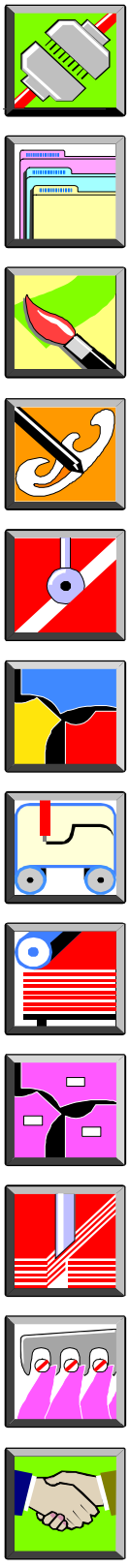

GERBERcutter®

APPLICATIONS MANUAL

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Chapter 1

Automated Cutting Theory

General

The GERBERcutter is an efficient, computer controlled cutting system. When approached at a basic level, automated cutting is easy to comprehend. Computer aided design systems provide instructions to control the cutting system and the GERBERcutter executes those commands. Flexibility within the software allows for differences in patterns, materials, and types of manufacture. There are four key concepts to be considered for automated cutting:

Data Preparation

Preparation of data for a GERBERcutter is slightly different than for hand cutting. Special consideration must be given to the material being cut. Practices that are intuitive in manual cutting are not necessarily intuitive to an automated cutting system. In other words, clarity of the instructions improves quality of execution.

Vacuum Hold Down

Automated cutting relies upon a vacuum system to compress and stabilize the material to be cut. The size of cut pieces, material porosity, and cutting sequence affect the performance of the vacuum system.

Knife Sharpening

Material content (i.e. natural / synthetic fibers, coatings, etc.) and ply heights determine knife sharpening requirements. Adherence to GERBER recommendations on Preventive Maintenance ensures the optimum mechanical performance of the GERBERcutter systems.

Motion Control

Quality requirements, material and type of manufacture must be considered when optimizing the performance and cutting speeds of the GERBERcutter. This is assisted by a built in knowledge base within the control software. This sophisticated software is flexible to meet the needs of aerospace, apparel, automotive, furniture and many other industrial applications.

Chapter 2

Pattern and Cutdata Preparation

General

This section addresses methods and features used to prepare patterns to be cut on a GERBERcutter interfaced with an AccuMark or MicroMark system. Some of these features will affect throughput, i.e., selective lift and plunge, small parts slow and small parts first.

To obtain a maximum quality cut, or to increase throughput; several features that are available on the GERBER systems and suggested implement actions are listed on the following pages.

To provide the best possible data for the GERBERcutter, a few comments should be made about pattern preparation and input. Some of the techniques and methods about pattern preparation described below are part common sense and part mandatory to achieve a quality cut with fast throughput. Unlike hand cutting, the GERBERcutter does not have eyes or a mind of its own. The cutter simply follows instructions from the data created on the marker making system and the parameters set in the GERBERcutter Parameter Manager.

Before the pattern input is started, it is a good idea to make a few decisions on what the desired cutting result should be. For example:

1. Are slit, V or both notch types going to be used?

2. Is it permissible to miter corners?

3. Is there an added buffer on the pattern template to compensate for hand cutting inaccuracies? If so, is it still needed?

Questions like these should be answered before pattern input is started, so changes will not have to be made to patterns stored in the marking system.

If the existing patterns are torn, wrinkled or frayed, these patterns should be redefined by making sure the corners are accurate, crisp and clean, that straight line segments are straight and that curves are smooth. When the pattern is ready for digitizing, there are a few "Do's" and "Don'ts" to follow.

Digitizing

- Always define an accurate grain line, the length should be as long as possible. If the grain line is off on rectangular pieces, the parts will not nest with true common lines.

- Always start digitizing a pattern piece on a corner. Avoid starting in the middle of a curve. If cutting begins on a curve, the part may not be cut cleanly or could be distorted at the start / end point.

- Do not start on a corner containing a notch, or where a notch is less than 7 mm [1/4"] from the start point. A notch that is too close to a corner may result in excessive heel cuts.

- Use as few grade and intermediate points as possible. Overloading a part with data points will slow the cutter down and has a negative effect on curve smoothness. In general, data points should not be spaced closer than 3 mm [1/8”] apart. Even spacing of data points on a curve is more beneficial than a high number of data points.

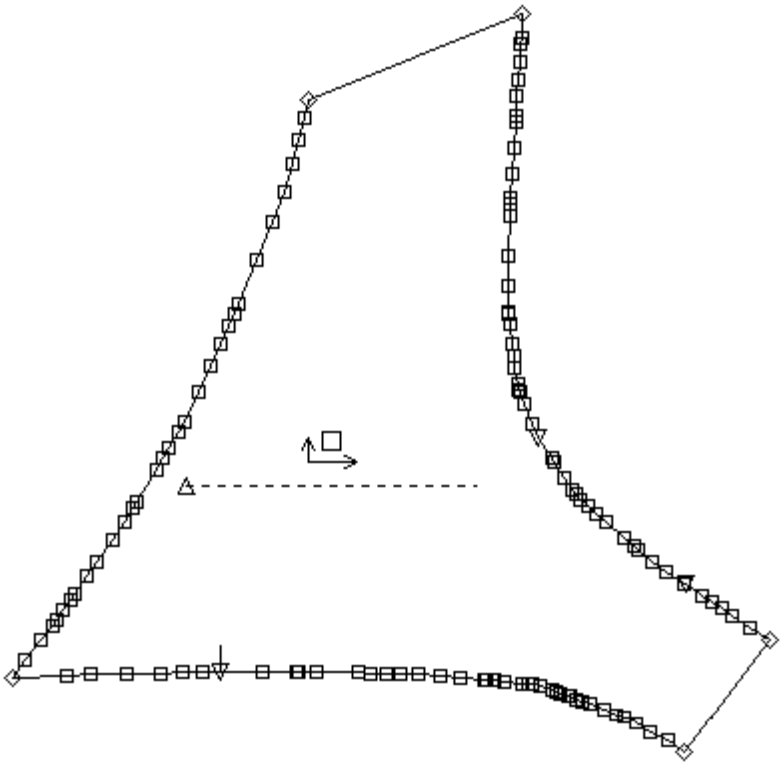


Figure 1: Excessive Data Points

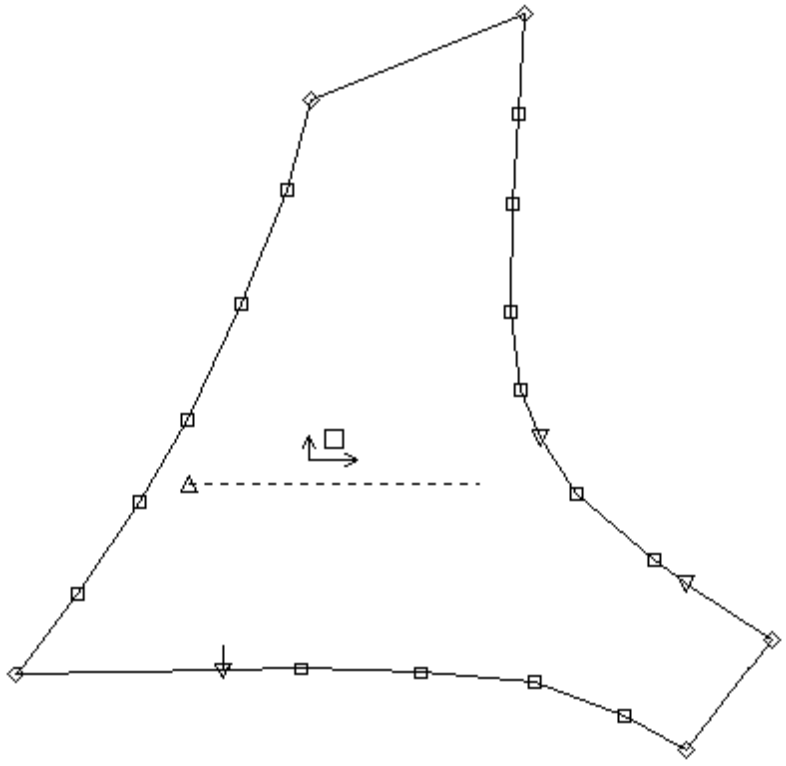


Figure 2: Recommended Number of Data Points

- At critical corners or sharp internal angles, it is advisable to include a lift and plunge command (M46) which lifts the knife at the beginning of a corner and plunges it in the direction of the new heading. The C200MT GERBERcutter software is configured to lift and plunge on internal angles of 45 degrees or less automatically.

- Whenever possible digitize mirrored pieces. This will ensure accuracy and save time digitizing. In some cases, especially when dealing with softer materials, the slight pushing effect of the knife during cutting may cause the piece to be slightly asymmetrical. In such cases, the "Bi-directional Mirror" feature on the AccuMark may help. When this feature is active, the cutter will begin cutting at the center of the piece, and cut half of it clockwise; then it will return to the starting point and cut the other half counter-clockwise, insuring a perfectly symmetrical cut.

  To set up Bi-directional mirror cutting:
  In the Cutting parameter table, set "Bi-directional Mirror" to ON, and store the table.

Notches

The “V” notch is recommended for use on the GERBERcutter. The notch width should be two times its depth for the best results. A 3 mm [1/8"] deep “V” notch should be 6 mm [1/4"] wide. The “V” notch is recommended for two reasons:

1. It is faster to cut than a slit notch. The knife stays in the material, unlike the slit notch where the notch is cut and the knife lifts and returns to the perimeter of the piece. Typical gain in productivity is 4% to 8%.

2. It is easier to locate “V” notches during sewing operation. This helps increase sewing production.

If Slit notches are required, they should be created on the CAD system 1.6 mm [1/16"] shorter than the required length. GERBERcutters cut slit notches 1.6 mm [1/16"] longer than the nominal notch described on a part due to the actual cutting edge of the knife being ahead of the center of rotation.

To maintain an accurate depth of the slit notches, the Knife Wear Compensation must be set properly. As the knife is reduced in width during the sharpening process, software automatically compensates for this wear. Refer to the Cutting Parameters section for procedures.

90 Degree Corners

The GERBERcutter is capable of cutting three types of 90 degree corners. Each corner varies slightly in shape and cutting time.

90 Degree No Lift Corner - The fastest corner to cut is the 90 degree no lift corner. The knife simply turns 90 degrees at the corner and continues cutting. Most soft materials cut very well with this corner, however, small distortions of the corner may result due to the knife turning in the material. This distortion is more noticeable with harder fabrics and higher plies.

90 Degree Mitered Corner - The C200MT software has the ability to automatically miter a standard 90 degree no lift corner. Instead of the knife moving 90 degrees, the cutter will respond with two consecutive 45 degree moves.

90 Degree Lift and Plunge Corner - The 90 degree lift and plunge corner is the slowest, but most accurate corner possible. It can be done by implementing the M46 command.

NOTE: When using the 90 degree lift and plunge corner, check for possible damage to adjacent pieces by corner heelcut or corner overcut. This can be corrected by increasing Corner Advance or decreasing Corner Overcut in Parameter Manager.

Buffering

Buffer is the distance between pieces in a cutfile that is occasionally required to insure accurate cutting. The need for buffering depends on the quality specification of the user and the material being cut. Buffering can be used in two modes, Static or Dynamic. Static buffering is automatically applied where selected. Dynamic buffering is applied at a piece level by the operator during marker making. Both modes allow the flexibility to buffer specific regions (top, bottom, left, right, segment) or the entire piece. Segmental buffering can apply buffer to a defined region of a piece. For example, if buffering is desired only on the top of a sleeve, the point attribute - B can be assigned to the beginning of the segment and clockwise around the piece a Q can be assigned to the endpoint of the desired buffered line. This can be performed during digitizing or in Piece Verify. Refer to the AccuMark User's guide for complete procedures.

Small parts should be buffered for best possible quality. A 1.5 mm [1/16"] buffer around each part should be sufficient in most cases. This means there will be a minimum of 3 mm [1/8"] between adjacent buffered parts. Buffering is not required on true common lines.

Soft materials such as fleece may require buffering due to the effect of vacuum holdown on the material. If any material compression in the X and / or Y axes is present due to vacuum, as a part is cut, the piece and the surrounding material will compress - widening the cut line. When an adjacent piece is cut, the compression may be within the perimeter of the piece. This will have the appearance that the first piece nicked into the second piece.

Materials which are non porous may have cutting limitations due to the inability of the vacuum system to hold the spread securely. In these cases, buffering can provide added piece stability which may allow higher ply cutting.

In order for buffering to be applied effectively on AccuMark systems, it is important that a consistent piece category naming convention be used. In this way, it will be possible to apply different amounts of buffering to different parts of different pieces. For example, a user may decide that all top sleeve caps need to be buffered by 2 mm, but nothing else does. A consistent piece category system makes this possible.

AccuMark systems:

1. Edit Database - LayLimits.

2. Define the piece category or categories.

3. Assign a block/buffer rule number to each category. ("Default" is considered to be a category also - it consists of all undefined categories.)
4. Give the table a name and Store it.

5. Edit Database - Block/Buffer.

6. Define each desired blocking or buffering rule, using the same numbers assigned in LayLimits. For example, Rule #1 might be BUFFER - DYNAMIC - RIGHT - .063".

7. Give the table a name and Store it.

   Use the new tables in the order file whenever buffering is desired.

MicroMark systems:

1. In the Style Description Menu, set the buffering amount desired in the "Die Allowance" field.

   Buffering amounts may be set differently for each piece in a style, or identically for all pieces in a style.

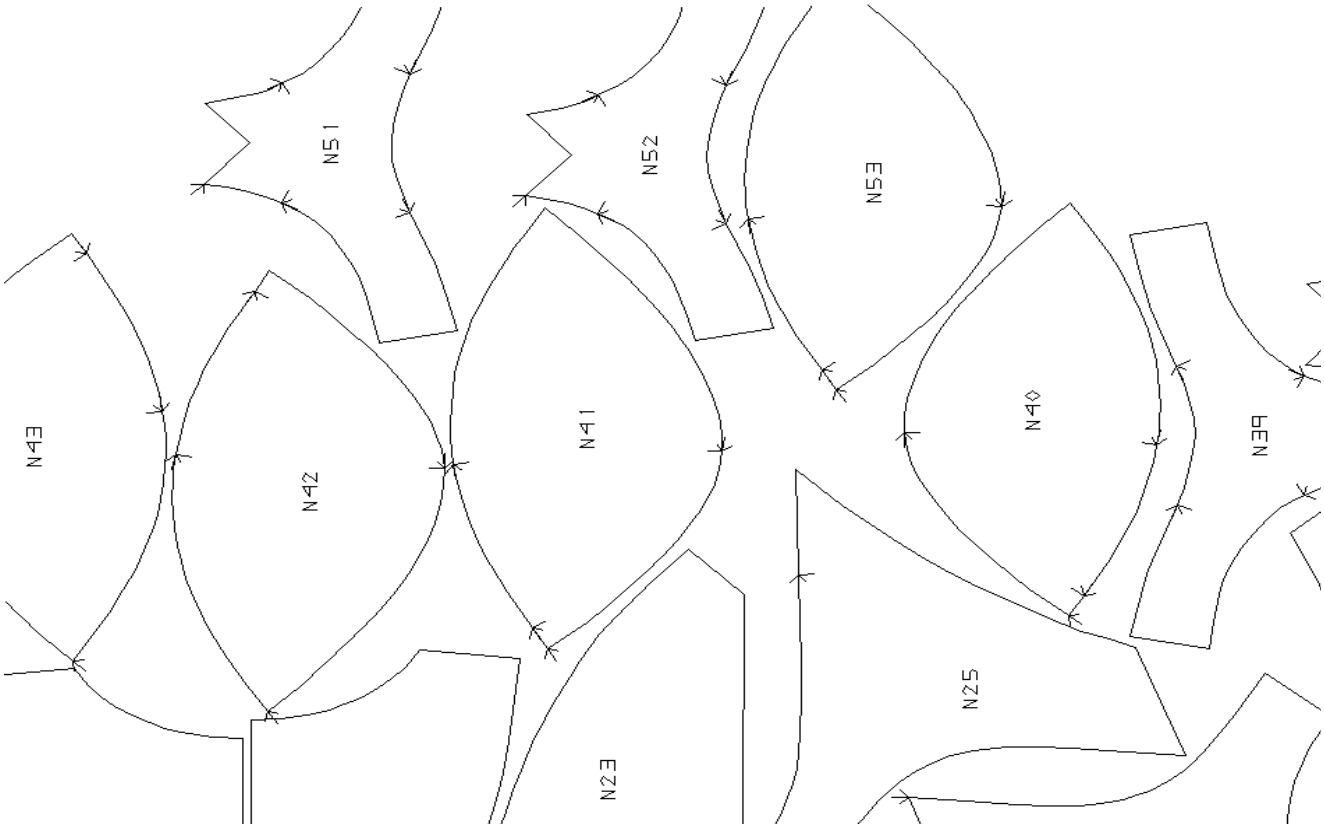


Figure 3: Section of cutfile depicting Buffering between pieces

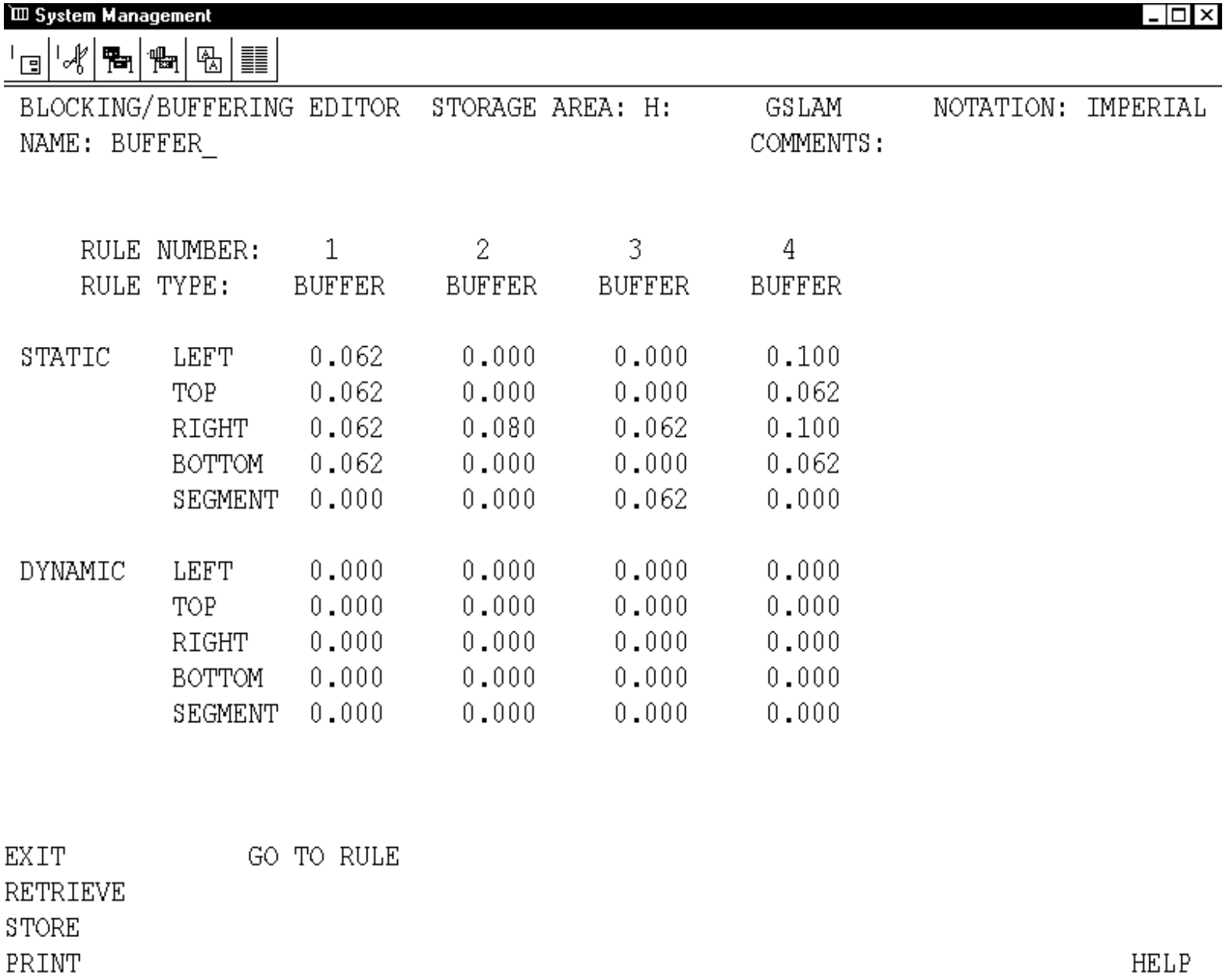


Figure 4: AccuMark Blocking / Buffering

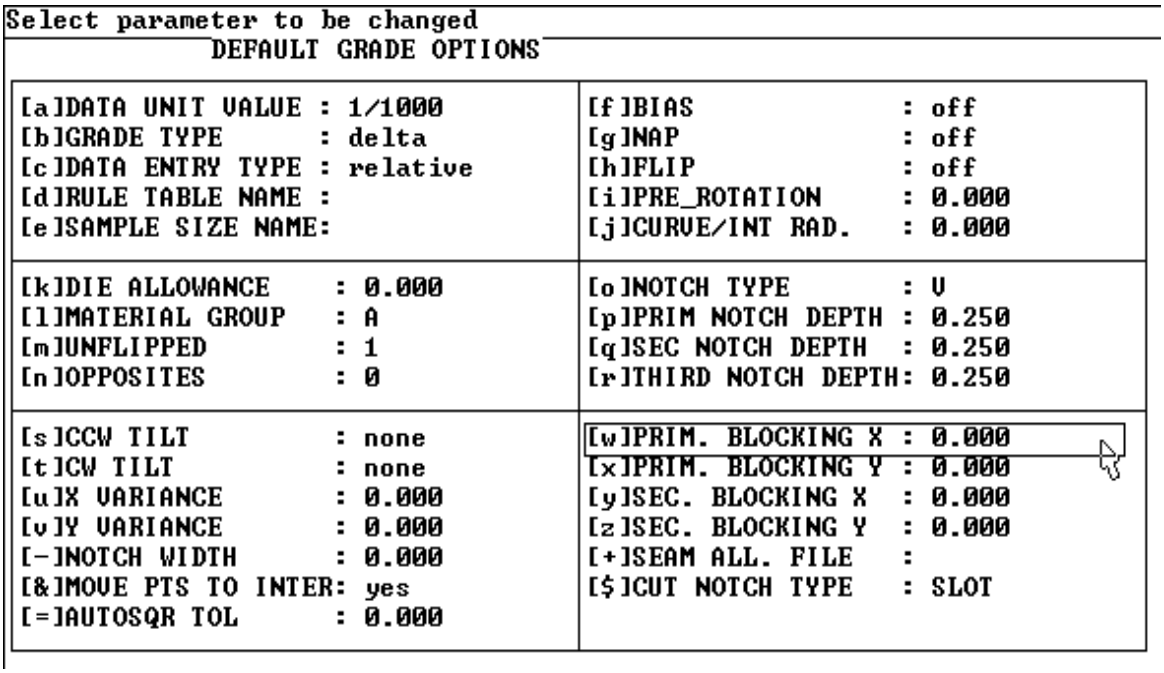


Figure 5: MicroMark Blocking

Blocking

Blocking is a technique where the perimeter of a piece is enlarged by a set amount, and then the enlarged perimeter is cut, leaving the original piece perimeter surrounded by extra material. This technique is most often used during stripe and plaid cutting, where the exact position of the piece in relation to the fabric will subsequently be fine-tuned, usually by pinning, and then the finish cut will be performed. It is also used on pieces which would be die-cut in a later operation, and also for pieces which might be shared between two different size bundles.

AccuMark systems:

1. Edit Database - LayLimits.

2. Define the piece category or categories.

3. Assign a block/buffer rule number to each category. ("Default" is considered to be a category also - it consists of all undefined categories.)

4. Give the table a name and Store it.

5. Edit Database - Block/Buffer.

6. Define each desired blocking or buffering rule, using the same numbers assigned in LayLimits. For example, Rule #1 might be STATIC - DYNAMIC - LEFT - RIGHT -TOP - BOTTOM - 50%.

7. Give the table a name and Store it.

   Use the new tables in the order file whenever buffering is desired.
   In the Cutter parameter table, be sure that "Cut Net Parts" is set to NO.

