Rotary clipper school

14 December, 2006

Raute Controller, 24 GPM Servo Proportional Valves

RAUTE

COURSE CONTENT

Section	Topic
1	*SAFETY*
2	*DESCRIPTION*
3	*CLIPPER THEORY*
4	*OPERATION*
5	*MAINTENANCE*
6	*TROUBLESHOOTING*

Tags

CONTROLLER

- O — Durand (old)
- N — Raute (New)

AREA

- M — Mechanic
- E — Electric

LEVEL

- 1 — General
- 2 — Advanced

RAUTE

Section 1

SAFETY

GENERAL

References:

- Plant safety procedures
- Clipper Manual - Section 1

SPECIFIC

Critical points:

- Hydraulic Power Unit (Knife & Rolls)
- Conveyors and hold-downs

Non critical points:

- Controller cabinet power

Section 1

SAFETY

IMPORTANT:

The safety procedures described in the following pages are intended only to highlight some specific points regarding the Rotary Clipper and are not meant to replace nor substitute, in any case nor to any extent, any other safety procedures applicable, whether issued by the mill or by any other local, federal or otherwise relevant authority.

In case of conflict or contradiction between the recommendations contained in this document and those emanating from these authorities, the latter will take precedence.

RAUTE

GENERAL PROCEDURES

MAIN POINTS

1. DO NOT OPERATE NOR SERVICE ANY MACHINERY UNTIL YOU GET THE APROPRIATE TRAINING TO DO SO.
2. ALWAYS USE SAFETY GEAR: HIGH VISIBILITY VEST, HARD HAT, SAFETY GLASSES, EAR PLUGS AND STEEL TOE SHOES.
3. LOCATE AND KNOW HOW TO USE THE EMERGENCY STOP BUTTONS.
4. LOCK-OUT ALL SYSTEMS AS REQUIRED, BEFORE SERVICING ANY MACHINERY OR ENTERING ANY HAZARDOUS AREAS.
5. REFER AND COMPLY WITH PLANT SPECIFIC SAFETY PROCEDURES.

RAUTE

SPECIFIC PROCEDURES

MAIN POINTS

1. SHUT OFF AND LOCK-OUT HYDRAULIC PUMP
2. CLOSE SHUT-OFF VALVE AT THE HYDRAULIC TANK
3. TURN OFF CONSOLE POWER
4. TURN OFF ELECTRONIC CONTROLLER POWER
5. LOCK-OUT INFEED CONVEYOR
6. LOCK-OUT HOLDOWN BELTS
7. LOCK-OUT OUTFEED CONVEYOR
8. DISCHARGE ACCUMULATORS

