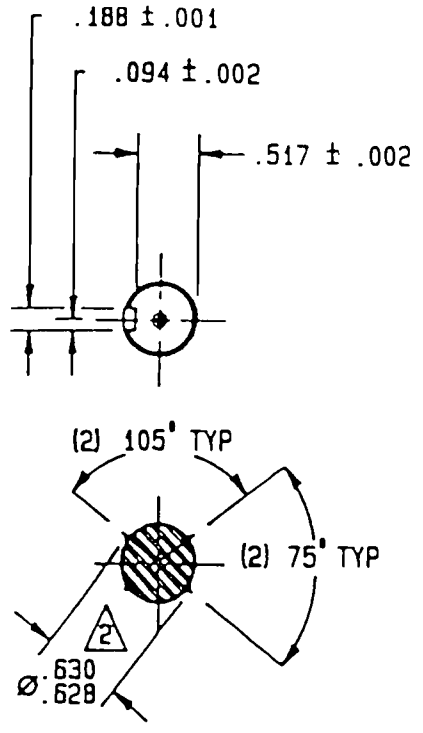
b. What does the "SH" mean? _____

c. When was the original print drawn? _____

d. How many revisions has it had? _____

e. Who approved this drawing? _____





SECTION B - B
(SCORING DETAILS)

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1173	T	REVISE GEOMETRIC DIMENSIONS. SEE ECO REPORT	8/1/91	R.F.A.
E.C.O. NO.	REV.	CHANGE	DATE	APPR

TOLERANCES		SIGNATURES		DATE	TITLE
UNLESS OTHERWISE SPECIFIED		DR BY	J. MERCHANT	11/15/88	SHAFT
ENGLISH	METRIC	CHK BY	J.M.	2/14/89	
DEC. [.00] ± .01	MM. [0.00] ± 0.25	MFG	D.S.	2/14/89	MATERIAL STRESSPROOF STEEL A-311 OR 1144
DEC. [.000] ± .005	MM. [0.000] ± 0.127	MS	H.B.	2/14/89	HARDNESS
ANGLES DEC. ± 1/2°	FRAC. ± 1/32	QC	S.P.H.	2/14/89	NEXT ASSY.
ALL RADIUS .015 BREAK ALL SHARP EDGES .015 MACHINED SURFACES 100 / R.M.S. MAX.		APPR BY	R.F.A.	2/14/89	USED ON: 4060

XYZ Company

DWG. NO.	REV.
545HCCC3GC1	T

SCALE NONE SHEET OF

f. How many flags are on this drawing? _____

g. How much tolerance is allowed to two decimal places under the English system?

_____

h. What material is used in this part? _____

4. Identify the following abbreviations.

a. RC _____

b. BA _____

c. EP _____

d. SL _____

e. MM _____

f. AL _____

g. RK _____

h. CV _____

i. SH _____

j. FH _____

5. Break down the following part numbers:

a. 34BA4003

b. 14RL2401

Chapter 1 Answers

Title Block #1 Activity, Page 3

1. A. Bend radius: 015
   B. Angle: .5
   C. Two-place decimals: +/- .020
2. 18 Gage C.R. Steel (.0478)
3. C = 3 times
4. The drawing is .6 to the fan housing's true size.
5. PGM
6. 8/11/93
7. AAA00003659
8. To match this print to the actual TDR documents
9. Baldor Electric Company
10. Piece-part. If other parts were shown and how they work together, this print would be a sub-assembly.
11. 35FH4000A01

Title Block #2 Activity, Page 4

1. Similarities: (Answers may vary.)
   Both have a title block.
   Both list tolerances.
   Both have had same # of revisions.
   Both have numbers in decimal form.
   Both have drafter's initials given.
   (etc.)
2. Differences: (Answers may vary.)
   Different scales
   Metric tolerances are given on one print.
   One has a "checked by" box.
   One has balloons and flags.
   (etc.)

Balloons and Flags, Page 5

1. 11
2. Adhesive
3. Apply Item 7 to insides of end cap before assembly.

Title Block #3 Activity, Page 6

1. .05
2. The finished length has been machined.
3. DMB
4. Rotor core

(Continued at top of the next column)

Title Block #3 Activity, Cont'd, Page 6

5. Hot drawn seamless steel tubing
6. 8
7. 580
8. To save the company from having to create 8 different prints for the same part.