MicroMark systems:

1. In the Style Description Menu, enter blocking amounts (either as linear measurement or percentage of repeat) in the Primary or Secondary X and Y fields.

   Primary blocking will happen automatically; Secondary blocking can be triggered during marker making. Each piece may be individually defined, or all pieces may be identically defined.

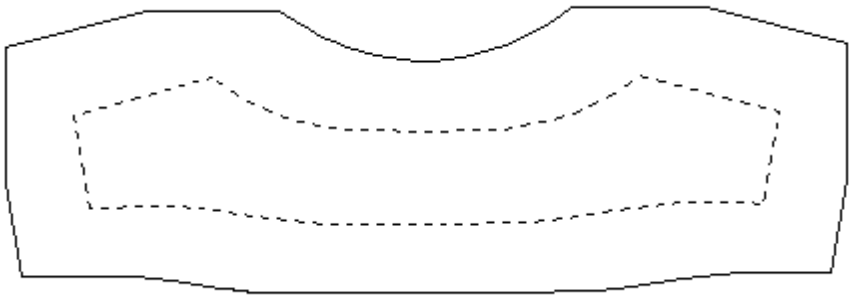


Figure 6: Piece Blocking, the original piece is represented by a dashed line

Block Fusing

For some applications, a technique known as “block fusing” can prove to be a good time-saver. In block fusing, several pieces are grouped together in a marker, and then cut out as one block. The block is then fused, and then the block is re-laid and the finished pieces (referred to as “net parts”) are cut from the block.

AccuMark systems and Gerbercutters work well together in this operation. The AccuMark system can automatically create the necessary blocks, both self and fusible, and can generate the three separate cutfiles necessary to do the entire operation on the Gerbercutter.

Steps involved in Block Fusing

1. Create a self marker containing one or more instances of pieces grouped together for block fusing, and create a cutfile for it.

2. Use the above marker to create the corresponding fusible marker, and create a cutfile for it also.

3. Create a third cutfile containing only the self blocks, for use in cutting the net parts.

4. Spread and cut the first self marker.

5. Spread and cut the fusible marker.

6. Fuse the blocks and re-lay.

7. Cut the fused blocks on the Gerbercutter, using the automatically-supplied “V” notch in the lower left corner as an alignment guide. The Gerbercutter will execute an op-stop at the V notch, display a message telling which block is being cut, and will then cut the net parts.

   NOTE: When this final cutfile is generated on the AccuMark, “Cut Net Parts” needs to be set to “YES” in the Cutter Parameter Table.

   Consult your AccuMark User’s Manual for more details on the automatic features available in Block Fusing.

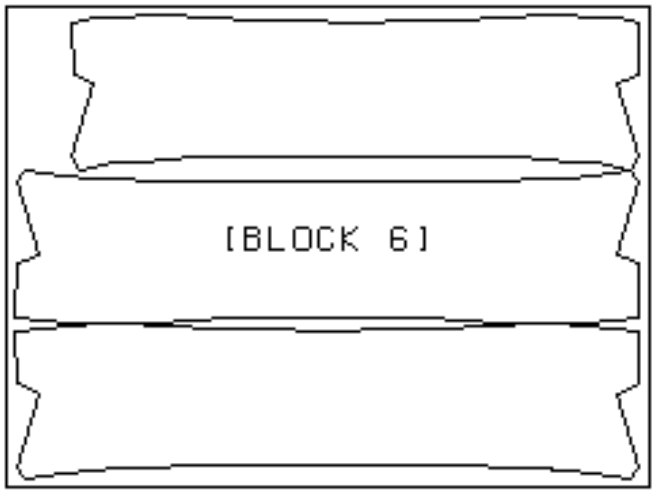


Figure 7: Block Fusing

Piece Attributes

Alternate Start Points

Alternate Start or “K” points allow the CAD operator to determine where the GERBERcutter starts cutting a piece. This can have a significant effect on cut quality and throughput of the cutfile as the start points of pieces are used to determine the cutting sequence. Multiple start points can be assigned to large pieces to improve automatic sequencing and reduce dry haul. Without a start point assigned, the piece will typically start cutting at the first digitized point. On pieces that are digitized as a mirrored piece, the first digitized point is on the mirror line and often at a notch location. It is essential to assign an alternate start point in this case.

AccuMark systems - There are several methods of implementing alternate start, or "K" points.

1. In Digitizing, pressing D2 on the cursor will assign a K point.

2. In Piece Verify, Edit Points, a K attribute can be assigned to the point.

3. In PDS, Edit Attributes, Point Menu is used.

MicroMark systems - There are several methods of implementing alternate start, or "ALT STR" Points.

1. In Digitizing, pressing # 9 on the cursor at the point location will assign an ALT STR Point.

2. In Point Modifiers, ALTSTR Point can be used.

Lift and Plunge Points

Lift and Plunge or “L” points can be assigned by the CAD operator to control how the GERBERcutter will cut a corner. The cutting systems can cut most corners with acceptable quality with the knife continuously in the material. Corners were the quality is critical can be commanded to lift the knife out of the material, turn to the next heading and plunge into the material completing the corner. The only disadvantage is the increased time for LP corners. A judicious use of lift and plunge points is recommended until quality is examined on the cutting system.

AccuMark systems - There are several methods of implementing lift and plunge, or "L" points.

1. In Digitizing, pressing D1 on the cursor will assign an L point.
2. In Piece Verify, Edit Points, an L attribute can be assigned to the point.

3. In PDS, Edit Attributes, Point Menu is used.

MicroMark systems - There are several methods of implementing "Lift Plunge Pts".

1. In Digitizing, press Lift Plunge Pt in the Menu area.

2. In Point Modifiers, LIFT PLUNGE PT can be used.

Cutting Attributes

Small Pieces often prove to be the most difficult to cut accurately. Cut quality can often be improved for smaller pieces by reducing the cutting speed and altering the sequence of the cut to cut these pieces before larger, adjacent pieces. By cutting small pieces first, hold down power of the vacuum system is enhanced. Small Pieces are defined as follows:

AccuMark systems

1. Edit Data Base, LayLimits, Piece Options. The Piece Options are assigned by Piece Category. An option "M" designates all pieces with that category as a Major, or "large" piece. If no "M" is present, the pieces are defined as Small Pieces.

MicroMark systems

1. Small Pieces are defined by the area of the piece in N/C Cut under Defaults, Small Piece Area.

Small Slow

The Small Slow feature is often very helpful to ensure optimal cut quality. This can automatically reduce the cutting speed on small parts. To implement the Small Slow feature:

AccuMark systems

1. Define Small Pieces

2. Edit Parameter, Cutter, Set the Cut Small Slow parameter to the percentage of velocity that small pieces are to be cut.

MicroMark systems

1. Define Small Pieces

2. N/C Cut, Defaults, Cut Code Options, Set Slowdown M25 to Yes.

Small First

The Small First can improve vacuum holdown by cutting the small parts before the larger pieces in the file. There may be an adverse effect on throughput due to an increase in the Dry Haul distance. To implement the Small First feature:

AccuMark systems

1. Define Small Pieces

2. Edit Parameter, Cutter, Set the Small First parameter to Yes.

MicroMark systems

1. Define Small Pieces.

2. N/C Cut, Edit, Sequence, Small Pieces First

Cutfile Post Processing

When the Cut Process or NC Cut Generation has been completed, the "Marker" is converted into a "Cutfile". This Cutfile can be brought to the GERBERcutter with no other user intervention required. All the commands required by the cutting system including the cutting sequence are included within the data file.

Post Processing refers to the enhancement of a cutfile after it is generated on a CAD system. While this step is not required, significant benefits to throughput and cut quality can often be realized. Manual and Automatic software routines allow the user to customize the cutting process.

The Gerber Power Processor - GPP200 software is such an editing tool. The automatic features of the GPP200 Power Processor - Common Line, Path, and Piece Reorder are included in the C200MT software and will be discussed in the Preprocessor Utilities section.

Chapter 3

Material Handling

Spreading

Before cutting, the fabric or material to be cut is spread on the spreading table. The alignment, or straight edge, of the spread should be on the GERBERcutter Operator's side to facilitate setup.
A typical spread consists of:

1. Underlay paper - Type is determined by material being cut.

2. Material - Maximum ply height is determined by material and GERBERcutter configuration.

3. Plotted Marker - Used for piece identification only. (Optional)

4. Overlay - Polyethylene plastic cover film is applied as the spread is indexed onto the GERBERcutter.

It is recommended that the material is spread to the cutfile length and not to the marker plot. Plotter paper may shrink slightly due to heat and humidity and inaccuracies may result.

Materials must be spread tension free. Failure to do so may result in undersized or distorted cut pieces as the material relaxes after being cut.

Underlay Paper / Plastic Cover Film

GGT provides a wide range of underlay paper (solid, punched and perforated) and plastic cover film (6 - 1.25 mil thickness) in an assortment of widths. Contact your Agent or GGTWHQ Miscellaneous Sales department for information.

Floatation

Spreading tables must provide for easy movement of the lay. One person should be capable of bringing a spread to the cutter. Air floatation options are available on Gerber spreading tables, contact your local sales representative.

Material Guidance

Conveyorized cutting systems will automatically index sections of the spread on to the table surface to be cut. These sections are called bites. Spreading tables should be leveled and aligned with a transit so the spread is drawn onto the cutting surface parallel to the X axis at all times. Alignment of the edge of the spread should not be left to chance. Sufficient material guidance will eliminate the requirement for Operator intervention.

Bundling

Once cut pieces are indexed onto the Take Off table, they must be removed or "bundled" for routing to the sewing operations. Planning methods for scrap disposal, piece identification, and providing bins or carts to transport cut goods is based upon manufacturing requirements. The practices followed should allow for uninterrupted operation of the GERBERcutter. Operating efficiencies are quickly lowered if the Gerber operator is required to stop cutting to insure all the cut pieces are removed prior to the next bite.

Chapter 4

PRE-Cutting Preparation

General

This section addresses a few of the items that should be checked prior to the start of cutting, periodically throughout a shift, or whenever the quality of cutting appears to be deteriorating.

Sharpening Stones

Inspect the sharpening stones to ensure they have a good sharpening surface, and check for a build-up of dirt, grease, or any other substance on the sharpening surface. If the stones are dirty, use the recommended cleaning solvent. Avoid exposing sharpen stone bearings to cleaning solvents to avoid premature failure.

Change the stones if the wheel surface appears to be smooth, the stones are clean and the cut quality starts to deteriorate, or if the stones have been in use for approximately 80 hours.

Sharpen Belts

Inspect, clean and/or replace the O-ring sharpener drive belts at the start of each shift. Replace the belts when performing a stone change.

Knife

The knife should be inspected, cleaned and/or replaced prior to the start of each shift, when the quality of the goods being cut starts to deteriorate, or the knife is worn or bent. There is no substitute for a close visual inspection of the knife while removed from the system to ensure adequate sharpening. Knife life is dependent on the abrasiveness of the material being cut and the frequency of sharpening.

Knife Intelligence Alignment (S5200 / S7200 / S91)

Knife Intelligence must be aligned for proper operation. The sensor (transducer) in the presser foot bowl is aligned to zero (0) volts DC when no knife deflection is occurring.

NOTE: The lower roller guide in the presser foot bowl must be allowed to flex side to side to allow proper operation of the transducer. The KI Limiter screws are designed to prevent overtravel protection for the lower roller guide, not to restrict movement. A clearance of 0.25 mm [0.010"] should be set between each KI Limiter screw and the lower roller guide.

The KI alignment is accomplished with the Diagnostic, KI Calibration. Position the knife off material and select Diagnostics, KI Calibration. A horizontal bar graph of the transducer output voltage will appear on the monitor. Depress the Trimcut button on the Beam Control Panel and the knife will plunge into the bristle. Loosen the clamping screw on the lower roller guide assembly and adjust the transducer core until the gauge is at, or near zero (green range). Tighten the clamping screw, exit the diagnostic and perform a KI Null. Refer to the GERBERcutter Operator Manual as required.

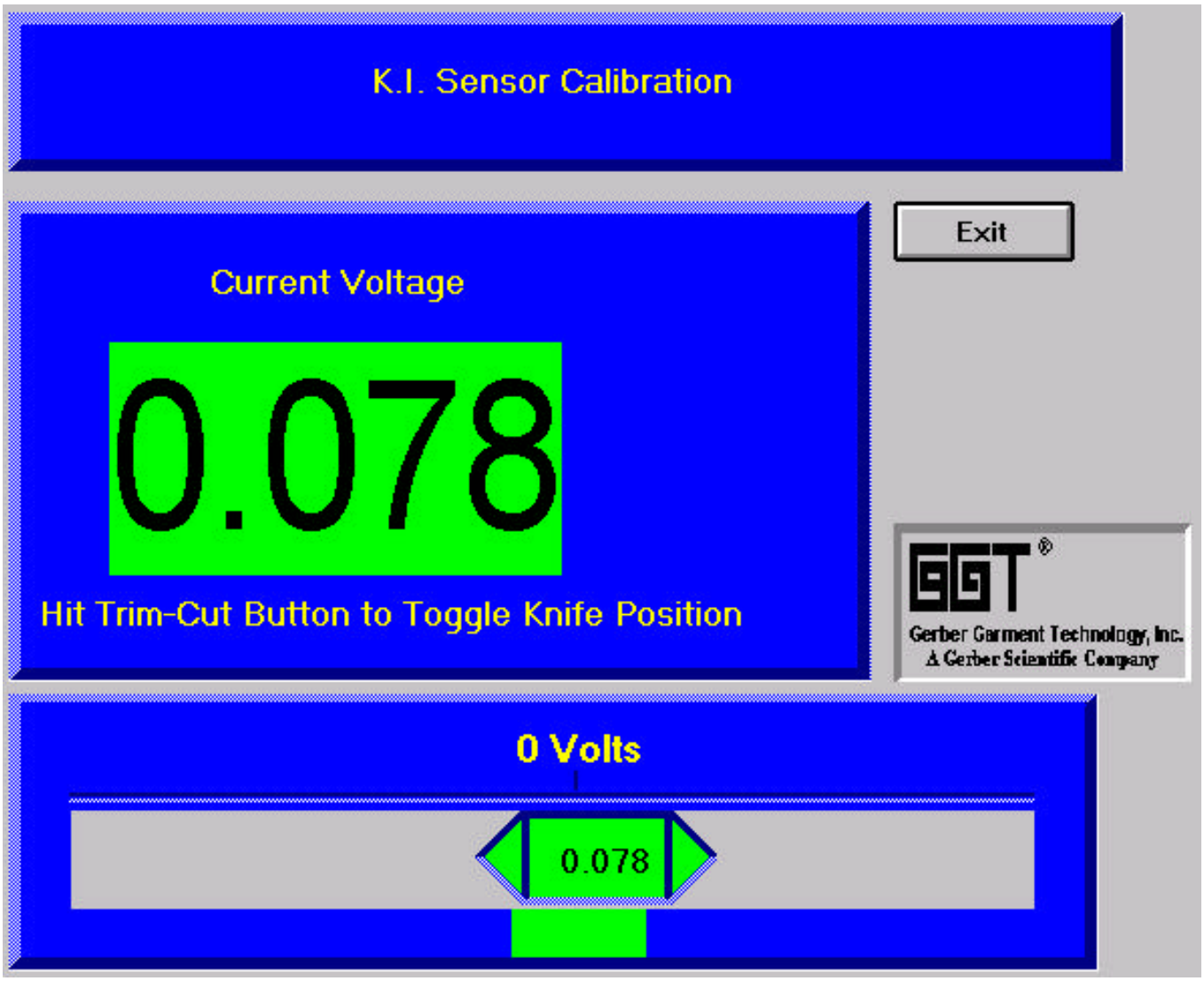


Figure 8: Knife Intelligence Alignment Screen

KI NULL

Knife Intelligence Null provides a convenient means to precision tune the transducer alignment. Nulling of the Knife Intelligence should be performed frequently. At a minimum, KI Null should be performed after initializing the GERBERcutter and at the beginning of each spread. To perform a KI Null, with vacuum on, position the knife to a location that is just off the edge of a spread while allowing the presser foot bowl to be over the spread. Depress the 1 key twice on the Beam Control keypad, the knife will plunge momentarily and raise.

KI Alignment and KI Null aligns the input to the Knife Intelligence circuitry only. To verify the Knife Intelligence is functioning properly, follow the steps below:

1. Position the knife over bristle.

2. Set the Cutting Speed to zero (0) and Knife reciprocation - OFF on the Beam Control Panel.

3. Using the Trimcut button and the +X slew key on the Beam Control keypad, plunge the knife into the bristle.

4. At this point the knife should be oriented at the zero degree heading and the Knife Intelligence gauge on the FEP should display zero (0).

5. With a pencil eraser, carefully push against the side of the knife. *CAUTION*: The knife is very sharp! As the knife is deflected, Knife Intelligence will cause the C axis to move the knife towards the applied force up to the maximum amount of degrees set by the Deflection Angle parameter.

6. Check for KI response in both directions and exit the Trimcut mode.

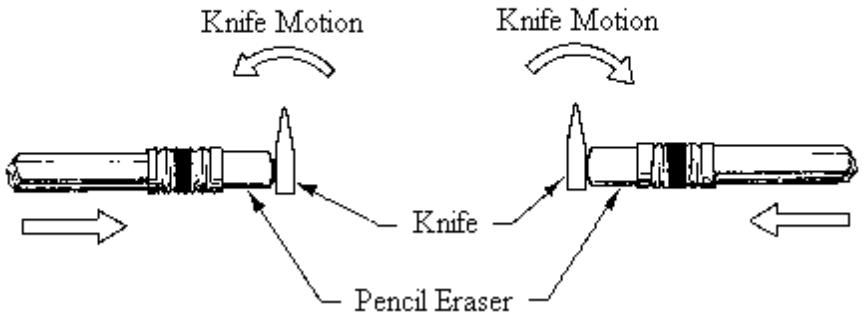


Figure 9: Knife Intelligence Deflection Test

Lubrication

High speed components in the Knife Drive, X,Y and C Axes and the Vacuum systems require periodic lubrication to ensure reliability. Do not over - lubricate! Refer to the GERBERcutter Operator's Manual for the daily, weekly and monthly lubrication procedures.

Vacuum

The GERBERcutter is equipped with an electric motor driven vacuum generator and the necessary interconnecting ducting to the cutting surface. A filter is installed at the inlet of the vacuum generator. This filter should be cleaned the beginning of each shift. Refer to the GERBERcutter Operator's Manual for procedures.

Proper vacuum is critical in maintaining good quality cutting. Vacuum requirements vary dependent upon material and ply heights.

Air Pressure

Air pressure is required to plunge the knife and drill through the material. The compressed air supply should be oil and contaminant free for optimal life of the GERBERcutter's pneumatic components. The air pressure should be set at 4.1 bar [60 psi].

Presser Foot Bowl

The presser foot bowl air pressure should be adjusted to where the bowls rides on the surface of the material without pushing it. This setting will vary depending on ply height. Any gap between the bowl and the material will cause a ragged effect on the top plies of a cut. The optional Material Stabilizer is available to assist in cutting air impermeable or slippery materials.

Chapter 5

Preprocessor Utilities

The Preprocessor utilities provide a means to automatically enhance cutfiles. This process is not required, but in many instances improvements to cut quality and throughput will result.

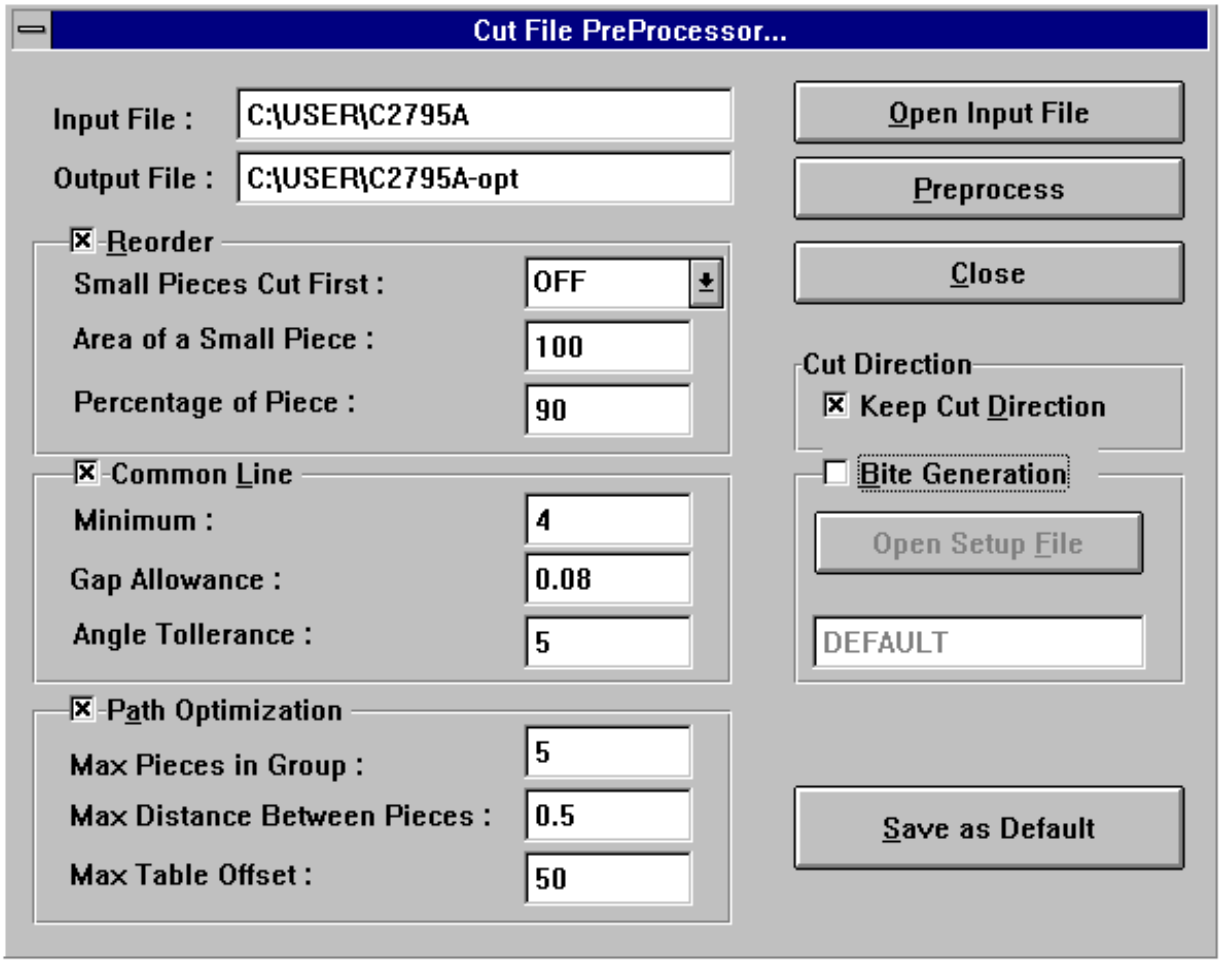


Figure 10: C200MT Preprocessor Screen

Automatic Piece Reorder

Automatic Piece Reorder feature in the C200MT software uses a sophisticated approach to piece sequencing. A cutting window, or "tier" is automatically generated by the software based upon the largest piece in the cutfile. Sequencing is then performed on one tier at a time with special consideration to small pieces. To Preprocess a cutfile in C200MT:

1. Select Utilities menu, Preprocessor.

2. Click the Open Input File button and select the cutfile to process.

3. The original cutfile is unchanged, an output file will be created with a .OPT extension. You may rename this file if desired.