ALL SYSTEMS MUST BE AT ZERO ENERGY STATE

HYDRAULICS LOCK-OUT

MAIN SWITCH LOCKED OUT

SHUT-OFF VALVE CLOSED AND LOCKED OUT

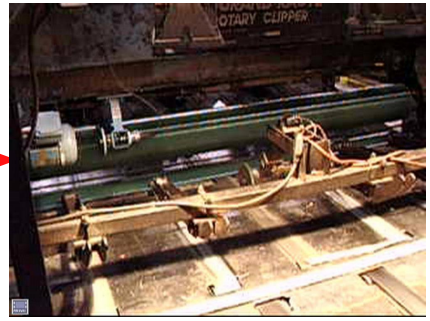
ONLY WITH NEW RAUTE CONTROLLER

DISCHARGE VALVE CLOSED AND LOCKED OUT

MECHANICAL LOCK-OUT

MAIN SWITCH OFF AND LOCKED OUT

IN-FEED LOCKED-OUT



OUT-FEED LOCKED-OUT

HOLD DOWN AIR VALVE CLOSED

HOLD DOWN LOCKED-OUT

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Section 2

DESCRIPTION

CLIPPER FRAME

Knife Subsystem

Anvil rolls

HYDRAULIC UNIT

General view

Controls

CONTROLLER

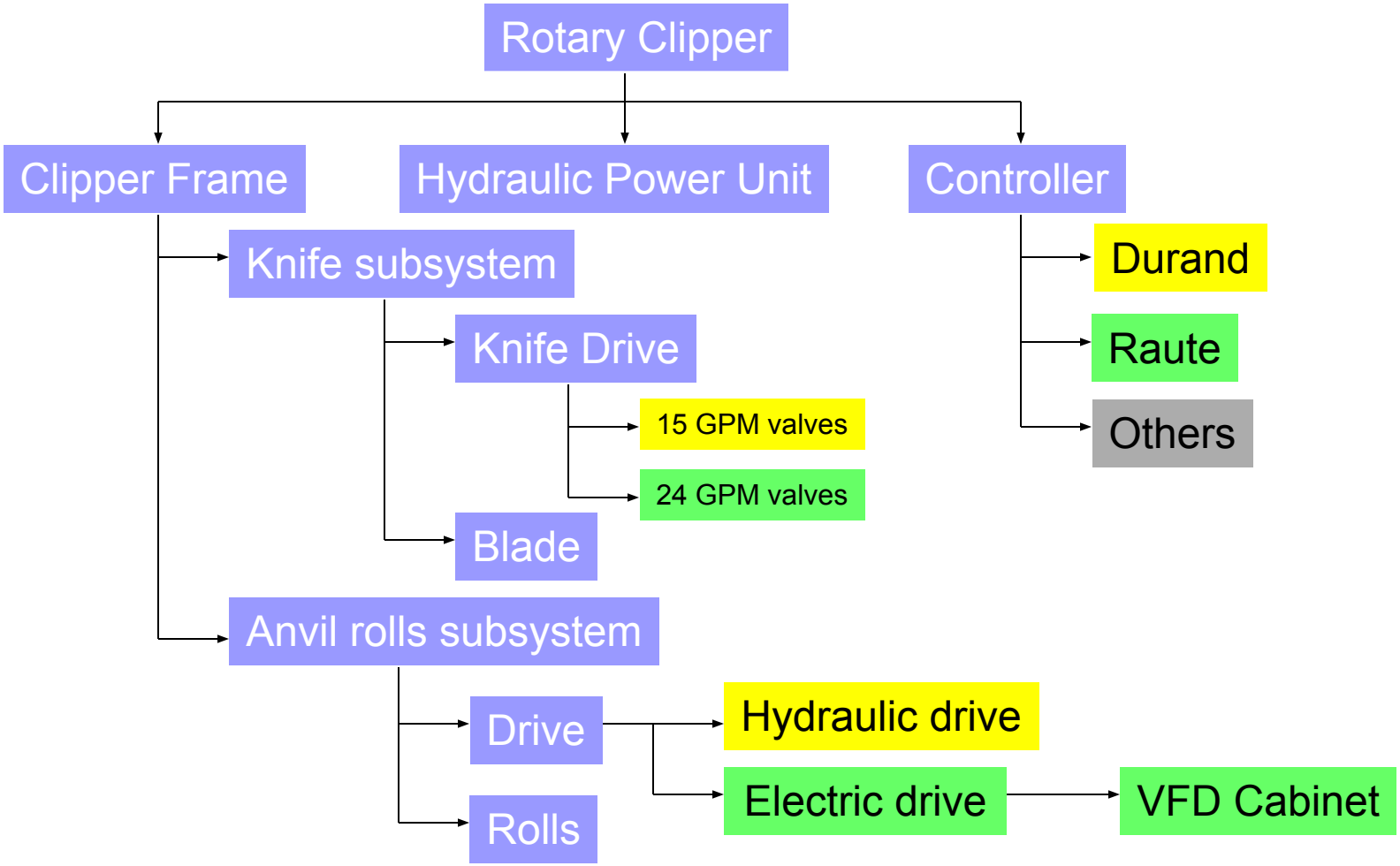
General views

Basic wiring

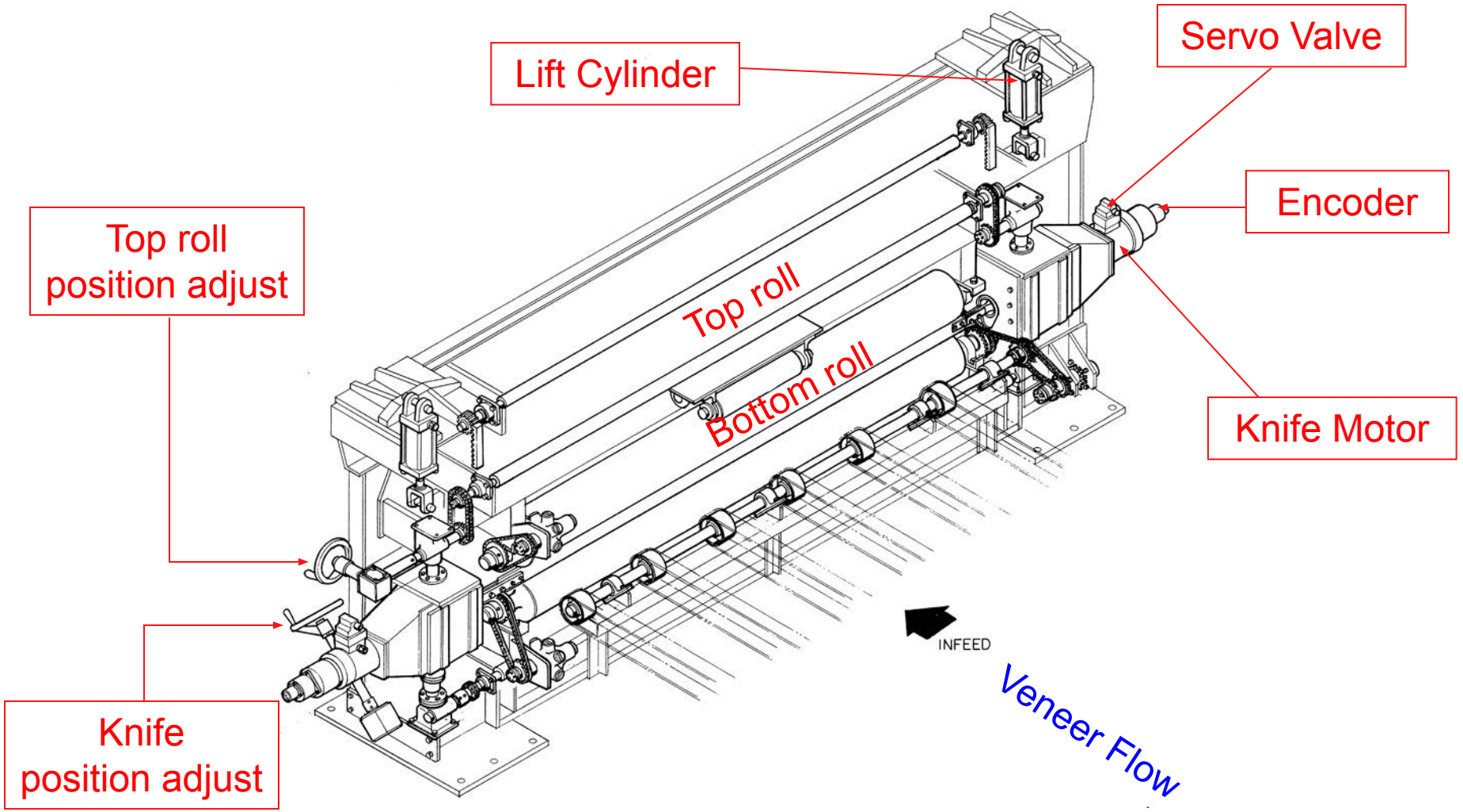
CONTROL LOGIC

Hardwired logic

CLIPPER VERSIONS