Blueprint Activity, Page 7

1. 37FH4000A01
2. Fan cover 37/307 Frame w/greaser
3. BGM
4. 5
5. piece-part
6. 10/11/94
7. 7
8. Fan housing or fan cover

Alphanumeric Systems, Page 8

1. *Alpha* refers to ordering information by *letter order.*
2. *Numeric* refers to ordering information by *number.*

Part Number Activity, Page 14

1. A. 35 = Frame
   FH = Fan Housing or Cover
   4000 = Material Type
   A01 = Variations
   B. 35 = Frame
   RC = Rotor Core
   0002 = Material Type
2. On the title block
3. 18 gauge C.R. Steel
4. Hot Drawn Seamless Steel Tubing
5. 29 = Frame
   FL = Field Lamination
   4 = Poles
   24 = Number of Slots
   0 = Family Group (a sequential number 1-9 or E for experimental)

Chapter 1 Answers

Chapter 1 Review, Page 15

1. A piece-part drawing displays a part which may include several views. A sub-assembly displays how multiple parts fit together.

2. (Answers may vary.)
   a. Company Name
   b. Revisions
   c. Drafter's Initials

3. a. 54SH0003G01
   b. Shaft
   c. 11/15/88
   d. 20
   e. RFA
   f. 2
   g. +/- .01
   h. Stress-proof Steel

4. a. RC Rotor Core
   b. BA Base
   c. EP Endplate
   d. SL Stator Lamination
   e. MM Master Coil Lamination
   f. AL Armature Lamination
   g. RK Rocker Armature
   h. CV Inspection Cover
   i. SH Shaft
   j. FH Fan Housing or Cover

5. a. 34BA4003
      34 = Frame Size
      BA = Base
      4003 = Material

   b. 14RL2401
      14 = Frame Size
      RL = Rotor Lamination
      2 = Poles
      40 = Slots
      1 = Family Group