4. Select the Reorder option and confirm the sequencing parameters.

5. Click the Preprocess button.

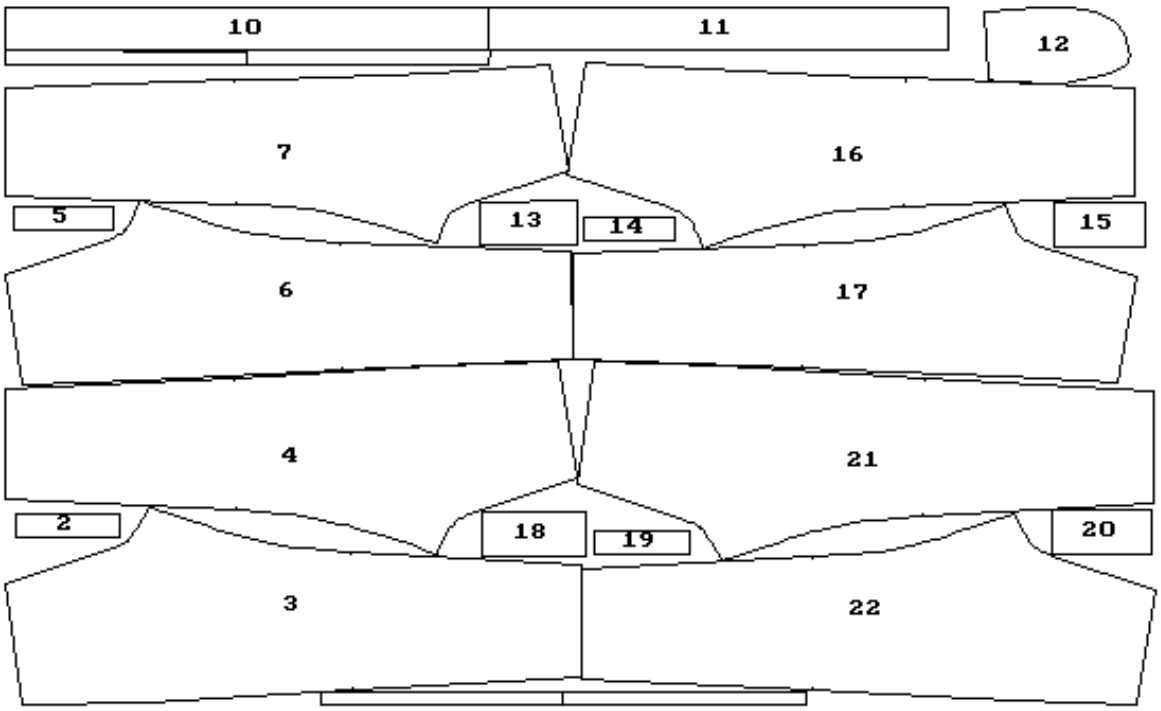


Figure 11: Originally Sequenced Cutfile

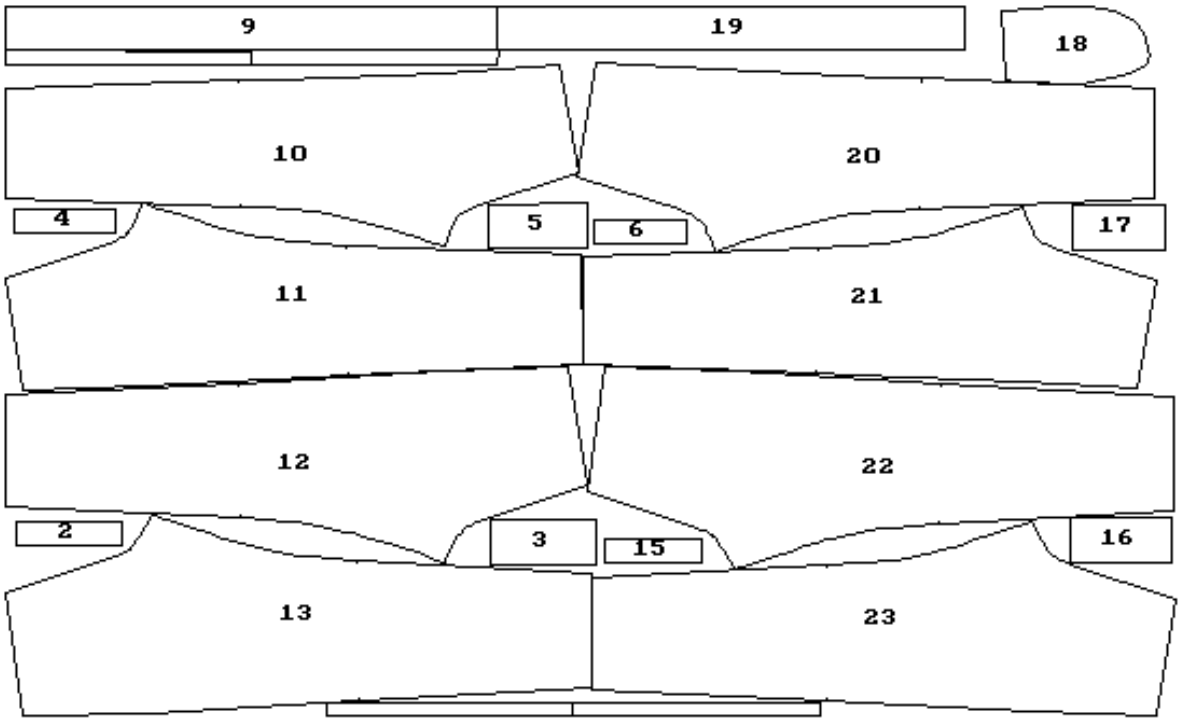


Figure 12: Reordered Cutfile, sequenced by tier

Automatic Piece Reorder Parameters

Small Piece Cut First OFF / BY PIECE / BY TIER

The Small Piece parameter, when enabled tells the system how to handle small pieces. By Tier cuts all the small pieces in the tier before cutting the large pieces. By Piece cuts the small pieces near a large piece first moving through the tier. Off cuts all pieces in the tier without regard to their size.

Area of a Small Piece cm^2 [in^2]

Enter the maximum piece area the system will consider small.

Percentage of Piece %

Enter the minimum percentage of a piece that must be included in the tier for that piece to be sequenced in the tier.

Automatic Common Line

Automatic Common Line feature in the C200MT software can enhance cut quality and improve throughput by removing redundant cut lines. If a small gap is present between two parallel lines, the software can be configured to treat the lines as common. Adjacent lines with V notches are not true common lines. To Preprocess a cutfile in C200MT:

1. Select Utilities menu, Preprocessor.

2. Click the Open Input File button and select the cutfile to process.

3. The original cutfile is unchanged, an output file will be created with a .OPT extension. You may rename this file if desired.

4. Select the Common Line option and confirm the parameters.

5. Click the Preprocess button.

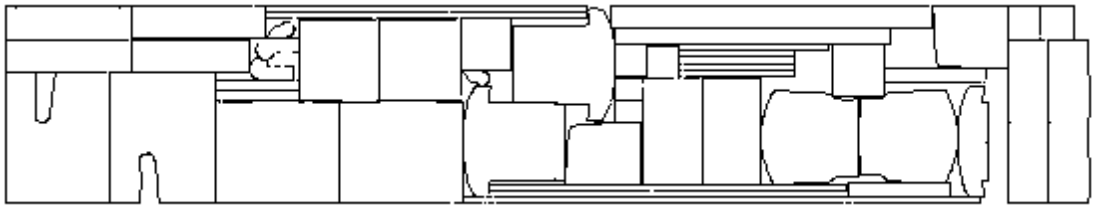


Figure 13: Cutfile with Common Lines

The furniture cutfile above in figure 13 was processed with the Automatic Common Line utility allowing changes to the cut direction. The Dry Haul distance increased slightly, however, Cut distance was reduced by 23%. An overall savings of 16% was realized in the Total distance.

Automatic Common Line Parameters

Minimum
: Sets the minimal segment length which should be considered as common.

Gap Allowance
: Defines the maximum distance allowed between lines to consider them as common.

Angle Tolerance
: Defines the maximum angle deviation, in degrees, between lines to consider them as common.

Automatic Path Optimization

Path optimization analyzes pieces in a cut file and determines a more efficient way to cut the pieces by keeping the knife in the material. The cut path is modified and multiple pieces are combined into one piece. Lift and plunge and dry haul time may be reduced also cut time can be reduced significantly, depending on the cut file. To Preprocess a cutfile in C200MT:

1. Select Utilities menu, Preprocessor.

2. Click the Open Input File button and select the cutfile to process.

3. The original cutfile is unchanged, an output file will be created with a .OPT extension. You may rename this file if desired.

4. Select the Path Optimization option and confirm the parameters.

5. Click the Preprocess button.

Automatic Path Optimization Parameters

Max Pieces in Group

The maximum number of individual pieces you want calculated together as one piece. This allows Path Optim to eliminate knife lifts and dry hauls between pieces.

Max Distance Between Pieces

The maximum distance between individual pieces you want calculated together as one piece.

Max Table Offset

The maximum length of the group of pieces you want calculated together as one piece. Controlling the length of the group minimizes vacuum loss on the table. A value of 500 processes the entire bite or cutfile.

Bite Generation

If Run Time Biting feature is not to be utilized, the Bite Generation feature in the Preprocessor can generate bite markers. The Bite lengths are controlled by user parameters in the Settings screen under Bite Parameters (configs). The Maximum / Minimum Bite Length parameters are set to user defined lengths and when enabled in the Preprocessor will input bites into a given cutfile.

1. Select Utilities menu, Preprocessor.

2. Click the Open Input File button and select the cutfile to process.

3. The original cutfile is unchanged, an output file will be created with a .OPT extension. You may rename this file if desired.

4. Select the Bite Generation option.

5. Click the Preprocess button.

Cut Direction

When this feature is enabled the Preprocessor will choose its own cut direction rather than the standard cutting direction of clockwise. Changing the cut direction gives Path Optimization and Common Line features more flexibility in determining the cut path. Dry haul times may be reduced significantly, depending on the cut file.

1. Select Utilities menu, Preprocessor.

2. Click the Open Input File button and select the cutfile to process.

3. The original cutfile is unchanged, an output file will be created with a .OPT extension. You may rename this file if desired.

4. Select the Cut Direction option. Make sure all other desired Preprocessor features are enabled or disabled.

5. Click the Preprocess button.

Open Setup Files

After configuring the Preprocessor parameters, you have the flexibility to save these settings to a particular Setting. This is beneficial when cutting a variety of different materials and or cutfiles and it is necessary to have different features in the Preprocessor enabled. To achieve this you first must:

1. Select Utilities menu, Preprocessor.

2. Click the Open Input File button and select the cutfile to process.

3. The original cutfile is unchanged, an output file will be created with a .OPT extension. You may rename this file if desired.

4. Select the desired Preprocessor features.

5. Click the Open Setup Files button.
6. Choose the desired Setup file.
7. Click the Save As Default button.
8. Click the Preprocess button.

Chapter 6

Queue Manager (QM)

General

The Queue Manager utility allows a user to create job queues that contain multiple markers to be cut sequentially. When a job queue is run, each marker is opened, processed and closed automatically until all the markers have been completed. The system will pause between markers waiting for operator confirmation unless configured for Contiguous Run. Once a job has been created it can be stored and recalled when it is needed for future use. Or, if the job queue will not be reused it can also be automatically deleted after processing. Job queues can increase throughput, while queues are being created, other markers can still be processed. The QM program may also be copied from the C200MT software to an off site PC where an administrator can create job queues to be copied back to the cutter PC, reducing the cutter operators responsibility. In conjunction with Contiguous Cutting a Job Queue can be processed entirely with no stoppages between markers. Once a marker within a Job Queue has been completed the system automatically re-origins and starts cutting the next marker.

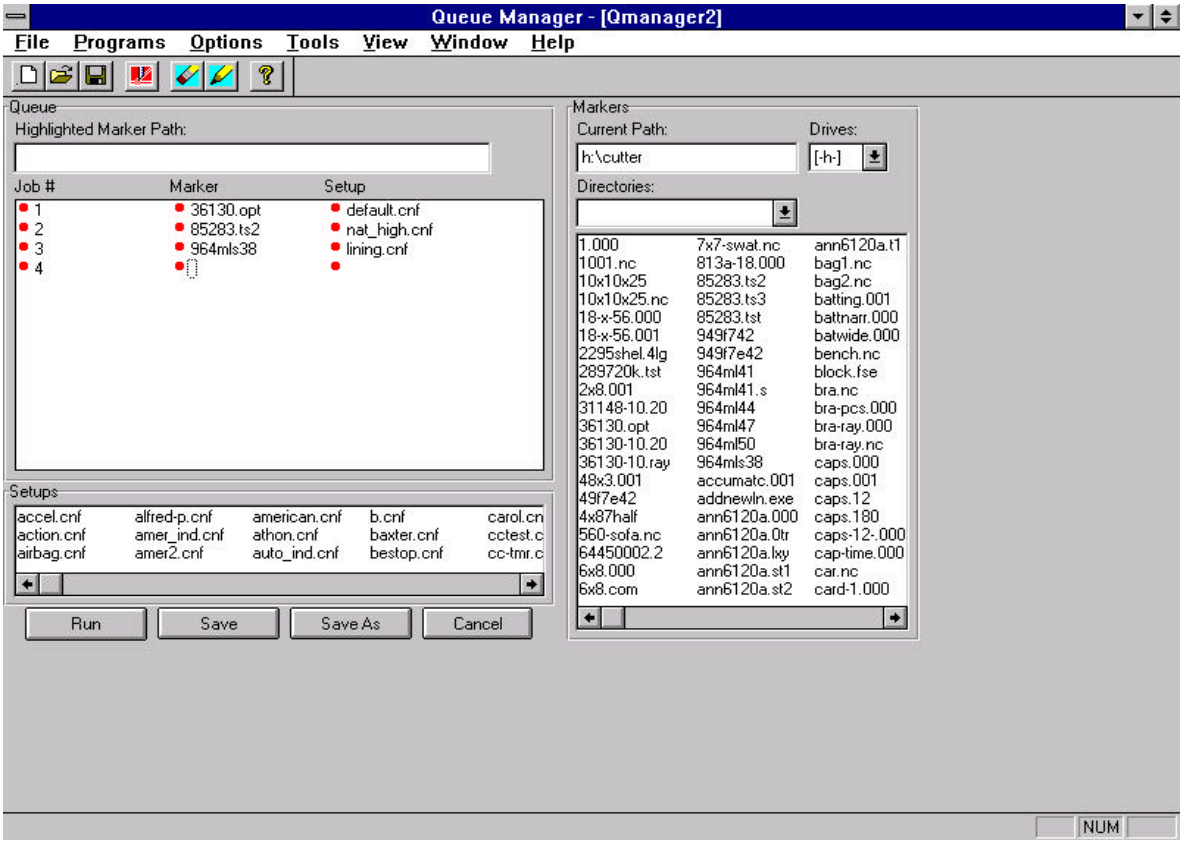


Figure 14: Queue Manager Screen

Creating a Job Queue:

The QM utility is entered either by pressing the QM icon on the C200MT main screen or from the Utilities menu, select Queue Manager. Then select Edit Queue. The QM screen displayed on the monitor is now ready to create a new job queue. When first opened, the queue section of the window is blank except for a "1" in the job # column. By selecting a marker from it's current drive and directory located to the right of the QM screen, the marker name will be displayed in the Job Queue as Job #1 with the default setup. To select a different setup for this job, click to highlight the setup that is to be change . Then select the desired setup from the Setups section of the window. Continue to select the required markers and their applicable setup in the order of processing until the Job Queue is complete. From the File menu select Save or Save As, and assign the job a name.

Editing a Queue:

From the Utilities menu, select Queue Manager. Select Edit Queue. From the file menu, select Open. Select the queue you want to edit. Jobs can be inserted by highlighting the job # where you want to add a marker. Then press Insert from the Options menu, or click the insert button (marked with a pencil) in the tool bar. The job line will be cleared waiting for a marker to be selected. Jobs may be moved by highlighting the Job # to be moved. Then type the job number you want to assign to this job and press Enter. To delete a job, highlight the job # to be deleted and press the delete button on the keyboard or in the tool bar (marked with a pencil eraser).

Running a Job Queue:

From the Utilities menu, select Queue Manager. Select Open Queue. If you know the name of the existing queue it can be typed in the Queue select box at this time or all existing queues can be seen and selected by pressing Enter. Once it has been selected the program returns to the Main Cutter Control screen and the first job in the queue is now loaded and ready for processing.

Parameters that affect QM

Selvage/Contiguous Cut category:

Contiguous Cut

On - The system automatically re-origins and starts processing the next marker.

Off - The system stops when it finishes processing a marker.

Minimum size of first bite

When Contiguous Cut is on, this parameter sets the minimum table length that must be available for the next marker to be processed without conveying cut goods off the cutting table.

Intermarker Gap

When Contiguous Cut is on, this parameter sets the distance between the end of one marker and the beginning of the next.

Queue Manager category:

Pause Between Queue Manager Jobs

On - When Contiguous Cut is on, the system stops between jobs in a Queue Manager job queue.

Off - When Contiguous Cut is on, the system processes an entire job queue without stopping.

Delete Job From Queue After Cutting

Yes - Each job entry is deleted from the job queue file immediately after being processed, the cut file is not deleted.

No - Turns off this feature.

Delete Queue After Cutting

This parameter determines whether a job queue and/or cut files in it are deleted immediately when done cutting the queue.

Que file - Queue file is deleted only.

Markers - Markers in a queue are deleted but not the queue file.

Que&Markers - The queue files and the markers in the queue are deleted.

Off - Turns this feature off.

Chapter 7

Cutter Information Data Base (CIDB)

General

The purpose of the CIDB is to provide a statistical report of the GERBERcutter's performance. As a marker is being cut specific time and distance information is continually recorded. At an administrator's request, individual marker reports can be recalled, as well as a summary of the marker reports, referred to as a shift report.

Operation

The report is a function which can be enabled and disabled through the Parameter Manager (PM) prior to cutting. The CIDB option must be enabled in the currently selected Setup File, as well as the Default Setup File when starting the C200MT program. Once the CIDB Report Generator has been started, select the report type, either marker or shift, define the desired time period, then create a new document. The newly created file is then viewed on the monitor, and can be copied, saved and printed. If file output has been selected in the PM, the report is written to the file MARKERS.RPT in the \REPORT directory. The file MARKERS.RPT will be created by the first report written to it, all subsequent reports will be appended to the file. This means MARKERS.RPT can contain several day or weeks of reports, the user should regularly retrieve the desired files to view, save, and or print for archival purposes. After the file has been utilized the MARKERS.RPT file can then be deleted from the PC and a new file will be created by the next report.

To Print the CIDB reports

Since no printer is available on a C200MT control, the desired report must be copied to a PC with a printer. Or if the cutter is networked to another PC, also with a printer, it maybe viewed and printed from that terminal. The Wordpad or Notepad programs within Windows NT are recommended to view and print the report. Using either program, open or load the report from it's current drive and directory. The report can now be view and printed using either program's Print function.

Operator, System, Marker and Error Comments

The CIDB also provides comments concerning noteworthy events that occur during the cutting operation. Operator Comments can be entered at the PC keyboard by the cutter operator. System comments are generated when events occur that may affect time and distance values reported in a shift and marker report.

Marker comments are generated when noteworthy events affect time and distance values only in a marker report. Error comments are generated when a PC or Controller error occurs.

Figure 15: CIDB Report Generator Screen

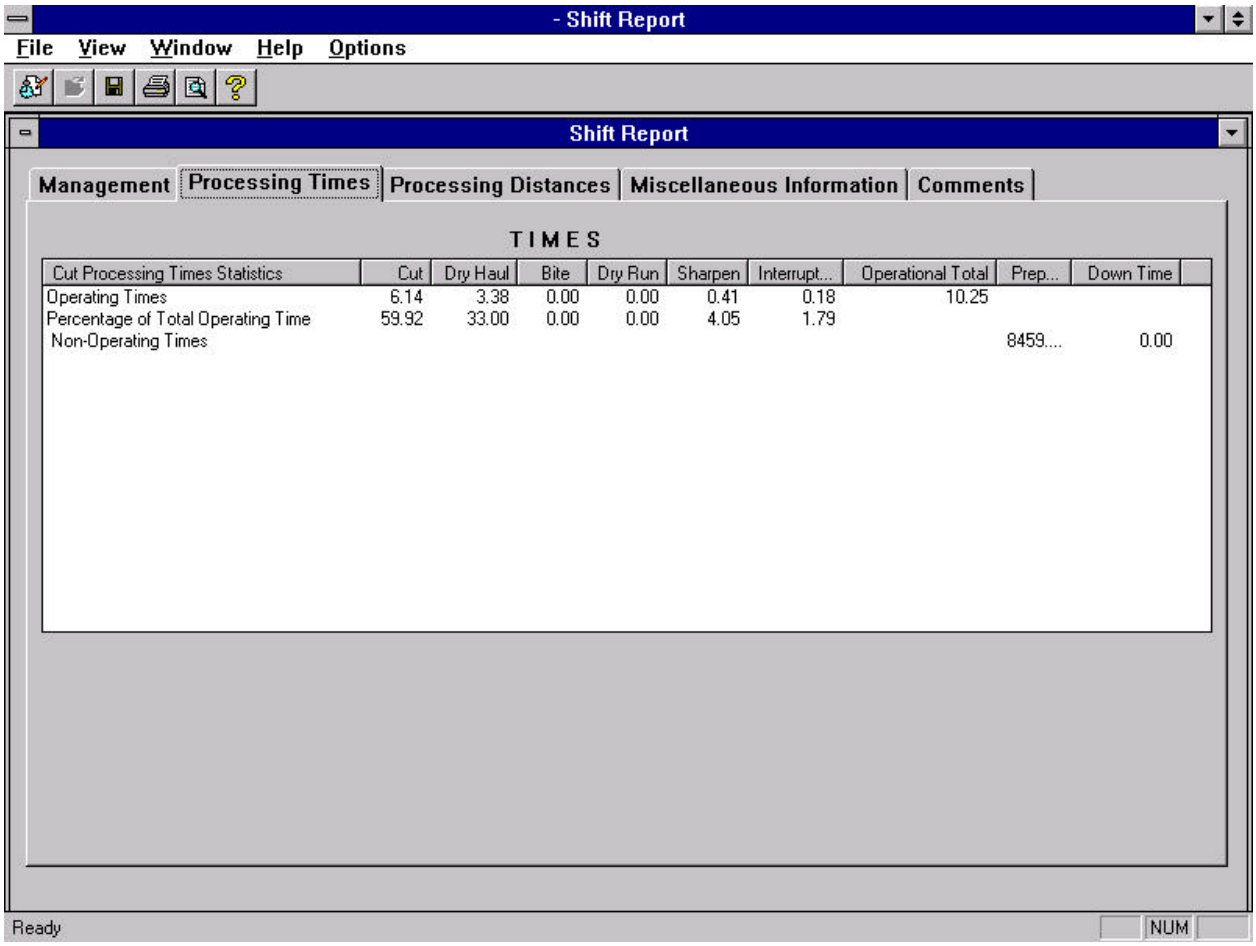


Figure 16: CIDB Screen Shift Report

Example of CIDB Marker Report:

Cutter Information Marker Report

Date 4/3/97
Setup Name : TWILL.CNF
First Marker ID : 56

			Processing Times							Processing Distances				Averages	
Start Time	Finish Time	Feed Rate	Cut	Dry Haul	Dry Run	Shrp	Intrpt	Total	Prep	Cut	Dry Haul	Dry Run	Total	Speed	Thruput
Marker : C278173.dat															
06:24:45	06:51;33	8	13.91	8:12	0.00	3.08	2:18	26.80	2.72	448.53	190.49	0.00	639.01	407.92	231..37
Marker : C278179.dat															
06:54:08	07:05:58	8	6.54	3.58	0.00	1.45	0.22	11.83	2.58	222.89	102.70	0.00	325.59	409.16	231.23

Marker Reports contain the following information:

File Name	The cut data selected (opened) for processing.
Feed Rate	The feedrate switch setting at the end of marker processing.
Start Time	The time at the start of the marker in military format.
Finish Time	The time in military format when the marker cutting process is complete.
Cut Time	The time in minutes and hundredths of a minute that the knife is in the down position.
Dry Haul Time	The time in minutes and hundredths of a minute that the knife is up while moving to the start point of a piece or moving to a drill location.
Dry Run Time	The time in minutes and hundredths of a minute the system was running in the Dry Run mode.
Sharpen Time	The amount of time in minutes and hundredths of a minute spent sharpening the knife.

Interrupt Time	= (Finish - Start) - (Cut + Dry Haul + Dry Run + Sharpen) Interrupt time, the amount of time in minutes and hundredths of a minute that the cutter was stopped by the operator, an Opstop or failure between the marker start time and finish time.
Total Time	= Cut + Dry Haul + Dry Run + Sharpen + Interrupt The total elapsed time in minutes and hundredths of a minute for this marker.
Prep Time	The elapsed time in minutes and hundredths of a minute from the end of the previous marker to the start of the next marker. Close attention should be paid to Interrupt and Preparation times. These are non-productive modes in which the system is idle. Gains to production are easily attainable by minimizing the times.
Cut Distance	The total distance traveled with the knife in the down position in feet and hundredths of a foot.
Dry Haul Distance	The total distance traveled with the knife in the up position in feet and hundredths of a foot, including moves made by other tools.
Dry Run Distance	The total distance the head traveled in the dry run mode in feet and hundredths of a foot.
Total Distance	= Cut + Dry Haul + Dry Run Distance. The total distance traveled by all tools in feet and hundredths of a foot.
Average Cut Speed	= Cut Distance / Cut Time. The total Cut Distance divided by the Cut Time given in inches per minute.
Average Throughput	= Cut Distance / (Cut Time + Dry Haul Time + Sharpen Time) The Cut Distance divided by the sum of Cut, Dry Haul, and Sharpen times, given in inches per minute. Average Throughput is important because it measures only the cut distance divided by the entire time that the system is in “Auto” mode. It is a realistic average and an excellent means to measure productivity.