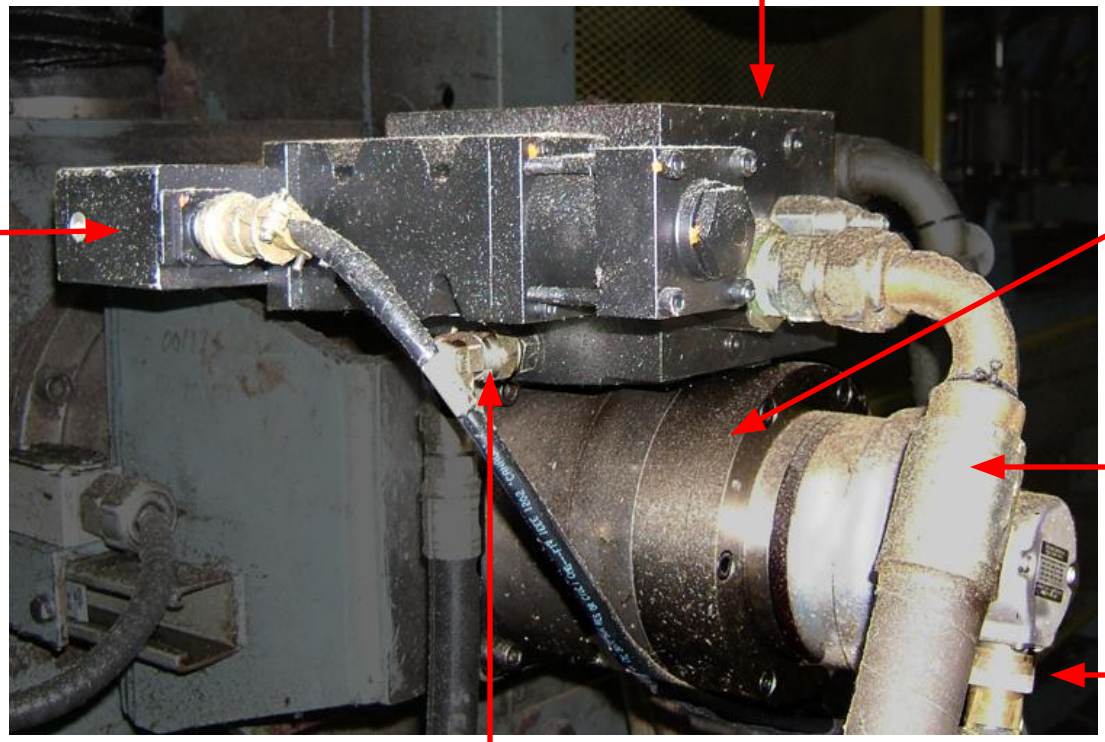


CLIPPER FRAME

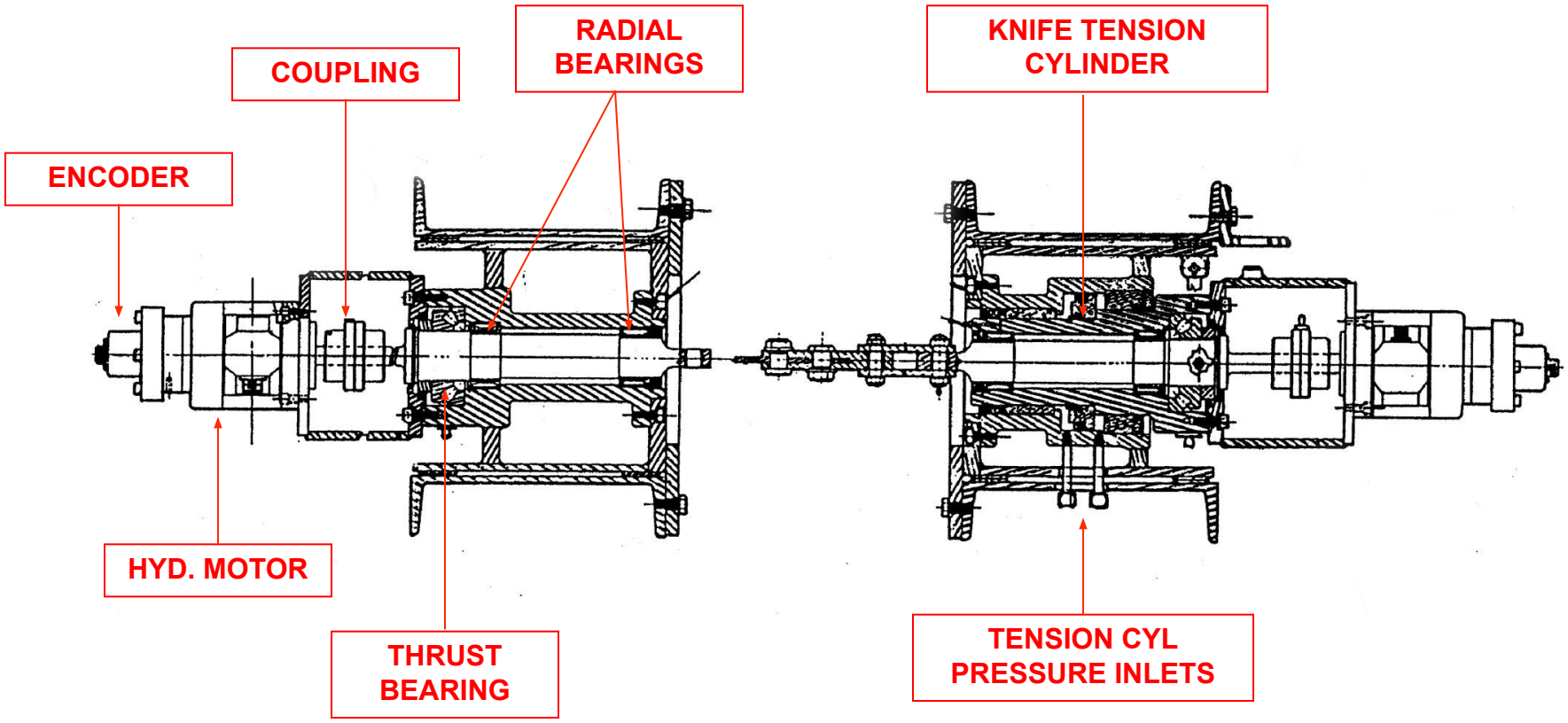


RAUTE

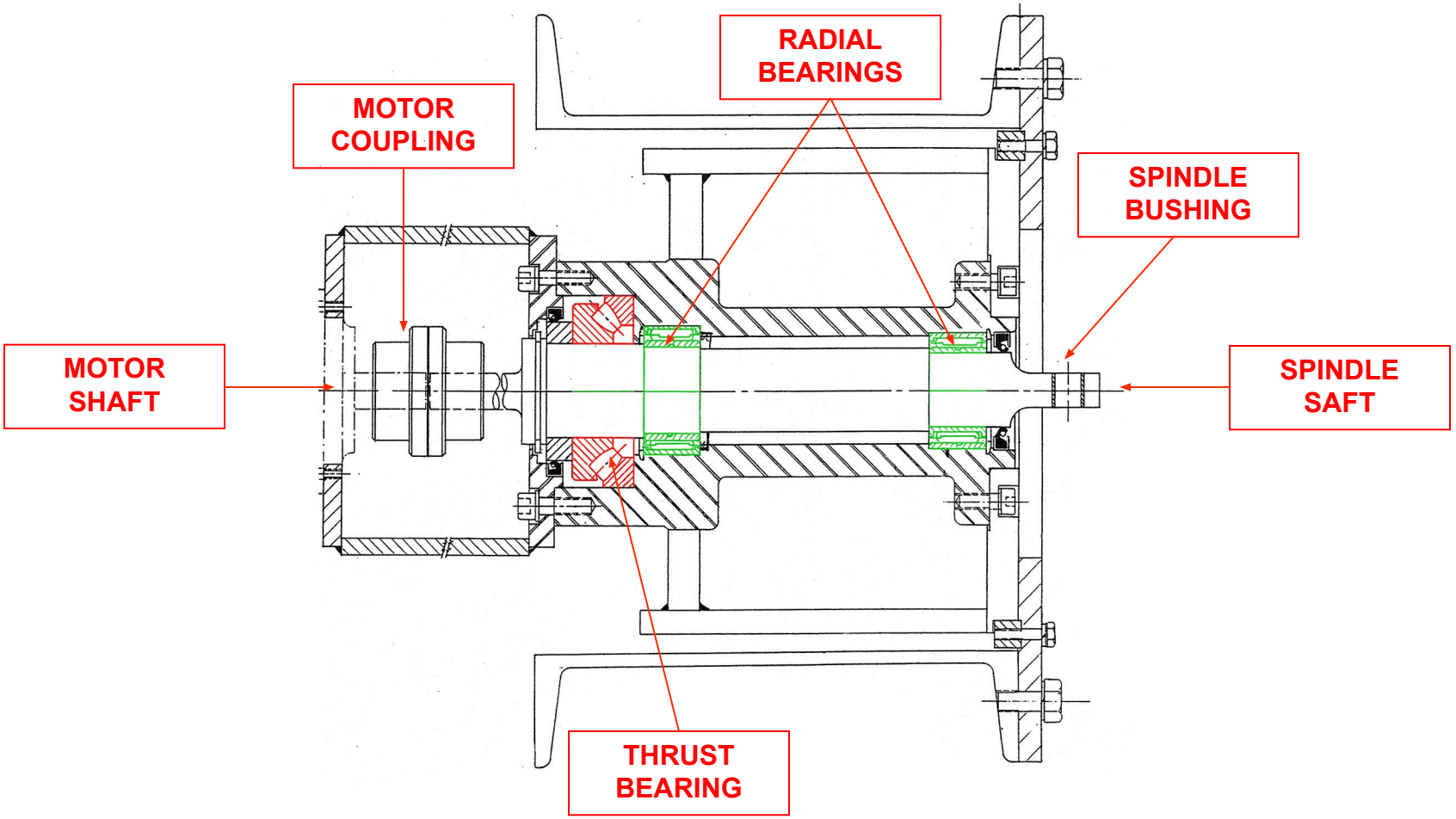
UPGRADED KNIFE DRIVE (24GPM)