Checkpoint 1

The Title Block and Alphanumeric Systems

1. Answer the following questions with the attached blueprint.

a. What is the drawing number? _____

b. What does the "SH" in the drawing number mean? _____

c. When was the original drawing made? *(date)* _____

d. How many revisions has it undergone? _____

e. What is the name of this part? _____

f. What change was made in Rev. "D"? _____

g. When was Rev. D made? _____

h. How many frame sizes can shaft A01 have? _____

i. Which frame size is larger: C01 or B01? _____

j. What is the tolerance allowed to three decimal places? *(+/-)* _____

k. What drawing does this drawing replace? *(date)* _____

l. When did this drawing become effective for use in final assembly? _____

2. Identify the common abbreviations.

a. SH _____

b. AL _____

c. BA _____

d. MM _____

e. FH _____

3. Break down the following alphanumerics:

a. 28FL4041

_____

_____

_____

_____

_____

b. 36FH400A01

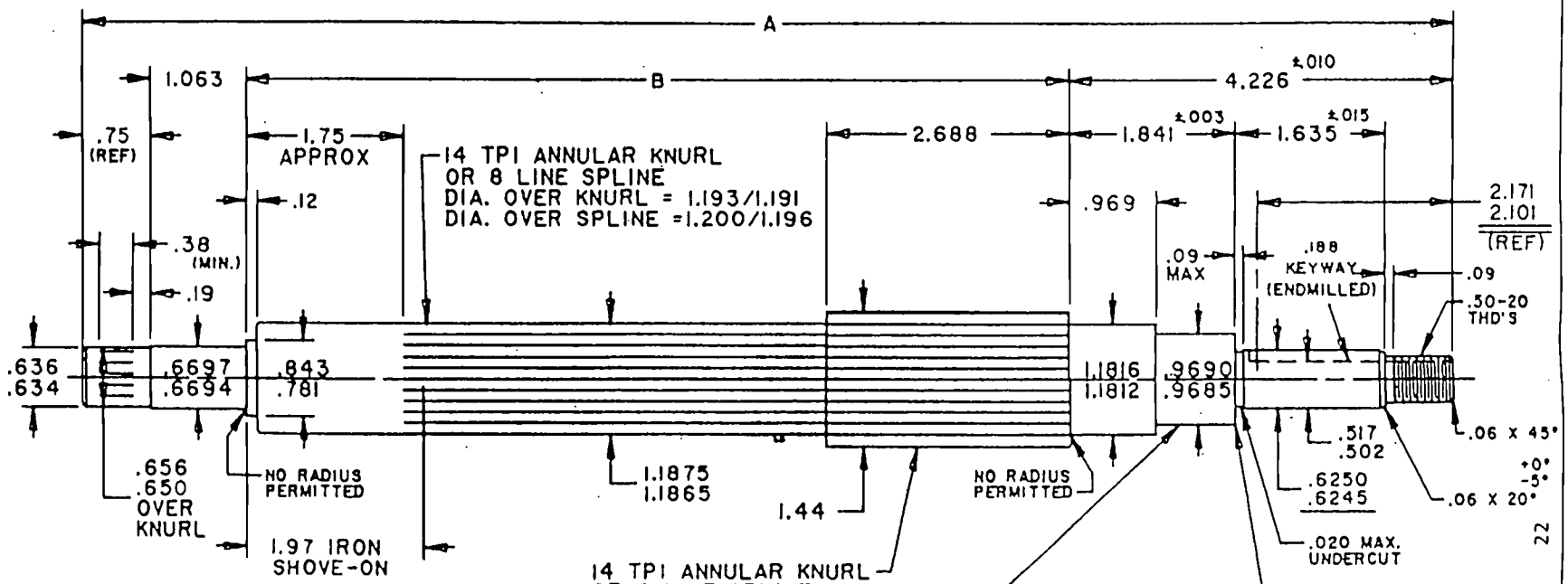
_____

_____

_____

_____

35SH1449

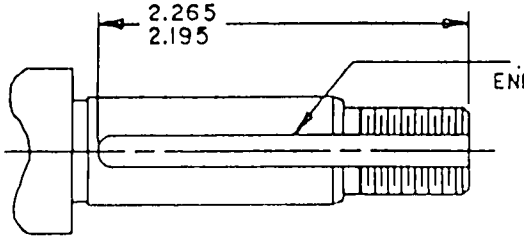


FRAME		A ±.0025	B ±.0025
510, 513, 516, 520	A01	13.1875	7.1562
524, 528	B01	14.1875	8.1562
535 –	C01	15.0625	9.0312

EFFECTIVE

NOV 2 6 1991

FINAL ASSEMBLY



KEYWAY DETAIL

REV.	DATE	BY	MATERIAL: 1.4375 DIA. STD. C.D. ST. PER S.P. #7
F	11-7-91	JO/TM	ADDED NOTE 'DO NOT BREAK SHARP EDGE ON...' (TDR#20414)
E	2-1-88	RAL	ADDED KEYWAY DETAIL
D	12-11-87	FH	CHG'D KEYWAY LENGTH FROM 2.12
C	6-8-87	RAL	ADDED ±.0025 TOL. TO 'A' & 'B' LENGTHS
B	6-26-86	FH	ADDED 510-520 & 524-528 STACKS
A	1-18-86	RAL	REDRAWN REPLACES DRAWING OF 7-25-83

35SH1449

TOL. ON FRAC. DIMS: ± | TOL. ON ANGULAR DIMS. ± | PATT. NO:

TOL. ON DEC. DIMS: ±.020 (2 PLACES) ±.005 (3 PLACES) | REF. NO:

XYZ Company

SPECIAL SHAFT - TEFC

MODEL 35M - NEMA 56CZ

DFTM: RAL	DATE: 1-18-86
ENGR:	DATE:
MFR:	DATE:

Tools for Learning

Participant Score Sheet

Record your Checkpoint scores on this sheet for your own reference. (*Not* required.)

Organization

Chapter 1 Checkpoint Score _____

Chapter 1 Areas to Work on

_____

_____

Chapter 2 Checkpoint Score _____

Chapter 2 Areas to Work on

_____

_____

Chapter 3 Checkpoint Score _____

Chapter 3 Areas to Work on

_____

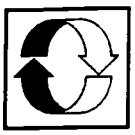
_____

Chapter 4 Checkpoint Score _____

Chapter 4 Areas to Work on

_____

_____



Participant Feedback

Participant Feedback

Chapter _____ Class Time and Date _____

Name _____

1. What problems are you having with this chapter? How can we help?

_____

_____

_____

_____

2. How will you be able to use this information on the floor?

_____

_____

_____

_____

3. What can be done to improve this course?

_____

_____

_____

_____

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