NOTE: A metric option is available in which case the distances will be measured in Meters.

Example of CIDB Shift Report:

CUTTER INFORMATION SHIFT REPORT

Shift Report Created : 04/03/97

CUTTER INFORMATION MANAGEMENT REPORT STATISTICS

Report Start	4/03/97 6:00:00
Report Stop	4/03/97 14:30:00
Shift Duration	Days: 0 Hours: 8:30:00
Number of Markers Processed	29

CUT TIME PROCESSING STATISTICS

Operating Times							Non-Operating Times	
Cut	Dry Haul	Bite	Dry Run	Sharpen	Interrupt	Op Total	Prep	Down
221.47	99.06	14.99	0.00	48.64	21.35	408.88	73.07	0.00

Percentage of Operating Time

Cut	Dry Haul	Bite	Dry Run	Sharpen	Interrupt
55.98	24.23	3.67	0.00	11.90	5.22

CUT PROCESSING DISTANCE STATISTICS

Operating Distance (Feet)				Percentage of Total Distances		
Cut	Dry Haul	Dry Run	Total	Cut	Dry Haul	Dry Run
7770.71	2984.75	0.00	10755.46	72.25	27.75	0.00

MISCELLANEOUS CUTTER INFORMATION STATISTICS

Total Automatic Mode Time	384.17	Minutes
Average Cut Speed	400.66	Inches per Minute
Average Throughput	242.87	Inches per Minute
Knife Wear	3372	Sharpens
Knife Life Remaining	-744	Sharpens
Free Disk Space	1042350080	Bytes

Shift Reports Contain the following Information:

Shift Report Created	The day the report was generated.
Report Start and Stop time.	The date and time from which the report has been generated, as well as the length of the shift and the Number of markers processed
Cut Time Statistics	An average of the time values from the Marker reports that are included in the desired shift.
Cut Distance Statistics	An average of the distance traveled by all tools in feet and hundredths of a foot from the Marker reports that are include in the desired shift.
Miscellaneous Cutter Info	Noteworthy system information at the time the Shift report is generated.

Accessing CIDB using Microsoft Access

The Cutter Information Database (CIDB) is compatible with Microsoft Access ’97. This gives users of the C200MT program the option of reading the data with the popular database program by Microsoft. The following is a description of the tables in the database to help the user to interpret the data in the CIDB. Unfortunately writing macros or using other advanced features of the Access program to analyze the data are too complex to be covered in this document.

The CIDB keeps statistics on how individual markers have been cut. The amount of time to setup and cut a marker as well as information about distances is all stored. From the information in the individual markers a shift report can be generated. This information can be used locate slow markers, find weak points in production, or just to keep track of production. We do not recommend that the CIDB be used for payroll purposes. It is also very important that the names of the tables and columns in this report are not translated.

Opening the CIDB with Microsoft Access

Opening the Cutter Information Database with Access is simple. The CIDB is stored in the CIDBACCS.MDB file. This file is located in the C:\report directory. To open the file:

1. Start Microsoft Access.

2. In the menu click on File, Open Database.

3. Use the Open dialog box to find and open the CIDBACCS.MDB file. This file is found in the C:\report directory on the cutter.

4. Relationships must be defined in Access between the Tables to link the information for reports, macros and queries. Writing macros, creating forms, and other advanced capabilities are beyond the scope of this document.

Structure of the Cutter Information Database

Before going into the structure there are a few important details about the CIDB.

- There are no keys actually defined in the CIDB, but they can be added without causing harm to the database.

- All distances in the CIDB are in inches or centimeters. If the C200MT program is set up to use the metric system, the distances will be in centimeters, otherwise it will be in inches. If the cutter was switched from one measurement type to another there will be problems with analysis since there is no indication of which mode (standard or metric) the cutter was in when any particular marker was cut.

- All times other then start and stop times are in minutes and hundredths of minutes. For example 3.75 would be interpreted as three minutes and 45 seconds.

- New tables may be added to the CIDB without causing difficulty. However, adding columns to the existing tables is not recommended.

Tables in the CIDBACCS.MDB database file.

1) MARKER_CUT_INFO – This is the primary table. It contains all the time and distance information for setting up, cutting each marker, how many pieces were cut, etc. This table has the following columns.

a) MarkerReportID (Long Integer) – This is used as the key for this table. Every marker cut has a unique MarkerReportID.

b) StartTimeStamp (Date/Time) – This is the time and date the marker was started.

c) EndTimeStamp (Date/Time) – This is the time and date the marker was finished.

d) OperatorId (Long Integer) – This is a key into the OPERATORS table which contains the name of the operator responsible for cutting the marker.

e) MarkerId (Long Integer) – This is a key into the MARKERS table which contains the name of the marker and the directory it is found in.

f) SetUpId (Long Integer) – This is a key into the SETUPS table which contains the name of the configuration file that is being used and the path it is found in.

g) Status (Long Integer) – This column is not used as of yet, but eventually it will indicate if the marker was completed among other things.

h) FeedRate (Long Integer) – The Feed rate that was set on the cutter to cut the marker.

i) CutTime (Double) – The amount of time the cutter spent cutting with the knife down.

j) DryHaulTime (Double) – The amount of time the cutter spent moving the head with the knife up.

k) SharpenTime (Double) – The time the cutter spent sharpening the knife.

l) DryRunTime (Double) – The amount of time the cutter spent cutting and dry hauling with the dry run option on.

m) BiteTime (Double) – The time the cutter spent conveying the material.

n) DownTime (Double) – The time during processing the marker in which the C200MT program was not running.

o) InterruptTime (Double) – The amount of time during processing the marker that the cutter was stopped.

p) PrepTime (Double) – The amount of time between finishing the previous marker and starting to cut the current marker. Basically the amount of time spent preparing to cut the current marker.

q) CutDistance (Double) – The distance the head traveled with the knife down.

r) DryHaulDistance (Double) – The distance the head traveled with the knife up.

s) DryRunDistance (Double) – The distance the head traveled with the Dry Haul option on.

t) BiteDistance (Double) – This field is not supported at the current time. It will represent the total distance the conveyor traveled while processing the marker.

u) MarkerLength (Double) – Not supported at the current time, but it will represent marker length.

v) MarkerWidth (Double) – Not supported at the current time, but it will represent marker width.

w) TotalPiecesCut (Long Integer) – The number of pieces that were cut while processing the marker.

x) KnifeWear (Long Integer) – Indicates how many times the knife has been sharpened.

y) KnifeLife (Long Integer) – Indicates how many more times the knife can be sharpened.

z) NumBites (Long Integer) – The number of bites that were cut while processing the marker.

2) MARKERS table. This table is used to keep track of the names of marker files as well as what directory they came from. It has three columns which are:

a) MarkerId (Long Integer) – This is the key for the table. All other tables reference this table by this column.

b) PathId (Long Integer) – This is the key into the PATHS table that contains the directory the file is found in.

c) MarkerName (Text) – The name of the marker file.

3) SETUPS table. This table keeps track of the names and paths the configuration files. Its columns are:

a) SetUpId (Long Integer) – This is the key for the table. All other tables reference this table by this column.

b) PathId (Long Integer) – This is the key into the PATHS table that contains the directory the file is found in.

c) SetUpName (Text) – The name of the configuration file.

4) PATHS table. This table stores all the paths of the marker and setup files that have been used since the database was turned on.

a) PathId (Long Integer) – This is the key for the table. All other tables reference this table by this column.

b) PathName (Text) – The complete path including drive letter.

5) OPERATORS table. This table is used to keep track of operator names.

a) OperatorId (Long Integer) – This is the key for the table.

b) OperatorName (Long Integer) – The name of the operator.

6) LOGINS table. This table keeps track of when an operator logs on or logs off.

a) OperatorId (Long Integer) – This column is a key into the OPERATORS table for retrieving the operator's name.

b) LoginTimeStamp (Time/Date) – The time and date the operator logged in.

c) LogoutTimeStamp (Time/Date) – The time and date the operator logged out.

d) TaskId (Long Integer) – The number indicating why the operator logged in. The only option currently available is production.

7) EVENTS table. This table is used primarily by the C200MT to help create the MARKER_CUT_INFO table by keeping track of various events by the operator and the cutter. It is also used to keep track of the operator comments.

a) EventID (Long Integer) – The key for the table. It also indicates the order in which the events were received.

b) Time_Stamp (Double) – The time the event occurred.

c) MarkerReportId (Long Integer) – A key into the MARKER_CUT_INFO table which indicates the report the event belongs to.

d) TimeInfo (Long Integer) – The status of the marker at the time of the event. Possible status values are:

    i) 4031 – Clipping window received
    ii) 4032 – Controller error
    iii) 4034 – Knife Sharpen
    iv) 4035 – Feed rate change
    v) 4036 – Marker started
    vi) 4037 – Marker in process
    vii) 4038 - Marker interrupted
    viii) 4039 – Partial marker report
    ix) 4040 – Marker finished
    x) 4041 – Servo power event
    xi) 4042 – Change in setup

e) Type (Long Integer) – This refers to the type of message in the Message column of this table. Some example values are:

    i) 1055 – PC Error
    ii) 4032 – Controller Error
    iii) 1052 – Operator comment

f) SubType (Long Integer) – Further information about the type of message. A list of values can be found in the Pc_errs.int and Cnt_errs.int files located in the C:\Sysfiles\English directory or the C:\Sysfiles\Native. Pc_errs.int file contains messages for errors detected by the PC and the Cnt_errs.int file contains messages for errors detected by the controller.

g) Message (Text) – A text message left by the operator or the PC.

8) PIECE_TIME table. This table keeps track of when each piece in a marker was started and how much time was spent cutting that piece. This table and the PIECE_M31 table are different from the other tables in that they are emptied as soon as a new marker is opened. The owner of the cutter must create special software or procedures if they want to use this information. The information in this table is only available before the next marker is opened. This table only contains information about pieces which the cutter has already started cutting.

a) PieceNum (Long Integer) – The number of the piece being cut.

b) PieceStart (Date/Time) – The time and date the piece was started.

c) PieceTime (Double) – The number of minutes and hundredths of minutes spent cutting the piece.

9) PIECE_M31 table. This table keeps track of the text messages stored in the M31 messages in the cut file. M31 messages are usually used for labeling information. This table is like the PIECE_TIME table in that it is emptied as soon as a new marker is opened. There may be multiple entries for each piece, and table may also contain repeat data. It is up to the user to determine which data is unnecessary or redundant and eliminate it. This table may contain label information for pieces that have not yet been cut.

    a) PieceNum (Long Integer) – The number of the piece the label applies to.

    b) PieceText (Long Integer) – The text message attached to the M31.

Chapter 8

Mechanical Considerations

Preventive Maintenance

Preventive maintenance is critical for maintaining optimal cut quality and minimizing system down time. Strict compliance to the recommendations set forth in the GERBERcutter Operator's Manual is recommended.

Knife Alignments

Heel to Heel, Knife Offset, and Knife Penetration are critical alignments to maintain cut quality. Refer to the GERBERcutter Operator's Manual for procedures.

Automatic Bristle Cleaning

Excessive buildup of lint and cutting debris in the bristle will deter from the vacuum system performance. Periodic cleaning of the GERBERcutter bristle blocks will ensure peak performance and extend the life of the bristle cutting surface. The S3200 / S5200 / S7200 GERBERcutters can be equipped with an optional Automatic Bristle Cleaner. This device redirects the vacuum to a nozzle which automatically sweeps each slat. Bristle cleaning is an offline operation to be performed at regular intervals when the system is not cutting. The interval will be determined by the type of materials being cut.

The conveyorized S91 GERBERcutters clean the bristle by means of an auger which rotates when the conveyor is in motion.

Chapter 9

Cutting Parameters

Parameter Manager

The GERBERcutter can cut a wide range of materials for many industrial applications. This is accomplished by configuring the system with different parameters such as knife speeds, vacuum levels, sharpening etc. for the specific materials and ply heights being cut. The C200MT control utilizes system configuration files called Setups. These Setup files contain all the operating charectoristics for the GERBERcutter. One specific Setup file can be configured to cut denim for example, and another Setup configured to cut nylon. The GERBERcutter can have as many Setup files as required. Operators select the applicable Setup file for each spread being cut. Parameters are grouped into Categories which are listed on the lower portion of the Parameter Manager screen. Refer to the C200MT User's Guide for listings.

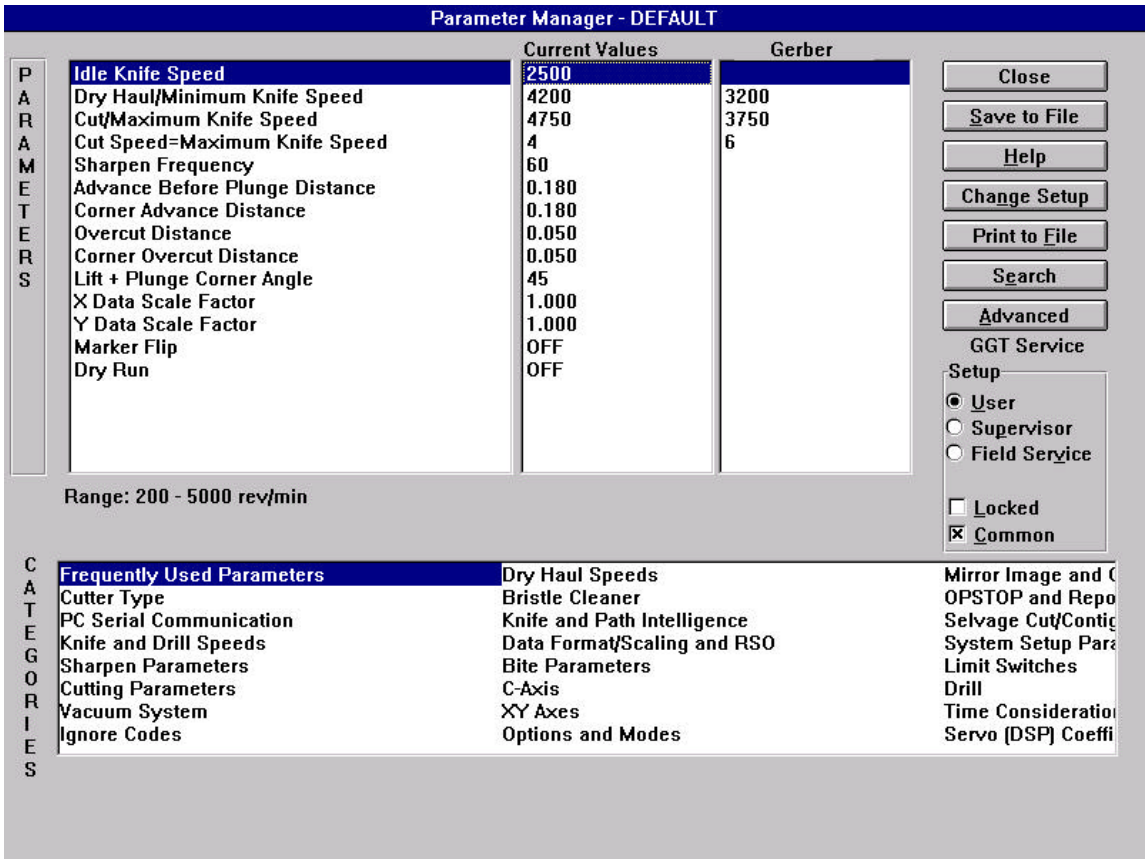


Figure 16: Parameter Manager Screen

Online Help

The C200MT software has a full listing of the parameter descriptions available online. To access the online help, highlight the desired parameter and press the F1 key.

Preset Setup Files

A selection of Preset Setup files is included with the C200MT software to assist new users. Slider bars for Ply Height, Material Hardness, Fusibility and Porosity are positioned by the operator to select the applicable Setup file for the material being cut. The Setups can then be enhanced for optimal performance cutting specific materials with experience.

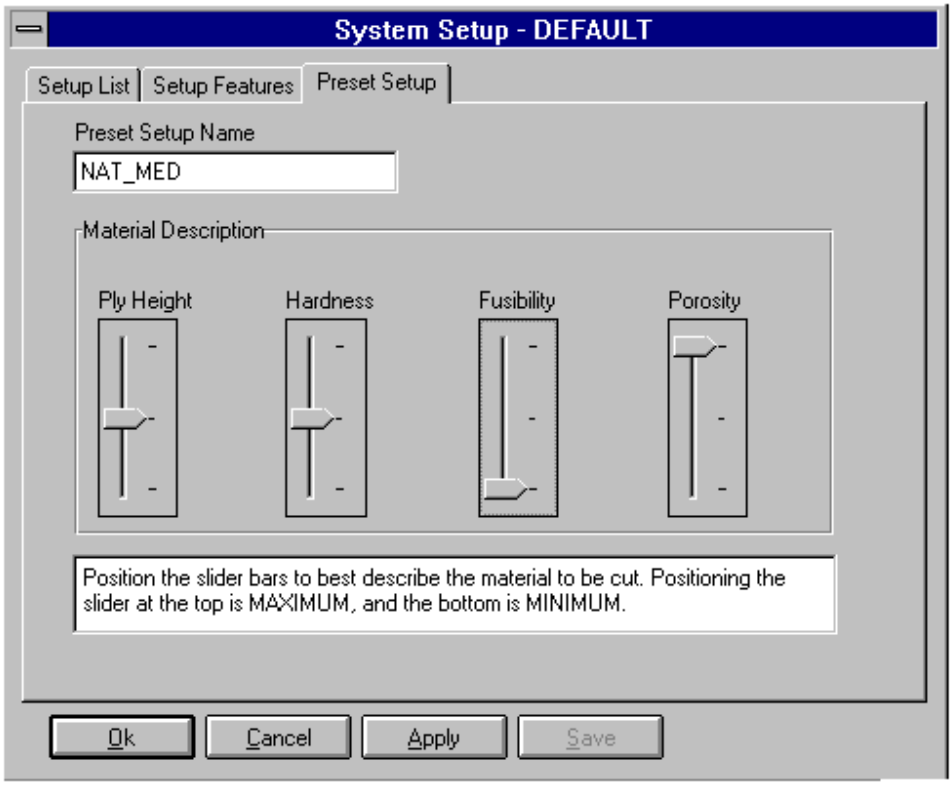


Figure 17: Preset Setup Selection Screen

Passwords

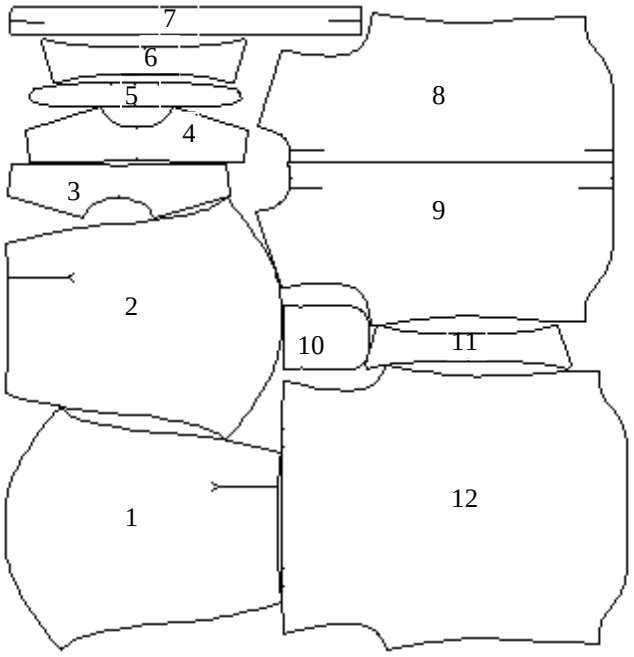
To manage the Setup files, they have been password protected by GGT. Cutter operators are allowed basic access to the parameters that are routinely required for general cutting situations. Management level access is provided to limit the operator's flexibility if desired. Field Service level access includes the parameters at the operator level and allows the configuration of hardware and software options and alignments to the system. Software level is used by GGT Engineering only.

To Print a Setup file:

Setup files can be written to a text (.txt) file for printing off-line.

Cutfile Orientation

A standard cutfile is oriented to start with it's origin in the lower left corner of the spread and cut sequentially from piece number one to the end of the file. Several options are available to alter this basic setup as required.

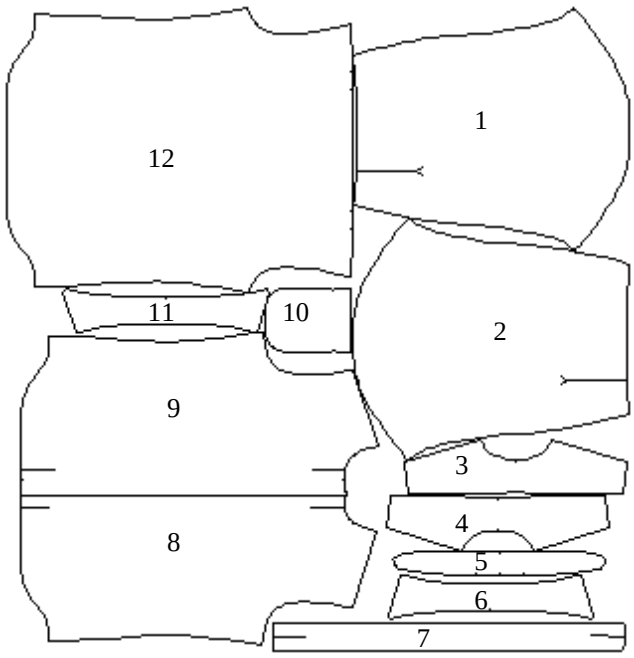


- Origin

Figure 17: Standard Cutfile Orientation

Marker Flip

This feature is useful to cut one way or napped goods that have not been spread with the correct orientation in respect to the GERBERcutter. Once a marker (cutfile) has been flipped, the origin remains in the lower left corner of the spread however, the pieces are cut sequentially in reverse order from the highest number piece down to piece number one. The Run Time Biting utility, or SBITE, must be enabled for this feature to operate.



- Origin

Figure 18: Marker Flip

Mirror Image

This feature can not be used on conveyorized GERBERcutter systems.
The origin will be located in the top right corner of the spread and pieces will be cut sequentially from piece number one to the end of file. Mirroring Option must be enabled.

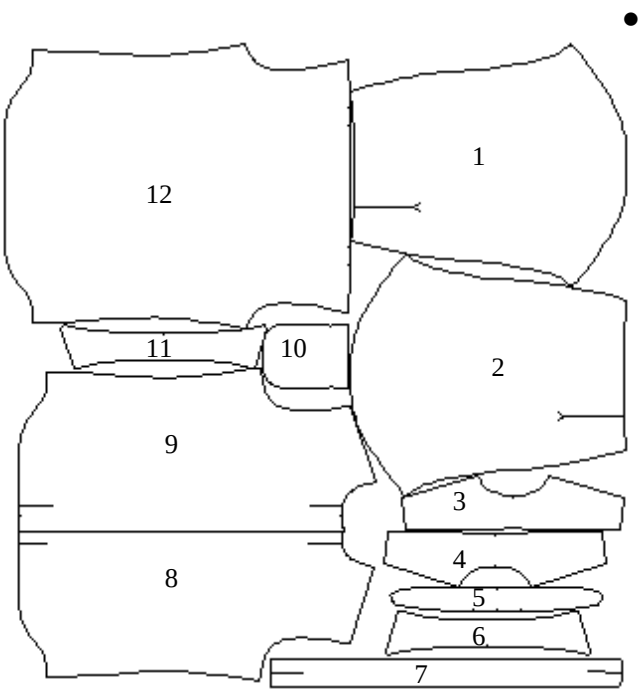
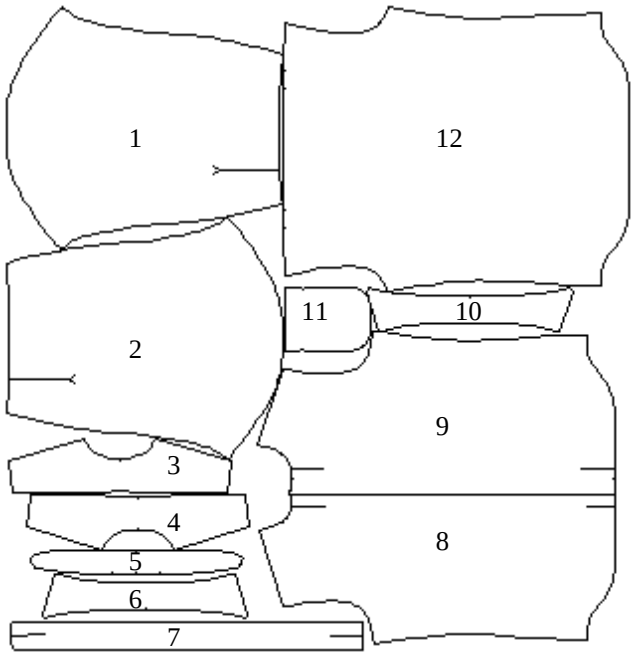


Figure 19: Mirror Image

Y-Axis Mirroring

This feature flips the standard cutfile vertically about an axis parallel to the X-Axis. The origin remains in the lower left corner of the spread and the pieces are cut sequentially from piece number one to the end of file. The Mirroring Option and Mirror Image feature must be enabled.



- Origin

Figure 20: Y-Axis Mirroring

Fabric Alignment

The Fabric Alignment feature can be used to compensate for a spread which is not oriented straight on the GERBERcutter bristle surface. Operator intervention is required on each bite to reconfirm the spread alignment. A limited use of this feature is recommended as it adversely impacts the GERBERcutter throughput. Accurate positioning of the spread maintained by guides on the spreading tables is the preferred solution. Refer to the C200MT User's Guide or Online Help for usage of the Fabric Alignment feature.

Bite Generation

C200MT software has the ability to automatically generate bite data for the conveyorized GERBERcutter. A reference cut, or Bite Clip, is cut in the selvage of the material prior to the conveyor indexing. This is used as a reference point of origin for the following group of pieces (bite). Bite Generation, or Run Time Biting, takes place at the time a file is selected to cut using the bite parameters established in the active Setup file. Bite Generation has three modes of operation: VARIABLE / STATIC / OFF. The Variable mode utilizes the Usable Table Distance in X to cut as large a window as possible without splitting any pieces unless they are longer than the cutting surface. Static bite mode uses the Minimum Bite length and Maximum Bite length to determine whether a piece is cut, split across the bite, or cut in the next bite. Off disables the Biting utility.

C Axis Yaw

Yaw is used to describe a directional variance of the knife from its commanded, C axis position. The units are degrees and a positive or negative sign is assigned relative to the cutting direction (clockwise or counterclockwise). Refer to the GERBERcutter Operator's manual for aligning the C axis yaw.

In some cases on systems equipped with Knife Intelligence, slight negative yaw (-0.50 to -1.00 degrees) can help the cutting system maintain buffers and minimize nicks to adjacent pieces. Caution: Use of this parameter will alter piece size slightly.

C Max Angle

C Max Angle determines what angle is considered a corner or part of a curve. This parameter provides for curve smoothing while maintaining the accuracy of the digitized data. This feature is very helpful when the digitized data has a high point density.

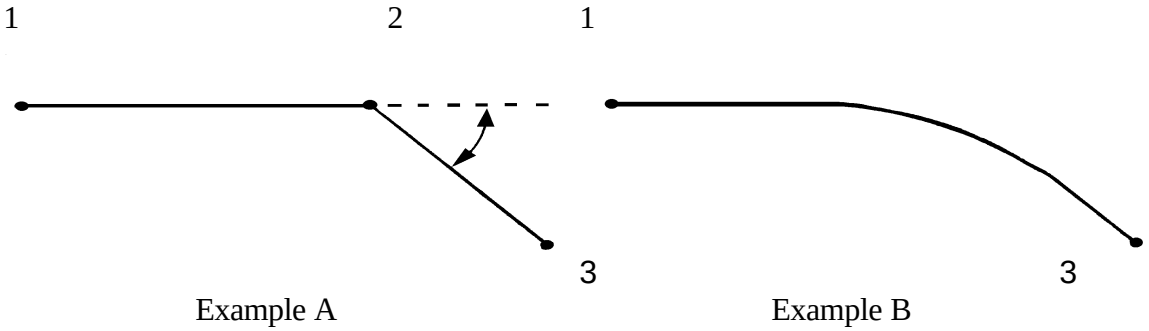


Figure 21: C Max Angle

If the C Max Angle parameter is set smaller than the angle depicted by arrows on Example A, the GERBERcutter will cut from point 1 to 2 to 3 as a corner in Example A.

If the C Max Angle parameter is set equal to or greater than the angle depicted, the GERBERcutter will cut an arc between point 1 and 3 as shown in Example B.

This curve interpretation is performed internally in C200MT software and is not visible in GVIEW or GPP utilities. Deviation between the arc and the original corner point is maintained below 0.5 mm [0.020”]. There is also a visual impact on the cutting process. Arcs cut with a steady velocity rather than the deceleration and acceleration required for a corner.

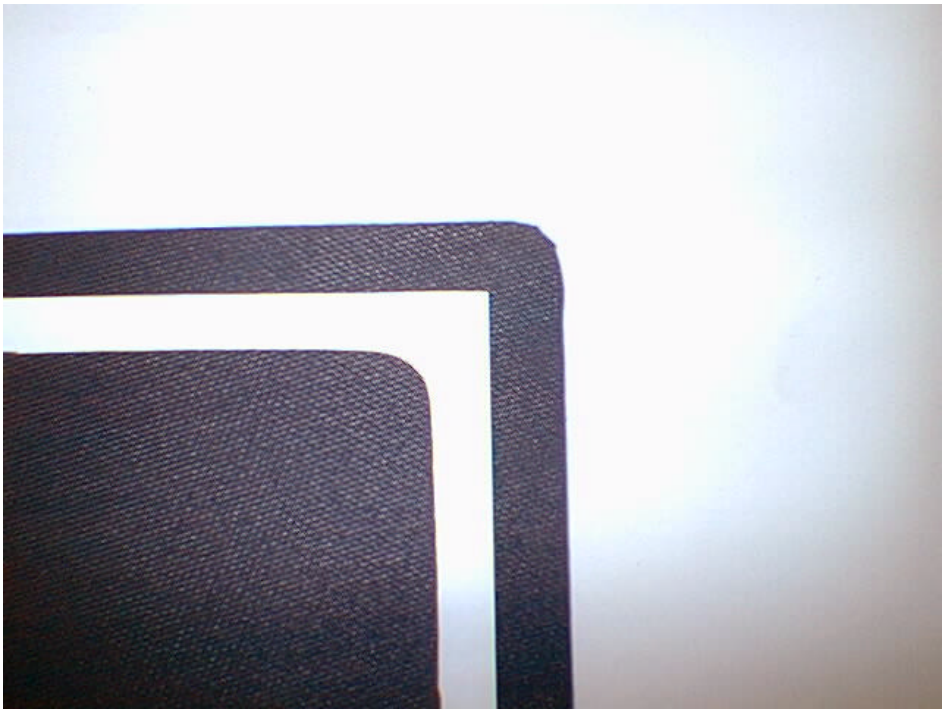


Figure 22: Cut Pieces depicting C Max Angle change

The pieces in Figure 15 were cut on a S3200 out of 4 mm Neoprene (for mouse pads). The cut data was digitized with five, even spaced data points on the 90 degree corners. The outer piece exhibiting flat spots on the curve was cut with the C Max Angle parameter set to the default setting of 20 degrees. The inner most piece with the smooth curve was cut with C Max Angle parameter set to 40 degrees and arcs were automatically created between the digitized data points.

Continuous Cutting

The Continuous Cut option on the S3200 / S5200 / S7200 GERBERcutter systems has been designed to provide uninterrupted cutting while the conveyor is biting. This can provide several benefits to users cutting small parts. The bundling process can be evened out with a steady flow of cut parts onto the take off table. Cutting throughputs may also be increased by eliminating the non cutting period of a standard bite move. Minimum and Maximum Bite Length parameters must be reduced by 50% when using this feature or Offtable errors may occur.

Corner Miter Feature

Mitering of 90° (degree) corners can provide acceptable quality without the requirement for lift and plunges. The Miter feature, when enabled, will make the GERBERcutter execute two - 45° moves instead of a single 90° move on a corner. The Miter Range parameter is to define what corners to apply mitering. Based upon a 90° corner, if the Range is set to 20° - corners between 70° and 110° will cut mitered corners.

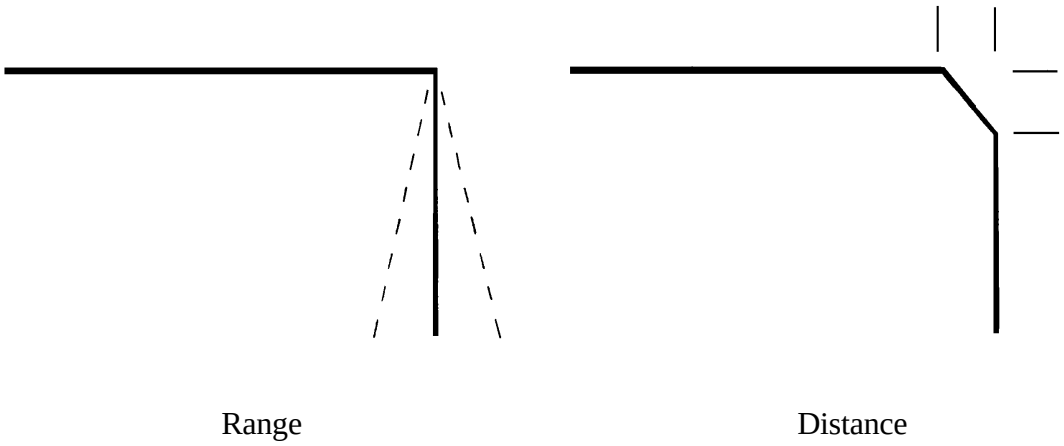


Figure 23: Corner Mitering

Cut Path Intelligence

The Cut Path Intelligence (CPI) option utilizes a sophisticated, real time measurement of the cutting process to optimize system performance. Knife sharpening, vacuum levels and servo motor currents are monitored by software to automatically control the cutting speed.

Sharp Knife Feature

The Sharp Knife feature operates on the premise that immediately following a sharpen cycle, the cutting speed can be increased for a percentage of the distance to the next sharpening cycle.

Low Vacuum Feature

If the vacuum level drops below a preset value, this feature will automatically reduce the cutting speed to ensure quality is not adversely effected. As the vacuum is restored, cutting speed will return to normal.

XY Force Feature

Complete software control of the cutting speed is determined by sensing the load on the servo motors while cutting. This feature is most effective on harder materials.

NOTE: Automatic feedrate control based upon servo system loading (XY force) is not optimum in all cutting situations. Certain materials may be difficult to cut while not significantly loading the servo system. The intricacy of the cutdata will also effect the recommended cutting speeds.

Knife Intelligence

Knife Intelligence compensates in real time for side forces acting on the knife blade. These forces push against the knife blade as it cuts through material, causing the knife to bend. Without Knife Intelligence, this deflection would cause variation between top and bottom plies of pattern pieces in high lays of fabric, especially at curves. Knife Intelligence senses such lateral forces and compensates for them, ensuring uniformity of cut patterns.

The amount of side force depends on type and quantity of material being cut, speed of the knife, and shape of the cut. A sensor (transducer) in the presser foot bowl monitors lateral stress on the blade, providing instant feedback to the computer control. Knife Intelligence then turns the knife in the direction of the force until there is a balance of lateral pressure.

Knife Intelligence becomes a requirement as ply heights increase above 3 cm of compressed material. Generally, as ply height increases » Deflection Angle parameter increases and as material hardness increases » KI Gain decreases.

The normal operating range of the Knife Intelligence parameters are as follows:

KI: Gain	10 to 40
KI: Deflection Angle	4 to 12

To access Knife Intelligence parameters on the C200MT control, select Settings, Parameter Manager. Enter the Category - Knife and Path Intelligence, KI: Gain and KI: Deflection Angle are is listed in the Parameters section.

Knife Wear Compensation

As the knife is sharpened, the width of the knife is gradually reduced. This could result in pieces not being cleanly cut out as the knife wears. To account for this, the number of sharpens are recorded and an adjustment is made to compensate for this wear. The adjustment for knife wear is implemented prior to lifting the knife out of the material (at slit notches, internal cuts, L&P corners and at the end of a piece). The Diagnostic, Display Restorable Info will show the amount of compensation the system is presently using.

The parameter Sharpens Until Overcut Update is used to accomplish this. If this parameter is set to 500, for example, after every 500 sharpens 0.2 mm [0.008”] will be added to the overcut. If an old knife in the system is not completely cutting out pieces, the compensation can be increased by reducing the Sharpens Until Overcut parameter so that more increments of 0.2 mm occur. Similarly, if the overcuts are getting too deep as the knife wears, the parameter can be increased so fewer compensation increments are performed.

Lift & Plunge Angle

The GERBERcutter determines if the knife should lift and plunge at a corner based upon the Lift & Plunge Angle parameter setting. At the default setting of 45 degrees, the knife will turn up to 135 degrees (180 - 45) with the knife remaining in the material. Any knife turn in excess of 135 degrees will result in a lift and plunge corner. This parameter is useful in making global changes to the cutting operation. Increasing this parameter above 85 degrees will have a substantial, negative impact on throughput and may cause the system to lift and plunge inside V notches. Lift & Plunge Angle is typically set from 45 to 75 degrees. If a global change is not required across the cutfile, the insertion of Lift & Plunge points (M46) on the CAD system can provide the opportunity to selectively enhance quality at critical areas with a minimal impact on throughput.

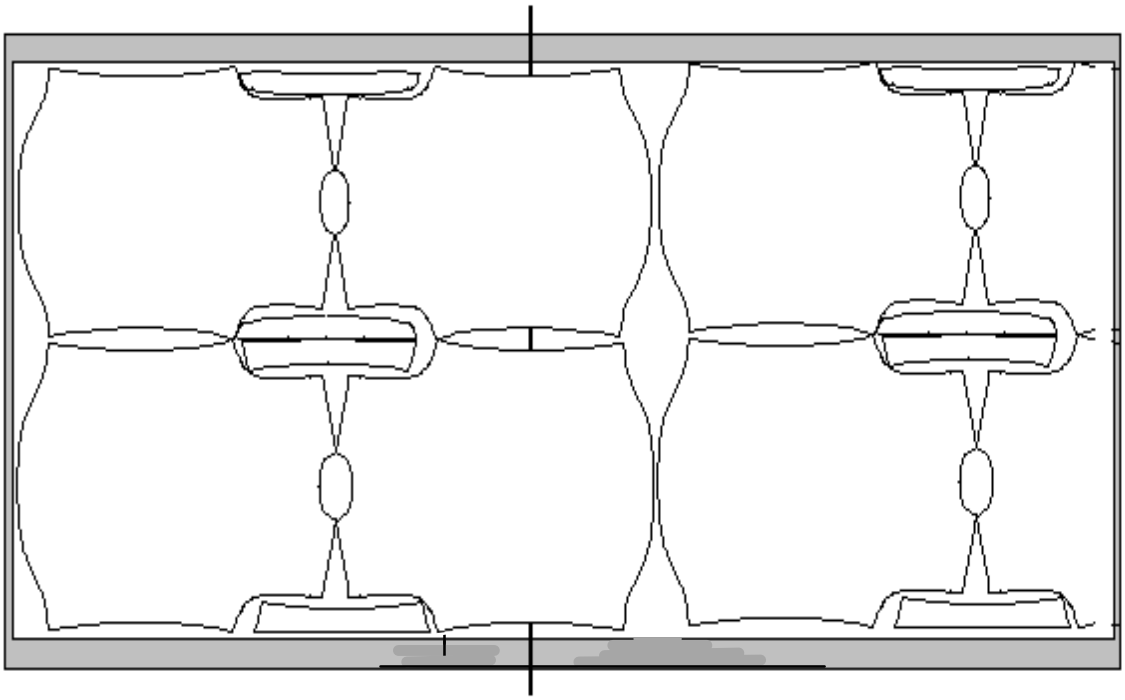
Maximum Cut Velocity

The GERBERcutter controls cutting speed, or feedrate, with a switch (range 0-15) on the beam control panel. Each increment is 1/15 of the maximum cut velocity parameter setting in the current Setup file selected. Many users customize the maximum cut velocity parameter setting. For example, when cutting high ply denim, a manager can set the maximum cut velocity between 1150 and 1400 cpm [450 to 550 ipm] and instruct the cutter operators to cut on feedrate 15.

To access the Maximum Cut Velocity parameter on the C200MT control, select Settings, Parameter Manager. Enter the Category - System Setup Parameters, Maximum Cut Velocity is listed in the Parameters section.

Selvage / Web Cutting

The Selvage and Web cut feature can be used to facilitate scrap removal and simplify bundling operations. Selvage refers to the material outside the -Y and +Y boundaries of the cutfile. The Web is the material in between pieces. After the bite clip is cut, the web of scrap material in between pieces is cut and the selvage edges of the spread are severed.



Bite Clip ^

Figure 24: Selvage and Web Cutting

Vacuum Control

The Vacuum Zoning option is available on the S3200, S5200, S7200 systems. (Standard equipment on the S91 Static and ZVC systems.) By concentrating the vacuum on the table surface in relation to the beam location, vacuum losses can be reduced significantly. The C200MT software will open and close valves to follow the beam and cutting head. Parameters are available to configure this "vacuum footprint", or moving window size. Materials such as fiberfill, foam and fleece are typically cut with no vacuum zoning or the overlap set to ensure three or four vacuum zones are always open. In Parameter Manager, the Vacuum Zoning parameter set to Enable turns on this feature.

Vacuum Zone Overlap

The Overlap parameter is used to prevent the abrupt transition of vacuum from one zone to the next. For example: Assume cutting is taking place in Zone #1 and the Zone Overlap is set to 10 cm. When the knife travels to within 10 cm. of the Zone #1 and #2 boundary, Zone #2 will open allowing the material to compress and stabilize prior to the knife reaching Zone #2.

Vacuum Level Control Feature

This feature allows the user to regulate the amount of vacuum applied to the material. This is useful when cutting low plies or materials which are prone to distortion such as foams. This is accomplished by the use of a valve on the inlet of the vacuum generator. Software control of the valve attempts to maintain a vacuum level set point configured in Parameter Manager.

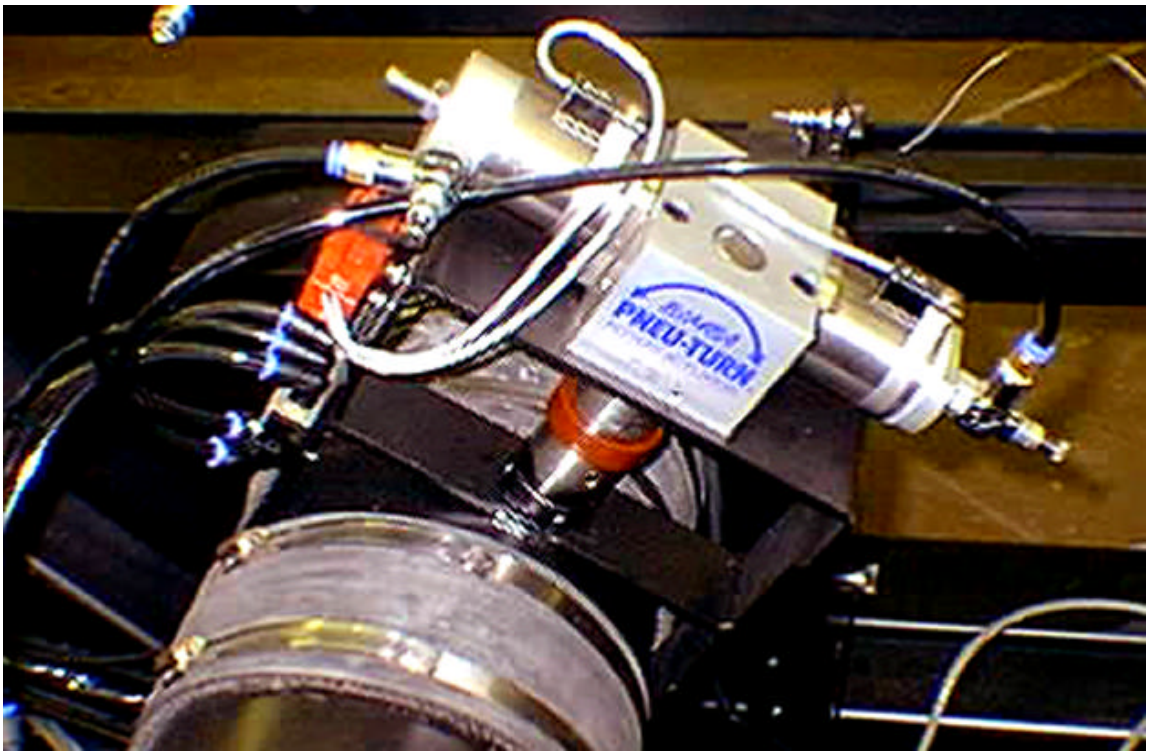


Figure 25: Vacuum Level Control Valve

Vacuum Level Control Parameters:

Vacuum Level Control
Enables or Disables the Vacuum Level Control feature.

Vacuum Level - Bite
Sets the vacuum level the system maintains when the cutter is biting.

Vacuum Level - Cut
Sets the vacuum level the system maintains when the cutter is cutting.

Vacuum Level - Idle
Sets the vacuum level the system maintains when the cutter is idle.

Vacuum Control - Pattern Length
Configures the control signal to the vacuum level control valve solenoid. Increasing this parameter makes the valve cycle faster.

Vacuum Control - Zero Offset
Configures the control signal to the vacuum level control valve solenoid. This parameter is used to align the actual vacuum level to the desired vacuum level set in Parameter Manager.

Vacuum Control - Vacuum Gain
Configures the control signal to the vacuum level control valve solenoid. This parameter effects the sensitivity of the tracking. In other words, how closely the level is maintained at the set point.

To Configure the Vacuum Level Control Feature:

1. Energy Savings Mode should be Enabled. The system can stabilize at a lower vacuum level faster if this feature is used.

2. Vacuum Zoning should be Disabled. Vacuum level control will track more accurately without vacuum zoning. Since the goal is a reduced level of vacuum, the vacuum should be evenly applied to the entire table surface.

3. Adjust the flow control valves on the vacuum level valve. Using the Diagnostic, Set / Read Discreet I/O, toggle the Vacuum level valve open and closed. Set the flow controls so the valve will open and close fully in slightly less than one second. The actual time is not as critical as an even time period to open and to close the valve.

4. In Parameter Manager, set the Vacuum Level - Idle to 3".

5. Initialize the system.

6. Cover the table with plastic cover film and turn on system vacuum.

7. Using the Slew Enable and the Arrow keys or Joystick, move the beam to exit Energy Savings Mode.

8. Observe the vacuum level. Do not be overly concerned if the level is not at 3" at this time. What you should look for is a stable, reduced vacuum level between 2" and 4.5" that is not surging.

9. Vacuum Control - Pattern Length parameter can be increased if the vacuum takes too long to reach a reduced level.

10. Vacuum Control - Vacuum Gain parameter can be reduced slightly to maintain a steady reduced vacuum level.

11. Turn off system vacuum and reconfirm the performance of Vacuum Level Control by starting the vacuum once again.

12. Vacuum Control - Zero Offset parameter can now be increased or decreased so the vacuum level on the gauge matches the 3” setting in Parameter Manager.

13. Set the Vacuum Levels in Parameter Manager to the actual levels desired for cutting and biting and check performance.

Chapter 10

Troubleshooting Cut Quality Issues

A logical analysis of the cut process is required to diagnose quality problems. Consideration of the cutting sequence and cut direction should be noted. Some of the questions you should consider are listed below.

1. Has the same cutfile been cut previously without any problems? This will help to determine if there are any problems related to the CAD data.

2. Has the same material been cut previously at identical ply heights? This could direct your attention to the mechanical condition of the GERBERcutter, i.e. sharpener.

3. Is the proper Setup file in use for the material being cut? Confirm that the proper operator procedures are being followed.

4. Is the vacuum adequate? Filters cleaned? Certain materials require the vacuum system to be functioning at 100%, others can be held stable with only marginal vacuum applied.

5. Is the knife sharp? Preventive maintenance performed on a timely basis? A degradation in the performance will always have a negative impact on quality.

6. Are the mechanical and electrical alignments within tolerance?

Pieces not cleaning out or excessive overcuts

Possible causes: Advance and Overcut parameters, Knife Wear compensation, or Pushing. Cut direction and starting point of the piece must be known to diagnose these problems.

Fusing

Possible causes: Dull knife, Excessive knife speeds, Slow cutting speed, Excessive ply heights. If parameter changes prove unsuccessful, coolant and lubricant options can be explored.

Pushing

Possible causes: Dull knife, Low knife reciprocating speeds, Excessive cutting speed, Insufficient vacuum, Cut piece sequence, Piece location in cutfile, Excessive Presser foot bowl pressure, Excessive ply heights.

Pushing can be identified if the top plies are inaccurate but the bottom plies are good. The optional, Material Stabilizer has proved to be a valuable tool to significantly reduce the possibility of pushing when cutting slippery, synthetic materials.

Nicking Adjacent Pieces

Possible causes: Incorrect mechanical knife alignment (offset or yaw), Material instability, Bite errors, Operator error.

Incorrect Piece Geometry

Possible causes: CAD data, Nesting of pieces, Material instability, Spreading under tension, Stepsize calibration, Beam square, Mechanical knife alignment, Incorrect Knife Intelligence settings, Bent knife.

The first step should always be to confirm the integrity of the CAD data.

Still Having Problems?

Try to separate the problem area to either the CAD data or the GERBERcutter. Remember that the quality obtained in cut goods is directly related to the quality of the CAD data input. In many cases, the mechanical condition of the GERBERcutter contributes to problems in performance. Do not assume that the knife is sharpening correctly, for example, unless you verify the condition of the sharpen stones and belts. With the assistance of your local GGT Service Representative, the mechanical condition and alignments should be confirmed. CAM Applications Specialists at GGTWHQ can provide support by phone / fax or onsite assistance to resolve cutting issues. Contact your local GGT Sales representative or Agent for details.

Appendix A

Performance Estimates

May, 1997

S-3200 PERFORMANCE ESTIMATES

NOTE: The figures listed below represent maximum ply height and cutting speed estimates. They can change dramatically within an application based on fabric types. Please be careful how they are used in R.O.I. calculations, etc.. The table will be updated as necessary.

PRODUCT	PERIMETER	MATERIAL TYPE	ESTIMATED PLY HEIGHT	ESTIMATED CUT. SPD.	ESTIMATED PROD/HR*
SHIRTS	2400 CM	COT/POLY	60	9.0 M/M	1000
JEANS	2100 CM	14 OZ DENIM	20	9.5 M/M	465
SUIT-MEN	5350 CM	WOOL/POLY	30	10.2 M/M	290
SPT.CT-MEN	3050 CM	WOOL/POLY	30	10.2 M/M	510
TROUSERS	2290 CM	WOOL/POLY	30	10.2 M/M	680
INTIM.APPR	825 CM	NYLON/LYCRA	40-50	7.5 M/M	2300
CHILD. WR.	2200 CM	CORDUROY	30	10.2 M/M	710
TEE SHIRTS	1200 CM	SGLE. KNIT	45	11.5 M/M	2200
BALLISTIC APPAREL	2200 CM	WOVEN KEVLAR	20	8.25 M/M	385
SOFT LUGGAGE	3800 CM	CORDURA	20	7.6 M/M	205
GLOVES	600 CM	POLY	20-24	7.5 M/M	1440
ATHLETIC WR.	4500 CM	GORETEX	25	9.0 M/M	250
UPHOLSTERY	7620	POLY/NYLON	18-30	9.0 M/M	140

***: CALCULATED AT 85% MACHINE EFFICIENCY.**

FORMULA FOR CALCULATING GERBERcutter PRODUCTIVITY:

$$\frac{51 \text{ MINS}}{(\text{PERIMETER} / \text{CUT SPD})} = \text{SIZES/HR.} \times \text{PLY HEIGHT} = \text{PRODUCTIVITY/HR.}$$

Productivity can be dramatically affected by factors such as:

- **Length Of Spread**
- **Quantity and type of notches**
- **Drill holes and other internal features**

May, 1997

S-3200 PERFORMANCE ESTIMATES

NOTE: The figures listed below represent maximum ply height and cutting speed estimates. They can change dramatically within an application based on fabric types. Please be careful how they are used in R.O.I. calculations, etc.. The table will be updated as necessary.

PRODUCT	PERIMETER	MATERIAL TYPE	ESTIMATED PLY HEIGHT	ESTIMATED CUT. SPD.	ESTIMATED PROD/HR*
SHIRTS	945 IN.	COT/POLY	60	350 IN/M	1000
JEANS	825 IN.	14 OZ DENIM	20	375 IN/M	465
SUIT-MEN	2100 IN.	WOOL/POLY	30	400 IN/M	290
SPT.CT-MEN	1200 IN.	WOOL/POLY	30	400 IN/M	510
TROUSERS	900 IN.	WOOL/POLY	30	400 IN/M	680
INTIM.APPR	325 IN.	NYLON/LYCRA	40-50	300 IN/M	2300
CHILD. WR.	865 IN.	CORDUROY	30	400 IN/M	710
TEE SHIRTS	472 IN.	SGLE. KNIT	45	450 IN/M	2200
BALLISTIC APPAREL	865 IN.	WOVEN KEVLAR	20	325 IN/M	385
SOFT LUGGAGE	1500 IN.	CORDURA	20	300 IN/M	205
GLOVES	235 IN.	POLY	20-24	300 IN/M	1440
ATHLETIC WR.	1770 IN.	GORETEX	25	350 IN/M	250
UPHOLSTERY	3000 IN.	POLY/NYLON	18-30	350 IN/M	140

***: CALCULATED AT 85% MACHINE EFFICIENCY.**

FORMULA FOR CALCULATING GERBERcutter PRODUCTIVITY:

51 MINS / (PERIMETER / CUT SPD) = SIZES/HR. x PLY HEIGHT= PRODUCTIVITY/HR.

Productivity can be dramatically affected by factors such as:

Length Of Spread
Quantity and type of notches
Drill holes and other internal features

May, 1997

S-5200 PERFORMANCE ESTIMATES

NOTE: The figures listed below represent maximum ply height and cutting speed estimates. They can change dramatically within an application based on fabric types. Please be careful how they are used in R.O.I. calculations, etc.. The table will be updated as necessary.

PRODUCT	PERIMETER	MATERIAL TYPE	ESTIMATED PLY HEIGHT	ESTIMATED CUT. SPD.	ESTIMATED PROD/HR*
SHIRTS	2400 CM	COT/POLY	90	8.9 M/M	1700
JEANS	2100 CM	14 OZ DENIM	36	8.9 M/M	775
SUIT-MEN	5350 CM	WOOL/POLY	60	9.5 M/M	550
SPT.CT-MEN	3050 CM	WOOL/POLY	60	9.5 M/M	1000
TROUSERS	2290 CM	WOOL/POLY	72	9.5 M/M	1275
INTIM.APPR	825 CM	NYLON/LYCRA	72	7.0 M/M	3100
CHILD. WR.	2200 CM	CORDUROY	60	9.5 M/M	1325
TEE SHIRTS	1200 CM	SGLE. KNIT	60	10.2 M/M	2600
BALLISTIC APPAREL	2200 CM	WOVEN KEVLAR	30	7.6 M/M	530
SOFT LUGGAGE	3800 CM	CORDURA	30	7.0 M/M	280
GLOVES	600 CM	POLY	36	6.4 M/M	1950
ATHLETIC WR.	4500 CM	GORETEX	30	7.6 M/M	260
UPHOLSTERY	7620	POLY/NYLON	40	7.6 M/M	200

***: CALCULATED AT 85% MACHINE EFFICIENCY.**

FORMULA FOR CALCULATING GERBERcutter PRODUCTIVITY:

$$\frac{51 \text{ MINS}}{(\text{PERIMETER} / \text{CUT SPD})} = \text{SIZES/HR.} \times \text{PLY HEIGHT} = \text{PRODUCTIVITY/HR.}$$

Productivity can be dramatically affected by factors such as:

- **Length Of Spread**
- **Quantity and type of notches**
- **Drill holes and other internal features**

May, 1997

S-5200 PERFORMANCE ESTIMATES

NOTE: The figures listed below represent maximum ply height and cutting speed estimates. They can change dramatically within an application based on fabric types. Please be careful how they are used in R.O.I. calculations, etc.. The table will be updated as necessary.

PRODUCT	PERIMETER	MATERIAL TYPE	ESTIMATED PLY HEIGHT	ESTIMATED CUT. SPD.	ESTIMATED PROD/HR*
SHIRTS	945 IN.	COT/POLY	90	350 IN/M	1700
JEANS	825 IN.	14 OZ DENIM	36	350 IN/M	775
SUIT-MEN	2100 IN.	WOOL/POLY	60	375 IN/M	550
SPT.CT-MEN	1200 IN.	WOOL/POLY	60	375 IN/M	1000
TROUSERS	900 IN.	WOOL/POLY	72	375 IN/M	1275
INTIM.APPR	325 IN.	NYLON/LYCRA	72	275 IN/M	3100
CHILD. WR.	865 IN.	CORDUROY	60	375 IN/M	1325
TEE SHIRTS	472 IN.	SGLE. KNIT	60	400 IN/M	2600
BALLISTIC APPAREL	865 IN.	WOVEN KEVLAR	30	300 IN/M	530
SOFT LUGGAGE	1500 IN.	CORDURA	30	275 IN/M	280
GLOVES	235 IN.	POLY	36	250 IN/M	1950
ATHLETIC WR.	1770 IN.	GORETEX	30	300 IN/M	260
UPHOLSTERY	3000 IN.	POLY/NYLON	40	300 IN/M	200

***: CALCULATED AT 85% MACHINE EFFICIENCY.**

FORMULA FOR CALCULATING GERBERcutter PRODUCTIVITY:

$$\frac{51 \text{ MINS}}{(\text{PERIMETER} / \text{CUT SPD})} = \text{SIZES/HR.} \times \text{PLY HEIGHT} = \text{PRODUCTIVITY/HR.}$$

Productivity can be dramatically affected by factors such as:

- **Length Of Spread**
- **Quantity and type of notches**
- **Drill holes and other internal features**

May, 1997

S-7200 PERFORMANCE ESTIMATES

NOTE: The figures listed below represent maximum ply height and cutting speed estimates. They can change dramatically within an application based on fabric types. Please be careful how they are used in R.O.I. calculations, etc.. The table will be updated as necessary.

PRODUCT	PERIMETER	MATERIAL TYPE	ESTIMATED PLY HEIGHT	ESTIMATED CUT. SPD.	ESTIMATED PROD/HR*
SHIRTS	2400 CM	COT/POLY	180	7.6 M/M	3000
JEANS	2100 CM	14 OZ DENIM	48	7.0 M/M	800
SUIT-MEN	5350 CM	WOOL/POLY	120	8.3 M/M	940
SPT.CT-MEN	3050 CM	WOOL/POLY	100	8.3 M/M	1350
TROUSERS	2290 CM	WOOL/POLY	120	8.3 M/M	1650
INTIM.APPR	825 CM	NYLON/LYCRA	96	6.4 M/M	3750
CHILD. WR.	2200 CM	CORDUROY	120	8.3 M/M	2300
TEE SHIRTS	1200 CM	SGLE. KNIT	100	8.9 M/M	3750
BALLISTIC APPAREL	2200 CM	WOVEN KEVLAR	50	7.0 M/M	810
SOFT LUGGAGE	3800 CM	CORDURA	50	7.0 M/M	460
GLOVES	600 CM	POLY	48	5.7 M/M	2350
ATHLETIC WR.	4500 CM	GORETEX	48	6.4 M/M	345
UPHOLSTERY	7620	POLY/NYLON	60	7.6 M/M	300

***: CALCULATED AT 85% MACHINE EFFICIENCY.**

FORMULA FOR CALCULATING GERBERcutter PRODUCTIVITY:

$$\frac{51 \text{ MINS}}{(\text{PERIMETER} / \text{CUT SPD})} = \text{SIZES/HR.} \times \text{PLY HEIGHT} = \text{PRODUCTIVITY/HR.}$$

Productivity can be dramatically affected by factors such as:

- **Length Of Spread**
- **Quantity and type of notches**
- **Drill holes and other internal features**

May, 1997

S-7200 PERFORMANCE ESTIMATES

NOTE: The figures listed below represent maximum ply height and cutting speed estimates. They can change dramatically within an application based on fabric types. Please be careful how they are used in R.O.I. calculations, etc.. The table will be updated as necessary.

PRODUCT	PERIMETER	MATERIAL TYPE	ESTIMATED PLY HEIGHT	ESTIMATED CUT. SPD.	ESTIMATED PROD/HR*
SHIRTS	945 IN.	COT/POLY	180	300 IN/M	3000
JEANS	825 IN.	14 OZ DENIM	48	275 IN/M	800
SUIT-MEN	2100 IN.	WOOL/POLY	120	325 IN/M	940
SPT.CT-MEN	1200 IN.	WOOL/POLY	100	325 IN/M	1350
TROUSERS	900 IN.	WOOL/POLY	120	325 IN/M	1650
INTIM.APPR	325 IN.	NYLON/LYCRA	96	250 IN/M	3750
CHILD. WR.	865 IN.	CORDUROY	120	325 IN/M	2300
TEE SHIRTS	472 IN.	SGLE. KNIT	100	350 IN/M	3750
BALLISTIC APPAREL	865 IN.	WOVEN KEVLAR	50	275 IN/M	810
SOFT LUGGAGE	1500 IN.	CORDURA	50	275 IN/M	460
GLOVES	235 IN.	POLY	48	225 IN/M	2350
ATHLETIC WR.	1770 IN.	GORETEX	48	250 IN/M	345
UPHOLSTERY	3000 IN.	POLY/NYLON	60	300 IN/M	300

***: CALCULATED AT 85% MACHINE EFFICIENCY.**

FORMULA FOR CALCULATING GERBERcutter PRODUCTIVITY:

51 MINS = SIZES/HR. x PLY HEIGHT= PRODUCTIVITY/HR.
(PERIMETER / CUT SPD)

Productivity can be dramatically affected by factors such as:

Length Of Spread
Quantity and type of notches
Drill holes and other internal features

May, 1997

GERBERcutter S-91
Estimated Ply Heights and Production Figures

IMPORTANT NOTE:

The figures listed below are to be used as a guide to **estimate** productivity for an S-91. System productivity is influenced by factors such as ply height, type of material, size and shape of pattern pieces, length of spread, spreading method, etc… Please consider all of them when using these figures.

Product/ Material	Estimated Perimeter Inches	Estimated Ply Heights	Estimated Cutting Speed	Estimated Productivity Per Hour
Shirts	900-950	240	200	240 doz
Jeans	750	60 (14 oz)	225	1000 pr.
Men's 3 pc Suit	2300	100-120	225	600 Units/Hr
Men's Sprt. Ct.	1200	100-120	225	1300 Units /Hr
Men's Vest	200	100-120	225	9000 Units/Hr
Men's Pant	900	100-120	225	1300 Units /Hr
Skirts	900-1000	80-120	250	1500 Units /Hr
Bras	325	48-60	200	250 Doz/hr
Shorts	200	80-100	225	360 Doz/Hr
Work Gloves	---	80-100	200	200 Doz/hr
Raincoats	1500	60	250	500 Units/Hr
Blouses	500-600	240	200	350 Doz/Hr
Auto Seat-Fabric	----	30-40	200	---------
Auto Seat- Vinyl	----	24-36	200	---------
**Auto	----	1/8" 24-40	225	---------
Trilaminate	----	¼" 16-36	225	---------
(Foam Backed)	----	3/8" 12-24	225	---------
**Aircraft Composite	----	1-6	300-350	--------
** Woven Kevlar	----	24-30	200	--------

****: TEST CUTTING IS MANDATORY BEFORE ESTIMATING PLY HEIGHTS. ALL HIGHLY COMPRESSIBLE MATERIALS MUST BE APPROVED BEFORE QUOTING.**

Productivity can be dramatically affected by factors such as:

Length Of Spread
Quantity and type of notches
Drill holes and other internal features

Appendix B

GERBERcutter® Input Data Specifications

This section describes the standard input data specifications for the C200B and C200MT GERBERcutter controllers.

All codes and functions listed in this document are currently supported by the GERBERcutter C200B and C200MT programs. In order for the customer to take full advantage of the capabilities of the GERBERcutter, the CAD system should be capable of generating all the proper codes.

Cutting Protocol

1) Case Sensitivity

All letters in GERBERcutter data must be upper case. The controllers will reject lower case letters.

2) N Sequence Numbers

The CAD system should have ability to generate N piece sequence numbers. These sequence numbers are used for part identification. Leading zeros may be omitted from sequence numbers.

3) Hxxxx File Identifier

An H file identifier is required when using a magnetic tape unit. An H file number should identify each complete nest or file . Each marker (file) must begin with a new H number (the H numbers must be ascending and sequential on each tape) to allow a logical search of the data for a particular marker. Files lacking H numbers may not be compatible with all GERBER programs or utilities therefore, it is recommended that an H number be inserted at the beginning of each cut file.

4) Nxxxx Part Sequence Number

An N sequence number should identify each part of a marker or cut file. The N number should be in a block by itself and should precede any data for the piece. The cut sequence is determined by the CAD system, not the cutter.
Drill holes should be inserted on a piece by piece basis and should be executed prior to the cutting of the piece.

5) X and Y Coordinate Data

The coordinate data should be in a 4.2 or 3.3 format, expressed in inches. For the metric system in a 5.1 format, expressed in millimeters.

For example, an X coordinate of 123456 would be interpreted as:

1234.56 inches	4.2 format
123.456 inches	3.3 format
12345.6 mm	5.1 format

Leading zeros should be omitted whenever possible to conserve storage space.

The coordinate data must be in absolute coordinates.

The negative sign must be included when required. Coordinates that do not contain a sign are assumed to be positive.

The lower left corner of the marker (NOT the GERBERcutter 0, 0 position) should be the origin point of all X and Y data. The CAD system should NOT put in a tool offset as this is performed by the GERBERcutter control program.

Data for knife rotation should NOT be included in the cut file. Knife rotation is calculated by the GERBERcutter control program.

The maximum allowable increment of X or Y axis motion with the knife down is 60 inches per block of input data.

6) X, G, and D Commands

A block may contain only one M, G, or D command. Leading zeros should be omitted.

G, D, and some M commands are modal (example: M14, M15). Some M commands are cyclic (example: M43).

The knife up and down commands accomplish the lifting and lowering of the cutting knife. The down position is the cutting position. These M commands are executed prior to any X, Y data in the block. They are modal, meaning they stay in effect until changed by the opposite knife command, another tool command, or next N number is encountered.

M, G, and D commands may be inserted in the same block as an X and Y coordinate.

Example: X1234Y1234M15.

7) End of Block

The asterisk (*) is used to separate blocks of data.

8) Plotting / Annotating

Some GERBERcutters have the means to print part numbers on the plastic overlay that covers the material to be cut. This annotation is made with an optional pen or marker.

Writing is accomplished by generating the appropriate axis motion and pen commands to produce the desired characters.

The CAD system should ensure that the knife is up before starting a pen routine. Likewise, the pen must be up before cutting or drilling.

9) Ignoring Data

Inserting a front slash (/) in the data stream instructs the cutter to ignore the data until the next front slash (/) is encountered. The Block Delete parameter must be set to ENABLE on the GERBERcutter to recognize this command character.

10) Cut Data Example

The following is an example of valid cut data.

(4.2 Data Format)

Data Block	Cutter Action
H1*	Identifies File #1
Nl*	Identifies Piece 11
X5OOY5OOM43*	Execute a drill cycle at this X,Y coordinate
XOYOM15*	Go to this X,Y coordinate with the knife up
XOY100OM14*	Plunge the knife go to this X,Y coordinate
X1OOOY1OOO*	Go to this X,Y coordinate
XlOOOYO*	Go to this X,Y coordinate
XOYO*	Go to this X,Y coordinate
M15*	Raise the knife
MO*	End of file

11) Overcut and Heelcut

The GERBERcutter control programs automatically maintain an operator specified heelcut and overcut (specified by the Advance Before Plunge and Overcut parameters on the GERBERcutter) regardless of blade wear. It is not necessary to add a heelcut at the beginning or an overcut at the end of a piece though the data.

M Commands

MO Program stop. All data previous to the MO is read and executed. Indicates normal end of file.

M01 Optional Stop. Causes the machine to stop processing. Normal processing will continue when the START button is pressed.

M14 Knife down.

M15 Knife up.

M17 Maximum advance. This code causes maximum advance (zero heelcut) . The advance before plunge (heelcut) routine is restored at the next plunge point. Overcut is maintained.

M18 Disable overcut. Advance before plunge (heelcut) is maintained. Overcut is restored at the next M14 or M15 command.

M19 Disable overcut and heelcut (used on slit notches). Heelcut (advance before plunge) and overcut are restored at the next M14 or N number.

M20 Message stop. Causes the next block of data to be displayed on the Operators Control Console (OCC) or computer monitor. The message may be up to 32 characters in length. Example: “M20*TEXT UP TO 32 CHARACTERS*".

M25 Slowdown. Caused the GERBERcutter to process at a reduced velocity. This reduction is variable and is specified by the parameter M25 Slowdown Percentage on the GERBERcutter.

M26 Restore normal velocity. Used after a slowdown command to restore normal cut velocity.

M31 Specifies label data. Used when a cut file contains information for a GERBER top ply labeler. This command is ignored by the GERBERcutter, unless it is equipped with an optional label print head. If equipped with a print head, LABEL mode must be selected for the cutter to recognize the label data. Three formats are supported; fixed, rotational, and mirrored.

M40 Enables automatic sharpening. Allows normal program controlled sharpening. The distance between sharpenings is operator specified by the parameter Sharpen Frequency (in inches) on the GERBERcutter. The controller assumes M40 if no sharpen command is given.

M41 Disable automatic sharpening. Disables controller specified sharpening based on inches cut. If this command is used, the cut file should contain sharpen commands or the operator should manually sharpen the knife.

M42 Sharpen command. Commands the cutter to perform a sharpen cycle.

M43 Drill cycle. Commands a drill cycle at the specified X, Y coordinate. This command is not modal, and must be repeated for each drill hole.

M44 Auxiliary drill cycle. Commands a drill cycle by the auxiliary drill (optional on the GERBERcutter) at the specified X, Y coordinate. This command is not modal, and must be repeated for each drill hole.

M46 Lift and plunge. Commands a lift and plunge at the next data point. This is used to ensure a perfect, crisp corner. This hinders the throughput of the cutter.

M51 Null Knife Intelligence. Commands a nulling of the Knife Intelligence circuitry.

M60 5% velocity reduction. Instructs the GERBERcutter to cut at a 5% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

M61 10% velocity reduction. Instructs the GERBERcutter to cut at a 10% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

M62 15% velocity reduction. Instructs the GERBERcutter to cut at a 15% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

M63 20% velocity reduction. Instructs the GERBERcutter to cut at a 20% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

M64 25% velocity reduction. Instructs the GERBERcutter to cut at a 25% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

M65 30% velocity reduction. Instructs the GERBERcutter to cut at a 30% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

M66 35% velocity reduction. Instructs the GERBERcutter to cut at a 35% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

M67 40% velocity reduction. Instructs the GERBERcutter to cut at a 40% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

M69 Conveyor advance (bite). Used for conveyor systems only. Commands the GERBERcutter to perform a conveyor advance (bite) . The amount of the advance must be specified at the beginning of each cut file by a ZX command. Not required on the GERBERcutter when Run Time Biting is used.

M70 Automatic origin. Instructs the GERBERcutter to make the current head location the origin.

M90 Automatic plaid/stripe match data. Indicates that automatic match data follows. Must be inserted after the N number, before any cut data. Limit of one (1) per piece.

M91 Match relationship. Defines the relationship of a match point to other reference points of other pieces.

M92 End of match data. Indicates the end of plaid/stripe match data.

D Commands

D1 Pen down.

D2 Pen up.

D4 Origin light. Selects the origin light as the current tool.

G Commands

G04 Automatic origin. Should be included in a block containing a X, Y coordinate. Sets the origin to this coordinate.

G70 3.3 Format. Specifies that 3.3 English format is to be used.

G71 5.1 Format. Specifies that 5.1 metric format is to be used.

G91 4.2 Format. Specifies that 4.2 English format is to be used.

Miscellaneous Commands

A Knife up.

B Knife down.

F Set feedrate (velocity). Used in the following format; F1200, specifies the cut velocity in inches per minute. Overrides the feedrate switch setting on the GERBERcutter.

L 25% velocity reduction. Instructs the GERBERcutter to cut at a 25% reduction in cut velocity. Normal velocity is restored at the next N number or M26 command.

R Drill cycle. Commands a drill cycle at the specified X, Y coordinate. This command is not modal, and must be repeated for each drill hole.

Z Bite length identifier (conveyor systems only) . Must be in a block with a X coordinate value. This specifies the length of conveyor advance (bite) to be performed. This must immediately follow the H file identifier.

SUMMARY OF INPUT CODES

*	END OF DATA BLOCK (EOB)
A	KNIFE UP (EQUIVALENT TO M15)
B	KNIFE DOWN (EQUIVALENT TO M14)
F	SET FEEDRATE
H	FILE IDENTIFIER (ILLEGAL IN DATA STREAM EXCEPT ON MAGNETIC TAPE OR AS THE FIRST BLOCK OF DATA ON A DOS MEDIUM)
L	RUN PART AT A 25% REDUCTION IN SPEED (EQUIVALENT TO M25)
N	PIECE SEQUENCE NUMBER
Q	ESTABLISH LIGHT SOURCE AS TOOL (EQUIVALENT TO D4)
R	DRILL CYCLE (EQUIVALENT TO M43)
X	PRECEDES X COORDINATE DATA
Y	PRECEDES Y COORDINATE DATA
Z	BITE SIZE IDENTIFIER (LENGTH OF CONVEYOR ADVANCE)
Dl	PEN DOWN
D2	PEN UP
G04	SET ORIGIN POINT
G70	SET FOR 3.3 ENGLISH DATA FORMAT
G71	SET FOR 5.1 METRIC DATA FORMAT
G91	SET FOR 4.2 ENGLISH DATA FORMAT
MO	END OF FILE (EQUIVALENT TO MOO)
M01	OPTIONAL PROGRAM STOP
M14	KNIFE DOWN (EQUIVALENT TO B)
M15	KNIFE UP (EQUIVALENT TO A)
M17	MAXIMUM ADVANCE OF THE KNIFE
M18	INHIBIT NEXT OVERCUT
M19	IGNORE OVERCUT AND ADVANCE
M20	DISPLAY NEXT BLOCK OF DATA ON OPERATORS CONTROL CONSOLE
M25	RUN PART AT A 25% REDUCTION OF SPEED (EQUIVALENT TO L)
M26	RESUME NORMAL SPEED
M31	INDICATES NEXT BLOCK OF DATA CONTAINS LABEL INFORMATION
M40	ENABLE AUTOMATIC SHARPEN
M41	DISABLES AUTOMATIC SHARPEN
M42	SHARPEN THE KNIFE 1 TIME
M43	DRILL CYCLE (EQUIVALENT TO R)
M44	AUXILIARY DRILL CYCLE
M46	EXECUTE A LIFT AND PLUNGE OF THE KNIFE AT THE NEXT DATA POINT
M51	NULL THE KNIFE INTELLIGENCE
M60	RUN PART AT 95% OF CUT SPEED
M61	RUN PART AT 90% OF CUT SPEED
M62	RUN PART AT 85% OF CUT SPEED
M63	RUN PART AT 80% OF CUT SPEED
M64	RUN PART AT 75% OF CUT SPEED

M65 RUN PART AT 70% OF CUT SPEED
M66 RUN PART AT 65% OF CUT SPEED
M67 RUN PART AT 60% OF CUT SPEED
M69 PERFORM A CONVEYOR ADVANCE
M70 SET ORIGIN AT CURRENT HEAD LOCATION
M90 AUTOMATIC PLAID/STRIPE MATCH DATA FOLLOWS
M91 DEFINES MATCH RELATIONSHIP
M92 END OF MATCH DATA
/ IGNORE DATA (DATA IS IGNORED UNTIL NEXT / IS ENCOUNTERED)

Appendix C

High Ply Denim Cutting

General

The GERBERcutter of choice for high ply denim applications is the heavy duty 91TCW or 91ZVC. These systems can be configured with a 0.125" knife and two piece, four roller, lower roller guides. The stability of the knife guidance and the ruggedness of components make the 91 suitable for multi-shift operations cutting up to 60 plies of 14 ounce denim.

Cutdata

Small Slow feature with a 25% reduction in cut velocity is helpful to maintain accuracy of the small parts without a significant impact to throughput. Small First is generally not required, but is preferred by some users as a preventive measure. A selective use of lift and plunge points can ensure the optimum quality of critical corners used as guides for automated sewing machines. The use of buffering is not globally required, some selective buffering may be desired dependent upon the patterns and quality requirements.

Mechanical Setup

The mechanical knife alignment (heel to heel, offset, and yaw) are critical in this application. Most users set the heel to heel for 9/16", negative knife offset of 1/32", and -0.5 to -1.0 degree C-Axis yaw. This configuration requires that all pieces are cut in a clockwise direction.

Cutting Parameters

The calibration of the Knife Intelligence must be maintained and KI Null performed on a regular basis. Typical KI settings for high ply denim cutting are KI Gain - 10 to 15, and KI Deflection Angle - 8 to 12.

Useful Features

Automatic Piece Reorder - To optimize Cut sequence.
Corner Mitering - To minimize requirement for Lift and Plunge corners.
C Max Angle - To improve quality of corners and v-notches.

Performance Expectations

Typical cutting speeds are feedrates 5 to 8 with overall throughput ranging from 225 to 250 ipm for most users.

Appendix D

Foam And Laminated Foam Cutting

General

While foam and laminated foams are easy to cut, consideration of cutdata generation and the vacuum features of the cutting system is required to optimize ply heights without experiencing piece distortion.

Cutdata

The stability of the laminate (cloth, vinyl, or scrim) often determines the requirement for buffering. Without a stable backing, many foams are prone to compression and distortion due to the vacuum used to hold them securely for cutting. In this case, what appears to be overlaps (or top to bottom ply deviation) in the cut parts is actually material not data induced. True common lines generally do not require buffering, the exception may be on common lines oriented in the Y-axis at a bite boundary. Selective buffering of up to 1/8" total between pieces may be required dependant upon pattern and quality requirements.

Mechanical Setup

Wider plastic cover film is suggested due to the higher uncompressed height of the spreads.

Cutting Parameters

Vacuum Level control feature should be explored to determine the maximum vacuum that can be applied to the material before distortion. Increasing the Zone Vacuum Overlap parameter (or disabling zone vacuum) is often usefull.

Bite lengths on conveyorized systems may be shorter than the usable cutting surface to minimize end loss through the material.

Throughputs can be enhanced by extending the distance between knife sharpening and sharpening only when the knife is up.

Useful Features

Vacuum Level Control

Glossary

- Terms are defined as used by GGT.
- Numbers are listed as if they are spelled out. For example, **5-star matching** is listed as it would appear if spelled out five-star matching.
- All entries are shown in lower case unless capitalization is required.

A

acceleration

The rate at which an object increases speed. Acceleration parameters can be set for several plotter and cutter functions.

AccuMark™

A family of CAD hardware and software products offered by GGT. AccuMark includes pattern making, grading, marker making, and related functions.

AccuPlanner™

A *cut order* planning system offered by GGT. Primarily, AccuPlanner allows users to break down a cut order into marker requirements with or without a marker library, then transfer those marker requirements as a marker order to the AccuMark.

alternate start point

An attribute that directs the GERBERcutter® where to begin cutting a piece. A maximum of four alternative start points is allowed for each piece. The GERBERcutter will select the closest alternate start point as it moves from the previously cut piece.

AM-1, AM-5

CAD systems previously marketed by Hughes Aircraft (AM-1) and GGT (AM-5). The AM-1 was first sold in the late 1970's, and the last AM-5 systems were sold by GGT in the mid 1990's. GGT still trains and supports AM-5 users world-wide.

annotation

Descriptive information plotted on a pattern piece or marker. Annotation may include any attribute known at the time of plotting, for example: name, date, size, associated bundle.

arrow keys

cutter & plotter: Keys on operator control panel used to manually control movement of the beam and head over the plotter or cutter table surface. Usually labeled with an arrow indicating the direction controlled. Also called slew keys.

ascending spread

A spread in which the sequential sections are of the same or greater height. This may or may

not imply cut sequence.

attached marker

A marker which is added to another and which loses its integrity.

Attaching a marker allows pieces in the now combined marker to be repositioned. This is especially valuable when two of the same marker are attached, because one marker can be rotated 180° and the newly merged marker will often be shorter than the sum of the original markers.

attribute

Special characteristic used to describe a point. AccuMark supports three general categories of attributes: point, notch, and cutter.

axis

An imaginary line used to describe movement and location on a plotting or cutting table.

See *X-axis*, *Y-axis*, *Z-axis*, *C-axis*.

B

batch

A processing mode in which several events are processed each after the other.

beam

A supporting, bridge-like device spanning a defined work area generally used to carry a tool holding device such as a plotting head or cutting head.

bi-directional fabric

See *two-way fabric*.

bi-directional step spread

A spread in which the steps may be **both** ascending or descending — either in total ply height or ply height by individual color. Sometimes called a *range spread*. See *step spread*.

bite

1. Programmed movement of material onto a conveyorized cutting table.
2. A portion of a marker, developed for cutting on a conveyorized table, displayed on a monitor.

block

marker making: (verb) Creating an object by grouping several pieces together.

(noun) Synonym for pattern piece.

cutting: (noun) An area of fabric purposely left uncut containing one or more pattern pieces that usually will have secondary operations performed on them (for example, fusing) before being net cut to their finished shape.

block fusing

The process of applying fusing to an irregularly shaped piece of fabric that contains several smaller pattern pieces. Upon completion of the fusing operation, the “block” will be restacked for the net cutting of the pattern pieces therein. The secondary cutting operation may be performed on a GERBERcutter, band-knife or by hand cutting.

block spread

A spread consisting of two or more sections, all of identical height and fabric.

blocking

A function that creates a space around a piece, generally used for pieces that will be fused or die cut. Not to be confused with *buffer*.

book-fold

Fabric which is not in roll form. Often used for high quality men’s suiting fabrics. Must be spread manually.

bristle (Gerber)

A penetrable cutting surface made of nylon or polypropylene which supports sheet materials for purposes of cutting. The surface is made up of bristle blocks of sufficient height to allow an unsupported reciprocating knife to be stroked electrically so as to cause a cutting action to occur to the sheet material positioned on top of the cutting surface.

bristle cleaner

Any of a number of mechanical devices used to shake, comb, and/or suck imbedded cutting debris from GERBERcutter bristleblock.

bristle grid

A support structure used on static GERBERcutter tables to hold Gerber Bristle blocks in place. They are normally sized one foot square.

bristle slat

Usually an extruded metal shape configured to hold Gerber Bristle blocks on a conveyorized GERBERcutter. A series of slats spanning the useable width are affixed to chains on the sides of a GERBERcutter table and make up the cutting surface of the cutter.

buffer

An additional amount of space added to the perimeter of a piece. Buffers may be required because of the type of product, method of cutting used or the material from which the product is made. GGT CAD systems can add buffer to whole pieces, selected sides of a pieces, and in some cases, to selected line segments around critical areas of the pattern piece.

See *cutting allowances*.

bundle

A *bundle* is made up of a stack of cut parts all of the same pattern piece and same size that are cut together. Example: a “bundle” of sleeves, a ”bundle” of collars. Individual pieces from many bundles are assembled to complete a product.

The term bundle may be used for variety of meanings, for example:

- The plies of fabric that are to be “bundled” together from the single stack. Usually either restricted to a single “color” or to a number of plies or both.
- The assembled full stacks associated with a single size or body from a spread.
- The assembled plies that are to be “bundled” from multiple stacks associated with a single “size” or “body” in a spread, usually restricted to a single color, number of plies, or both.

bundle ID

The unique identification of a bundle for purposes of work in process tracking, ease of bundling, or piecework payment. Often included in the annotation on a marker plot.

bundle size

The number of garments in a bundle. It may be fixed, as a “dozen” or 30, etc. In that case, it is often a factor of the quantities ordered by *SKU*. Thus, an SKU total of 120 may be factorable into 10 bundles of a dozen, or 4 bundles of 30.

NOTE: Bundle size may be counted in plies, then converted to pairs, or vice versa.

Bundle size may vary according to spreading ply height only. It may be mixed, as dozens, for example, with overages from 13-23 treated as a separate bundle of 1-11 pieces; or overages may be subsequently assembled into bundles of a dozen, and so forth.

bundler

The person who assembles the cut work from the cut table.

C

C-axis

An imaginary line, usually vertical, perpendicular to the work surface about which a cutting, plotting, or scribing tool rotates.

CAD

NOTE: All upper case. **C**omputer **A**ided **D**esign. GGT CAD systems encompass those activities associated with drafting and grading patterns, marking, and plotting.

CAM

NOTE: All upper case. **C**omputer **A**ided **M**anufacturing. GGT CAM systems encompass the activities associated with cutting fabric.

CAS

NOTE: All upper case. **C**omputer **A**ided **S**preading. GGT CAS systems refer to the spreader product line of GGT Niebuhr.

centralized cutting

A cutting room organized to support more than one sewing room.

CMS

NOTE: All upper case. **C**omputerized **M**anufacturing **S**ystems. The GERBERmover® unit production systems and related products, including IMPACT labor costing and production planning software.

color (fabric)

Included to note the industry use where a *color* can refer to more than one fabric. For example, a jeans vendor may make Navy jeans. The navy fabric may represent several different vendor's color names, such as Navy, Navy Blue, Blue, etc. It may be bought in several widths, weights, etc.

common line

A perimeter line shared by two or more pieces in a marker. The pieces may be joined to limit the requirement that both edges be cut. See cut path optimization.

complete cut

A cut order that has been fully cut. Includes all items.

component

One part of a whole assembly. Usually, a single piece, as in a cuff piece. Sometimes a sub-assembly, as in a "cuff." Sometimes, an entire garment. The vest is a component of the suit.

continuous spread

A spreading technique wherein rolls are fed continuously to the spreader, who will spread from one end of a spread to the other without regard to sectionalization. As soon as the roll has run out of fabric a new roll begins, regardless where the run-out occurs. See *overlap*, *range spread*, *spread through*

coordinate

(noun) An item that must be available simultaneously at the point of sale with another, coordinated, item.

Coordinates necessitate a high order of control in production control and scheduling which sometimes extends to insuring shade compatibility among coordinated garments at a particular retailer. The effect of coordinates is sometimes to force smaller, shade matched orders.

cradle-feed

A type of spreading cart which unwinds fabric by rotating the roll from the outside of the roll (in a cradle), as opposed to the traditional method of unwinding by pulling on the end of the roll (as paper towels are pulled). The result is lessened tension on the roll, better control of edges, and a generally higher quality of spread.

cut

(noun.) A *cut order*. However, if a cutting order calls for more than one spread, the individual spread is often referred to as a cut. Like the term "bundle," it is used many ways.

cut data

A marker data file that has been converted into a file format that tells the GERBERcutter how to cut specific patterns out of a lay of material.

cut-down

A bundle or plies in a bundle which are cut to a smaller size after the initial cut.

Manufacturers of dress shirt often use this to reduce overall cutting costs. For example, if a requirement exists for 100 shirts, 20 of which call for a shorter sleeve length than the other 80, it may be economical to cut all 100 shirts at the larger size, then "cut down" the sleeves only of the 20 shorter sleeve shirts.

cut height

Generally, the limiting height at which a spread can be cut, limited by quality considerations, cutter machine height, or fabric density.

cut order

An order, usually given by a production control department, for the production of an item. One phase of the production is cutting.

The reason it is called a cut order instead of sewing order, production order, etc., is traced to the nature of the ownership of piece goods (fabric.) Literally, if you cut it, you own it. Mills will not take back cut goods.

A cut order contains at least the following information:

- a name for the cut order
- the name of the item to be cut
- the name of the material from which it is to be cut
- the quantity requested
- when it is required to be cut

cut order planning

1. The process of converting a cut order into a set of orders for marker marking, spreading, cutting, and bundling, together with required reports and supporting documentation.
2. Controlling the activities which start with a cut order and end with organized cut parts.

See *marker planning*.

cut path optimization

A highly mathematical analysis of a marker to minimize the length of the cut path taken by an automatic cutter (GERBERcutter). Beyond minimizing the path of the knife to save time and reduce wear, other analyses are available to improve the quality of the cut pieces as well.

cut width

The width of the marker actually used on a spread.

cutable width

The measure of the width of the fabric that may be cut. *Cutable* width is almost always less than the total width of the fabric. It is normally the same or greater than the marker width or "cut width."

Cutable width is often standardized, and becomes the marker and cut width where fabrics can be relied upon to have a consistent width (low width variance and range) over the length of a roll.

Cutable width for a marker may be lower than the cutable width of an individual ply where different width fabrics are spread together.

Cutable width is sometimes defined as a fixed reduction of the purchased or *bought width* less a standard *edge allowance*.

Sometimes bought width is less than cutable width. This is especially true of knit goods which will be wider if relaxed, narrower if stretched.

cutter

1. The person who cuts fabric.
2. The machine used to cut fabric.
3. A cutting contractor.

cutting allowances

marker making: The distance between parts in a marker. Cutting allowances (or buffers) are used to maintain the quality of cutting by minimizing the opportunity for heel cuts, slits caused by the advance of the knife, and sufficient work space for cutting tight curves, notches, and juxtaposed points to lines. Cutting allowances and buffers may vary by cutting machine or method within a factory, and the attribute is important for marker selection.

cutting speed

The speed at which parts are cut. Important to planning decisions where the goals of short cutting time and high marker efficiency may suggest different solutions.

cutting ticket

A document of detailed information used in the cutting department to begin the manufacturing process. In many instances, it has all necessary information regarding the manufacturing of the company product. It details information such as style, sizes to be cut, fabric to be used, number of units to be produced, size range of those garments and the order in which they will be cut.

D

delivery date

Usually, the date a style is slated for shipment to a customer. Very important consideration

when considering alternative styles for production. See *cut and sold report*.

descending spread

The norm for *step spreads*. A spread in which successive section heights are the same or descending.

die cutting

Use of a metal tool (called a rule or die) to cut products by applying pressure from a hydraulic or electronic press. Small die cutting machines are sometimes called clickers.

Traditionally, the most exact method of cutting. Can be wasteful because of *cutting allowances* (buffers) required between cut parts. (Gang dies are an exception). Can be very fast.

Dies are often used for parts requiring exact corner shapes (some collars) or unwavering consistency. Rule dies are heavily used for leather cutting.

disposable, disposables

(noun) Product made for single use or minimal re-use. Often found in the hospital or medical products industries.

Because they are generally made from a process akin to paper-making, “fabrics” exhibit high stability and ease of spreading. They are often spread on super high speed machines to very great depths. *Die cutting* is common due to extreme hardness of the spreads.

drill

1. A tool that makes a mark or hole in the pattern piece which is used to align it with other pattern pieces.
2. An internal mark on a pattern piece.
3. An optional unit that attaches to the cutter head for making drill hole marks.

drill hole

A hole drilled in a spread, sometimes using colored dyes. Usually used to mark a point on a piece where something else is to be attached.

dry haul

The distance traveled by the system tool (plotter pen, knife, drill, etc.) while not performing its primary function (i.e. traveling from one piece to the next in the sequence).

dry run

To execute a cut file without plunging the knife or drill.

E

E-Stop

Emergency Stop — Safety feature included on GGT cutter, plotter, and spreader systems

which, when activated, immediately halts operation of the moving parts of the system.

edge alignment

When fabric is spread on a table the edge of the fabric closes to the operator is expected to be as uniform as possible. This helps assure the maximum cutable width of the fabric.

Good edge alignment is achieved when the edges of all plies are positioned within plus or minus 3 mm (+/- 1/8") of each other. GGT's Niebuhr spreaders offer excellent edge alignment capacity.

edge allowance

The allowed difference between the edge of the marker and the edge of the fabric.

efficiency

marker making: The area of the pattern pieces in the marker divided by the area of the bounding rectangle of the marker.

emergency power switch

A button that when pushed, immediately stops all plotter or cutter motion. *EStop*.

end allowance

The ply of fabric spread that will extend beyond the end of the markers. This allows for the normal shrinkage of fabric due to tension release, or for some pull back from the dynamics of spreading. The allowance may be as low as ¼ inch (rarely) to as much as four or more inches in a sloppy environment. A common allowance is 1-1½ inches per end. The end allowance is usually expressed as the total of both ends of the spread.

Knit fabrics require a greater allowance. Matched plaids will require an additional allowance for matching purposes.

There is also often an allowance between attached markers in spreads. The allowance is from zero to two inches, usually from ¼ to ½ inch.

engineered stripe/fabric

A solid colored fabric with a band of color (or colors) repeated at long intervals.

For example, many knit shirts are designed so that a band of color will always fall across the chest of the wearer, or a upholstery designed so that a print will always fall in the center of a cushion. The fabric has been "engineered" for a specific application. Engineered fabrics exhibit the same properties otherwise as plaids.

Engineered stripes are often cut apart in "body lengths" and manually relayed and aligned prior to manual cutting. This is especially common in better knit shirts.

F

fabric

Cloth made of textile yarns by weaving, knitting, lace making, braiding, netting, or felting from which various products are manufactured.

fabric utilization

A term defining how materials are consumed. Usually expressed in terms of length/unit of measure,typically, yards/meters per garment or dozen per garment. Also known as *material utilization*, *yardage factor*.

Examples: “The fabric is well utilized” (losses are favorable). “Fabric utilization is 13.17 yards per hundred” (consumption per unit).

face

The side of fabric intended to show, as opposed to the back or reverse.

face to face

A method of spreading fabric where the first ply spread and all subsequent odd-numbered plies are face up. Sometimes used to describe “pair” marking.

Always implies an even number of plies of fabric by color. Not to be confused with directionality. Face-to-face spreading may be one-way or two-way.

5-Star Matching

The 5-star matching method uses a plus shaped symbol (+), referred to as a “star” to indicate where matching locations are found. To specify a match location, the user only need to enter a single stripe and plaid repeat value. The system then generates a star (+) at the intersection of every stripe and plaid line, plus it generates a fifth star in the center of every four stars.

flip

Turning “over” of a piece in a marker, as opposed to a rotation. A piece may be flipped about its *x-axis* or its *y-axis*.

An important consideration in planning is to know if the fabric being cut permits pieces to be flipped. Flipping a piece often requires that the pieces associated with it in the marker be flipped also, as in the case of a front and back in a *pair marker*.

floatation table

Fabric may be spread on a table with holes in it through which air is pumped from beneath the table. The resulting decrease in friction permits the finished spread to be moved on the table (usually to a cutting machine).

flow matching

A manufacturing process, often used in the furniture industry to produce products where the fabric pattern appears to float from one piece to another.

folded fabric

Fabric which has been folded in half in the *warp* direction. Folded fabric typically has a cutable width equal to:

- one-half the cutable width of open fabric if the fold is used (See *on the fold*.) **or**
- one-half the cutable width of open fabric, minus the edge allowance if the fold is not used.

Folded fabric is often used in men's suiting for purposes of cutting a single garment. It provides generally good efficiency and ensures the symmetry of the parts cut from both plies.

fuse

A process using heat, pressure, or both to meld one "fusible" fabric into another. Often used to add structural stability to cuffs, collars, chest pieces, etc.

Fusing may be done to an entire roll of goods, to large pieces from which smaller pieces may be cut out, or to cut pieces directly. In the latter case the fusible fabric is often cut to shape.

There may be a fusible marker associated with a shell fabric marker in cutting.

fusible

Any woven or non-woven material that has a glue or other bonding substance applied to its surface. When heated under pressure, it bonds to other fabrics. Fusible is used to change the stiffness or *hand* of the material it is applied to.

G

GERBERcutter®

GGT's numerically controlled cutting machine. The term is used generically to define any numerically controlled cutting machine of the same general type. Note capitalization and registered trademark.

GERBERmover®

GGT's unit production system. A system of workstations networked with a central control and an overhead conveyor, used to transport product components through the assembly process.

Note capitalization and registered trademark.

GERBERplanner™

GGT's high end *cut order planning* system. Note capitalization and trademark.

grade, grading

The process of defining how a pattern grows from size to size.

Garments are designed initially in one size. The other sizes are "graded" from that size. A grade or grade rule defines the movement (direction and length) of the "grade" points defining a pattern shape from size to size. The movement need not be from the same point on another size but can be from a separate grade reference point. Unlike patterns, the human body is far from flat. Grading can be a demanding science

A pattern or style may have a different grade rule assigned to it for a different fabric. While this ordinarily becomes a different style, it is to be considered in the design of a planning system.

grade point

A point on a pattern piece (perimeter or internal) where grading amounts are assigned.

H

half-piece sharing

Putting a piece in the marker once for every two “bundles.”

In many garments, the left and right sides of the garment are asymmetrical. This means that a pattern piece only occurs once for a garment. Also, sometimes a piece is shared by both the left and right halves of the garment, as the yoke on a shirt.

If the garment is being pair marked, either the piece will end up being cut twice too often, or not at all.

The problem becomes complicated if the two sizes sharing the piece are of such different actual ”size” that the shared piece must be cut down for one of them. Thus, the shared piece must be ordered on the basis of the larger of the two sizes sharing it.

heel cut

Cut made by the heel of the knife. The heel is the thickest edge (following edge) of the knife.

I

imperial measure

Measurement using yards and inches.

initialize

To set an assembly, counters, switches, addresses to zero or other starting values at the beginning of, or at prescribed points in, the operation of a computer, plotter or cutter.

interlining

Materials placed between the inner shell (liner) and outer shell of a garment. Often a non-woven fabric used for stability or an insulating fabric or fiberfill.

internals

Non-perimeter lines or points on a marker or piece. For example, alternate grain lines, annotation, or drill holes.

J

JIT

Just **I**n **T**ime — A manufacturing technique which requires a tight relationship between vendors and customers to assure the availability of raw materials in a timely basis, and in minimal quantities replenished as needed; often daily or even more often.

K

knife blade

A device used to cut materials. Can have several shapes and cutting actions. A straight knife is used for reciprocating knife cutting and a roller knife can be used for single ply pressure cutting.

Knife Intelligence™

A patented feature on certain GERBERcutters (S-5200, S-7200, S-91), which measures mechanical forces against the side of the knife as it cuts. If the forces exceed a predetermined level, Knife Intelligence dynamically adjusts the knife's angle of attack to keep it perpendicular to the cutting surface.

L

label

cutting room: A small adhesive backed piece of paper usually stuck to each pattern piece in the lay containing pertinent information about that piece.

labeler

A GGT product which applies an adhesive backed identification label to the top ply of the fabric, centered on the expected location of the top ply of each piece in a marker.

lay

A common term for a *spread* . Also called layup.

lay rule

A set of rules governing the placement of pieces in a marker, having to do with such variables as: plaid and stripe repeats; directionality by piece or bundle or all; flip, tilt, and rotational limits. Definition of a lay rule varies by CAD system.

positional: A Marker contains pieces with positions. The locus of those pieces may be used as a reference for the making of another marker for a similar style or the same style with different sizes or at a different width. A lay rule may be named and retained.

sliding: A marker contains pieces that were placed in a certain sequence, using a certain motion (or Slide). That information can be saved and reused for other similar markers.

length

X direction of the table or marker.

lift and plunge point

An attribute assigned to a point on a pattern piece that forces the cutter knife to lift out of the material, turn to the proper direction and plunge back into the material to continue cutting.

lining

The inner shell of a garment next to the body.

Usually the liner is cut separately. Pattern pieces may be the same or a subset or totally different.

loft

A term describing the height of a fiberfill. A particularly lofty fiberfill has a low density. High loft often translates into good insulation properties or softness. Pile fabrics (velour, corduroys) exhibit this characteristic.

M

manual cutter

A person operating a straight or rotary electric cutting knife, or the knife itself.

marker

1. A group of pattern pieces laid out for plotting, scribing, or cutting.
2. A nested set of pieces usually in a rectangular space.
3. A rule (automotive). In Automotive applications a nested marker is often called a **tool**. It often contains all the pattern pieces of a seat model or combination of seat models for a specific car model.

marker end-allowance

See *end allowance*.

marker height

Number of plies by fabric and color that must be cut.

marker maker

The person who makes a marker.

marker optimization

The act of making a marker as short as possible.

marker order

An order given to a CAD system to make a marker.

marker planning

The process of determining which markers (existing and those to be made) are optimal for a *cut order*.

marking width

The specified width of a marker. Usually equal to *cutable width*.

Sometimes markers are created to be cut in parallel with other markers from the same cloth.

These may have a different width from cutable width.

match cut file

A nested cut file containing matching information about the pattern pieces. It includes matching hierarchy, location of match and reference points, and sufficient buffer around matching pieces to accommodate variations in fabric construction.

match line

In furniture production, a location on a pattern piece that is used to reference or mark the position on the pattern piece where an adjacent pattern piece will be matched in the finished product.

match plaid

A plaid fabric which requires that the fabric pattern pieces be placed to meet matching requirements, usually to a repetitive line or band across the fill of the fabric.

Often limits piece tilt and rotation.

Plaids may be unidirectional or bi-directional, meaning they may also force one-way placement of the pieces and spreading of the fabric. Usually determined by product manager.

Often used with *offsets*.

match point

A point in a pattern used as an aid in placing pieces to insure a match of stripe or plaid (or both). For example, a match point may be defined on a shirt front to which the pocket must align (either on that “repeat” or another.) This assures the plaid or stripe line is straight through the pocket and the shirt.

See reference point.

match-to-fabric point

The landmark or anchor point of the marker. All reference points and match points are located in relationship to the match-to-fabric point. It is normally the first match accomplished in the lay.

maximum spreading height

A limit for the number of layers of fabric laid on a table. Expressed as a number of plies (60 plies) or as a vertical height (7cm). Maximum spreading height can be a function of any of the following:

- the capacity of the GERBERcutter or manual cutter
- the limit for good quality
- the preferred bundle size or its multiple
- the density of the fabric
- the maximum bundle that can be handled after cutting

maximum step height

In a step or range marker there may often be a limit to the difference in marker heights from one section to the next. A GERBERcutter may be blocked by the wall of an ascendant section. More uniform section heights reduce the need to reset cutter controls.

merged marker

Markers are *attached* and pieces intermingled so that the resulting marker is smaller than the sum of the individual source markers.

message stop

A data sequence in AccuMark cut data which causes a GERBERcutter to stop and display a message on the control panel.

metric measure

System of measurement based on meters and centimeters.

Micro

Prefix used for Microdynamics, a former competitor of GGT's whose product line was purchased by GGT in 1993.

model

Also known as *style*, but style generally associated with a whole garment, whereas *model* more often refers to the set of components marked together for one garment. In many cases they are the same as the style.

A style may consist of several models, such as a model of the components consisting of the contrast fabric (blue) in a red and blue ski jacket. The red fabric also has a model for those components. Together they make up the shell of the style. There may be a model for the liner, and a model for the interlining as well.

Mover

Abbreviated form of GERBERmover®, a *unit production system* from GGT.

N

napped

Fabric in which fiber ends have been lifted from the surface, then clipped to a uniform length. Examples of napped fabrics include: angora, flannel, camelhair, and broadcloth.

Napped fabrics must almost always be spread directionally, for reasons of feel, appearance, or interaction with other fabrics (car seats, for example). Some fabrics, such as many woolens, have virtually no nap one can feel, but just enough to alter the appearance (shade or sheen) of the fabric if rotated.

nest

marking: A pattern piece that is drawn to show multiple sizes of the piece stacked on top of each other.

cutting: A group of pattern pieces arranged in a logical sequence which, when assembled, constitute a sewn product.

Niebuhr

A wholly owed subsidiary of GGT located in Ikast, Denmark. Niebuhr produces and sells a comprehensive line of spreading machines worldwide.

notch

A point on a pattern used for matching or alignment to other pattern pieces. Notch types include: slit, external V, internal V, castle, and T .

notch table

AccuMark: A table defining the types of Notches available. A field in Marker order entry

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O

off-line

The status of a printer, plotter or cutter when it cannot process data sent from the computer program.

offset

1. The distance a first pattern repeat occurs from the edge of a marker. Used to assure good centering of plaid or stripe-marked markers. It may be defined as +/- X or Y.

2. The physical distance from the origin light to the tool of the system (Knife, Drill, Pen, etc.).

one-way fabric

Fabric which, by virtue of pattern, nap, or appearance must be spread in one direction only.

on-the-fold

A cutting technique sometimes used in folded fabric, and often used with tubular fabric.

A component in a men’s suit may be cut on the fold if it is not a “paired” piece.

Sometimes a buffer is placed around pieces cut on the fold so that the buffered area may be cut out, the stack re-stacked for edge alignment, and the piece cut. This is because the far edge (folded) of folded or tubular fabric is not *edge-aligned* from spreading.

Tubular knits also afford the opportunity for on the fold cutting on both the front and back (if re-stacked) sides. Parts cut on the fold of tubular goods may have a permanent crease in the center of the piece if a quarter turn device is not used during spreading.

Efficiencies of on the fold marked tubular knits sometimes exceed those of open marked goods.

op-stop

Optional Stop An assigned point on a pattern piece that instructs the GERBERcutter to stop

cutting and wait for operator intervention. Most often with matching.

order

cutting room: The governing document of the manufacturing process. Can be defined as the *customer order* or *manufacturing order*. See *cut order*.

orientation

Piece position relative the marker, and to other pieces associated with the body or size to which it belongs is critical to the final product. Generally, the lay rules associated with a marker control the piece orientation.

origin/origin point

The position of the tool where cutting or plotting begins. GGT default value is 0,0.

ounce (_oz. fabric)

Weight per unit area is often used to purchase certain fabric. For example, 14oz denim weighs 14 oz per square yard. Roll lengths of roll remnants, or even new rolls, can be verified by weighing of the rolls.

Weights of fabric vary considerably by dye-stuff, so variations can be considerable by color. Washing, or other treatments to goods will alter the weight/area.

overcut

cutting: The amount of additional cutting the knife is directed to complete before being lifted out of the cut line. Overcut is added to the pattern perimeter to assure that all fibers are cut, allowing removal of the cut pattern piece from the table.

planning: Quantity of units allowed to be cut in addition to the amount ordered.

See *undercut*.

overlap

spreading: The length of fabric overlapping a section line or a splice lap point at the start or end of spreading. Also, the overlap of the new roll over the end of the previous roll in continuous spreading.

marking: The overlap of pieces in a marker. Overlap may be allowed or not. It may be resolved using an Optimizer or by re-making of the marker.

overlay

Usually the plastic placed over a spread on a GERBERcutter. A GERBERcutter has a vacuum table which, literally, sucks the spread down to give it stability before cutting. The overlay plastic is there to seal the vacuum.

P

parameter table

Specialized form that contains information used to control the performance and operation of the computer program.

pattern

The shape of a piece to be cut in manufacturing is represented by its pattern. Patterns may be hard or digital. One or more associated piece patterns together constitute the pattern for a model.

pattern area

The square measure of the space occupied by the piece or pieces in a model or marker, usually expressed as square inches or centimeters. The space does not include buffers. Internal "holes" are usually included unless other pieces are nested in the "hole."

The total area of the pieces in the marker divided by the marker area is the markers efficiency.

perforated paper

Underlay paper which has been mechanically perforated to produce air flow holes in a specified pattern. Perforated underlay is recommended when cutting material that restrict air flow such as linings, laminates, waterproof outerwear, etc.

perimeter

The outer boundary of an enclosed area.

The perimeter distance of a pattern set or of the pieces in a marker, together with the depth of the spread and the speed of the cutter, can be used to estimate the amount of time a section will require to be cut.

piece

CAD systems: One pattern piece. A single item in a marker. OR One ply of a cut piece.

CAM systems: A component of a cut product. OR An assembled, complete product, usually one of many in a cut order.

pinning

A method of matching pieces to one another. Vertical needles are embedded in pin-table and the pieces of fabric are manually pinned a match points. For example, the start of a particular color bar will always be pinned to a specific needle. Fabric may need to be stretched slightly or compressed slightly to attach properly and yield a match. Excessive stretch or compression will yield a poorly made, and probably unmatched, garment. The pins are removed prior to cutting.

plaid

A fabric with repeating color bands or graphics cross the fill of the fabric at fixed intervals (repeats) in the *warp* direction.

Garments which are made to match the plaid are called matched plaids.

Plaids may also have a stripe line, forcing both stripe and plaid match. Plaids with stronger color in the warp direction are often treated as stripes only. Plaids almost always require restrictive *lay rules* for tilt, rotation, flips, and piece orientation.

plot

(verb) The act of tracing out all the pattern pieces in a marker, the marker boundary, and the marker annotation. Today, almost always mechanical on wide rolls of paper.

(noun) The tracing itself. The plot is usually placed above the finished spread before cutting so that the ensuing cut bundles will have a piece of paper with the bundle ID and appropriate annotation. The plot is often stapled to the top of the spread, with each plotted piece stapled.

plot interval

The distance between marker plots on a roll of plotter paper. Often the same as the interval between markers (sections) in the spread. The interval between markers has great impact on material utilization.

ply

One layer of fabric.

NOTE: Plies are often counted as pairs, meaning the spread sheet must clearly state whether the ply count is in individual plies or pairs.

point

An X (horizontal) and Y (vertical) coordinate in a piece file that identifies an internal or external location. A series of connected points comprise a piece.

power up/power down

To turn a piece of hardware on or off.

purchased width

The nominal width at which fabric is being purchased. Not the same as *cutable width*.

Q

queue

A waiting or holding area from which items are processed. In cutting, a list of markers or cut files to be cut in a specific order or "queue." Queues can also be built of files to processed in a "batch" or in a specific order.

R

re-cut

A *cut order* issued to repair defectives from a previous cutting.

Piece recut is a parameter in the GERBERcutter control which allows the operator to select one piece out of a marker for recut.

reference point

In matching, that point on the control pattern piece to which another piece will be matched.

repeat

The interval between repetitions of the same band of color or a printed graphic on a piece of fabric. Used to define either stripe or plaid intervals for purposes of fabric spreading and marking.

A specific repetition of that band or graphic.

Often defined and used in conjunction with offsets.

roll

A roll of fabric. The normal way fabric is delivered. Usually includes a roll tag identifying the unique roll and its length, width (selvage to selvage), weight, color, etc.

S

scale a marker (or cut)

To make a marker (or cut) wider, narrower, longer, or shorter.

Scaling can occur at the marker, plot, or cut file level.

seam allowance

A seam allowance is the distance from the sewing (seam line) line to the edge of the pattern.

A wide seam allowance in some situations may lead to some “overlap” allowance in marking.

section

A marker in a spread or lay.

self fabric

The shell fabric. OR The primary fabric used in a garment and which distinguishes it from other style/colors.

selvage

In woven piece goods, the tightly woven border area of the fabric. Selvages vary from approximately ¼ to 1inch in width. Measurement from inside selvage to inside selvage is often used for *cutable width*.

A term used to describe the edge of a fabric, regardless of manufacturing technique, which by virtue of damage, unevenness, color, etc. is deemed unusable.

separation tissue

In spreading, a roll of lightweight, sometimes colored paper used to separate layers of fabric.

Bundle separation. Every 24 plies, a “bundle” separation tissue is laid down.

Shade separation. A marked change in shade may be denoted by a shade separation tissue.

servomotor

A closely controlled electric motor used to move the beam, cutting, or plotting head along the X, Y, and C axes of a device, such as a plotter or cutter. By powering the servomotors in one direction or the other in combination with the other servomotors, shapes can be drawn (plotted) or cut in a precise manner.

set-up time to cut

The time required to prepare to cut. Includes such times as:

- Maintenance functions on the cutting device associated with the start of every cutting job.
- Pulling up the spread using the floatation table
- Aligning the spread to the cutting surface
- Marking the start cut point
- Applying overlay plastic
- Clearing the previous cut
- Reviewing paperwork, filling out control forms, auditing cut files for correctness, and other administrative or quality assurance functions

shell

In garments, the outer layer of fabric. Usually the most valuable fabric. Sometimes the term “inner shell” is used as well. Often cut separately from the liner. Assembled separately, then joined to other layers. Sometimes multiple colors or fabrics and colors.

Silhouette

AccuMark Silhouette™ A pattern design system invented at GGT which allows pattern designers to utilize traditional pattern design methods, but supported by computer technology.

A general term in fashion referring to the “look” of a style. An “A-line” dress, for example.

single-ply cutter

A numerically controlled cutter designed specifically to cut one ply.

size

The name associated with a grade of a Model. Size Small, Large, etc.

The set of pattern pieces making up one repetition of a size of a garment. “”how many sizes in the marker?”

A size name frequently refers to multiple dimensions A size 32/30 pair of pants has a 32” waist and 30” inseam.

sizing

A starch-like substance used to give structural body and stiffness to fabric. It will usually be

released in washing and the real structure revealed.

slew keys

See *arrow keys*.

slit goods

A roll of piece goods may be slit to different widths to be subsequently used in bands, loops, fly's, strips, etc. Often used where cutting parts individually in a marker may increase handling costs in sewing more than the possible loss of overall efficiency.

A certain percentage of the fabric may be required to be issued for slitting in proportion to the yardage required for spreading.

splice lap

The amount of fabric lapped over when goods are spliced in spreading. The "allowance" represents an excess beyond the splice point itself.

splice mark

The action of determining the splice points in a marker or plot. OR Marking a table to indicate the location of splice points.

splice point

A set of points actually, which describe the actions taken upon encountering the end of a roll or a defect which must be removed in spreading.

The *last point* which must be covered by the goods already spread.

The *first point* which must covered by newly spread goods.

split piece

marker making: a piece which has been cut in half so that two pieces will exist where one did before, as in the case of a back split into a right and a left. If both are retained they will be larger than the previous single piece because *seam allowances* are added, unless they are to be placed *on the fold* .

spread

To lay fabric from a roll onto the flat surface of a table to a predetermined length and number of plies for subsequent cutting.

One or more attached or appended sections with fabric.

spreader

The person who actually prepares the spread.

spreading cart

The machine under control of the spreader which assists in spreading fabric.

spreading height

The nominal height in inches or ply count to which a fabric may be spread and cut. Usually limited by the cut height.

spreading machine

A device used to lay fabric onto the surface of a table in a tensionless, edge-controlled manner. The machine is employed to feed and guide the fabric in such a way that no distortion will occur as a result of the operation. Spreading machines are classified as manual, semi-automatic, and fully automatic. The vast majority in use are semi-automatic, usually carrying a rider who controls the spreading operation as to speed and flaw management.

spreading speed

The speed at which fabric can be spread. It may be a simple measure of average of overall throughput, as in yards per hour, or a more detailed calculation based on the spread plan, including consideration of set-up time, turns, accelerations, matching, fabric stretch characteristics, fabric weight, length of spread, *roll change allowances*, etc.

standard matching

Standard matching uses horizontal and vertical lines to determine matching locations. These lines are based on stripe/plaid repeat and offset values.

start point

Location on a piece where cutting begins.

step spread

A spread which has sequential sections which have the same or fewer plies than the preceding section.

storage area

AccuMark: The logical location of a markers and related data on a computer system.

fabric: The warehouse location of a fabric.

stretch

The characteristic of fabric to lengthen when pulled. It may also narrow or twist when pulled.

style

One or more *models* which are required for a finished garment. OR

The name of the garment we are requesting in a cut order. OR

A field name cross referenced throughout the cut planning database.

swatch

A small piece of fabric cut off the end of a roll and used for purposes of shade matching or other quality assurance measurements

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T

table length

The overall length of a cutting table. OR The maximum length allowed for a spread. OR The space available on a table for a spread.

tension

The nature of fabric manufacture, especially knits and stretch woven fabrics leaves “tension” in the long woven or knit fibers. After cutting, the tension is relieved in the pieces and there is a tendency then for them to shrink or re-shape. To offset this problem, fabrics that are tension-prone are often spread one day, allowed to “rest” overnight, then cut the next day. Sometimes the individual sections will be separated by cutting on the section lines immediately after spreading.

The second technique is to attempt to relax the fabric while spreading it. Specialized spreading machines are available for knit fabrics which either minimize imparted tension or even have positive actions to relieve the tension.

Woven fabrics which have a similar problem can have the inherent tension relieved by a process called “ripping,” or “tearing” where the selvage of the goods is cut periodically. The fabric will then more likely lay flat

It is difficult to predict the amount of relaxation a spread will have because of issues of:

- tension from the spreading cart.
- inconsistent tension from knitting process.
- effect of depth spread.
- variations by color.
- environmental factors.
- friction at table surface.

tool (automotive)

A marker is called a Tool in the automotive industry. Think of tool as in “tool” and die.

top ply labeler

See *Labeler*

trim cut

A cutting of the perimeter and ends of a spread to facilitate the subsequent cutting of the parts themselves. May also include separating sections

tubular goods

Tubular goods are goods knit on a circular knitting machine. The finished product is a tube with a helical “warp”

The width of tubular markers is generally defined as ½ the purchased width of the fabric. That is, a 30” tube is 15” in width.

Tubular fabric is sometimes opened on a special device and then cut as open goods. Sometimes goods are slit directly in a helical cut from tubular goods.

U

underlay

The paper under a spread, separating the spread from the spread table. Used to:

- Reduce potential damage to the first layer of fabric from movement of the final spread
- Reduce friction to enable movement
- Protect the fabric from the bristle surface of the cutter
- Protect the pieces from the cutter's vacuum.
- Keep the first ply clean

See *perforated paper*

unit production system

A system, such as GGT's GERBERmover, which conveys fabric pieces in a production environment one unit at a time. The "unit" is constrained to one or more pieces which will ultimately be sewn or processed together.

A system which minimizes work in process requirements, improves quality, and maximizes through-put in some sewing or finishing factories.

V

vacuum generator

An electric motor and turbine used to create a vacuum to hold material firmly on the table work surface during cutting.

vacuum resealer

An optional device used on GERBERcutters to preserve vacuum during the cutting operation. Usually consists of a heavy plastic *overlay* that is carried by the beam over portions of the lay already cut. It "reseals" the already cut surface to maintain vacuum levels.

vacuum table

The table on which a GERBERcutter cuts.

A table with a large vacuum and a bristle or otherwise porous surface which sucks a spread down prior to cutting.

vacuum zone

A portion of the cutting surface of some GERBERcutters. The cutting surface is divided into a fixed number of zones with software driven valves that open or close depending on the location of the beam carrying the cutting head.

variable bite

GERBERcutter bite lengths that shift to assure pieces are cut in their entirety.

Variable Speed Knife Control (VSK)

A GERBERcutter feature used to prevent fusing during cutting. The reciprocating speed of the knife is automatically kept in proportion to the forward motion of the knife. As the forward motion is slowed to turn corners or cut notches, the reciprocating speed is slowed proportionately.

velocity

The rate of speed at which an object moves, expressed in inches per second (IPS). Velocity parameters can be set for plotting, annotation, paper advancing, scribing and cutting.

W

weight

fabric: the weight per unit area. Especially used for knits, which are often purchased and/or allocated by weight.

width

Y direction of the table or marker.

See *cut width , marker width , fabric width*

width loss

The difference between the *cutable width* of a roll and the actually cut width. A roll cut at 60 inches, but cutable at 60½ inches has a ½ inch width loss.

Sometimes measured between the anticipated cutable width based on a purchased width, and the actual cutable width or actual cut width.

For example, we can buy 62 inch fabric expecting to cut it at 60-inche, but the rolls may be coming in cutable at 59-inch. The width loss is 1”. If some rolls are cutable at only 58” we can elect to cut all the fabric at 58” or some at 58” and the rest at 59”.

X

X-axis

The horizontal axis on a computer screen, spreading or cutting table. Movement to the left is negative and movement to the right is positive. Normal data flow is from the negative toward the positive side.

In the cutting room, the X-axis is normally considered to run the length of the spreading or cutting table, horizontal to the long edge.

X direction

The *warp* direction of the piece goods (along the length).

in the X direction is generally at the Left end of a marker as viewed by the cutter. 0.0/0.0 is the lower left hand corner of the marker.

Y

Y-axis

The vertical axis on a computer screen, spreading or cutting table. Movement down is negative and movement up is positive. In the cutting room, the Y-axis is normally considered to run across the spreading or cutting table, perpendicular to the long edge.

Y direction

In the *weft* direction of the piece goods (across the width).

In the Y direction is along the bottom edge of the marker.

Z

Z-axis

Z-axis measures the up and down motion of a tool such as a pen, knife, or drill. For example, the length of a reciprocating knife stroke is measured in the Z-axis.