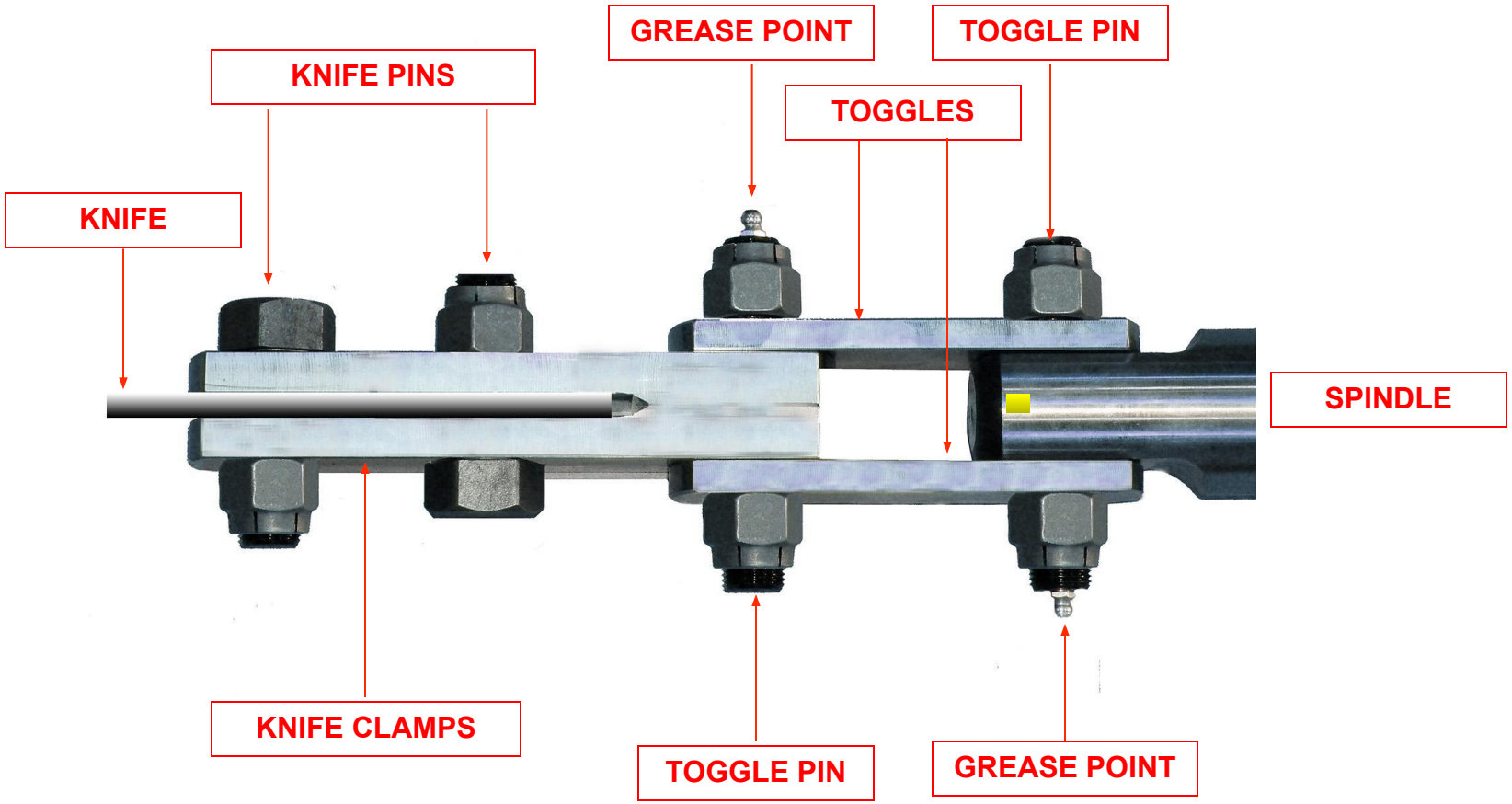
KNIFE LINKAGE



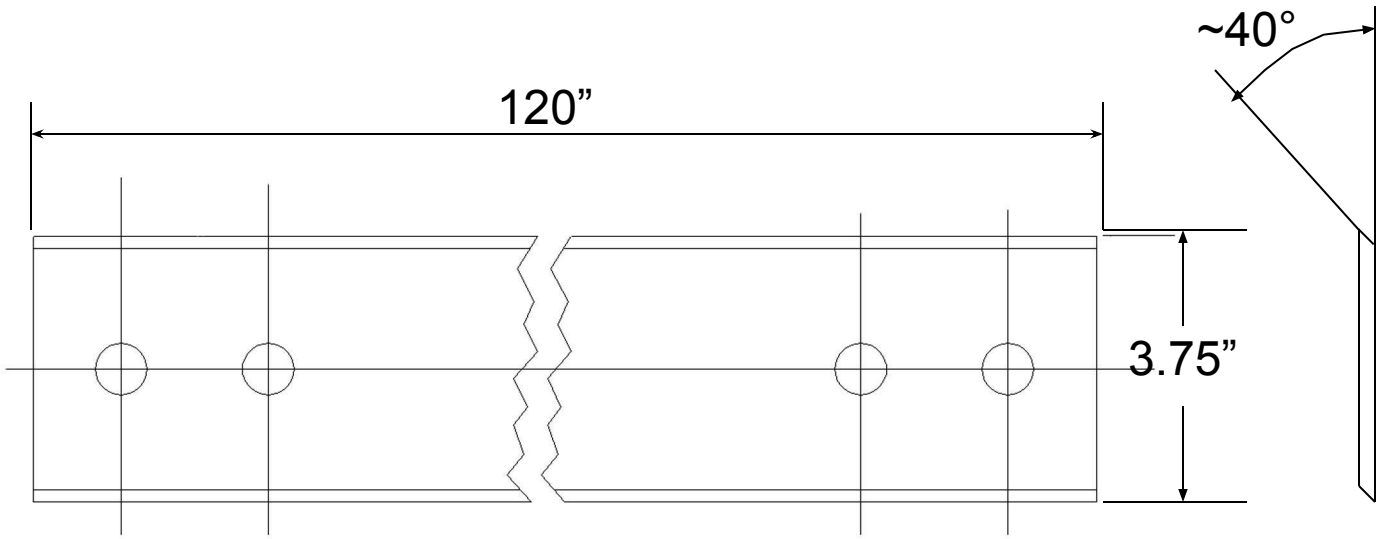
KNIFE DRIVE ASSEMBLY



KNIFE COUPLINGS ASSEMBLY



KNIFE BLADE

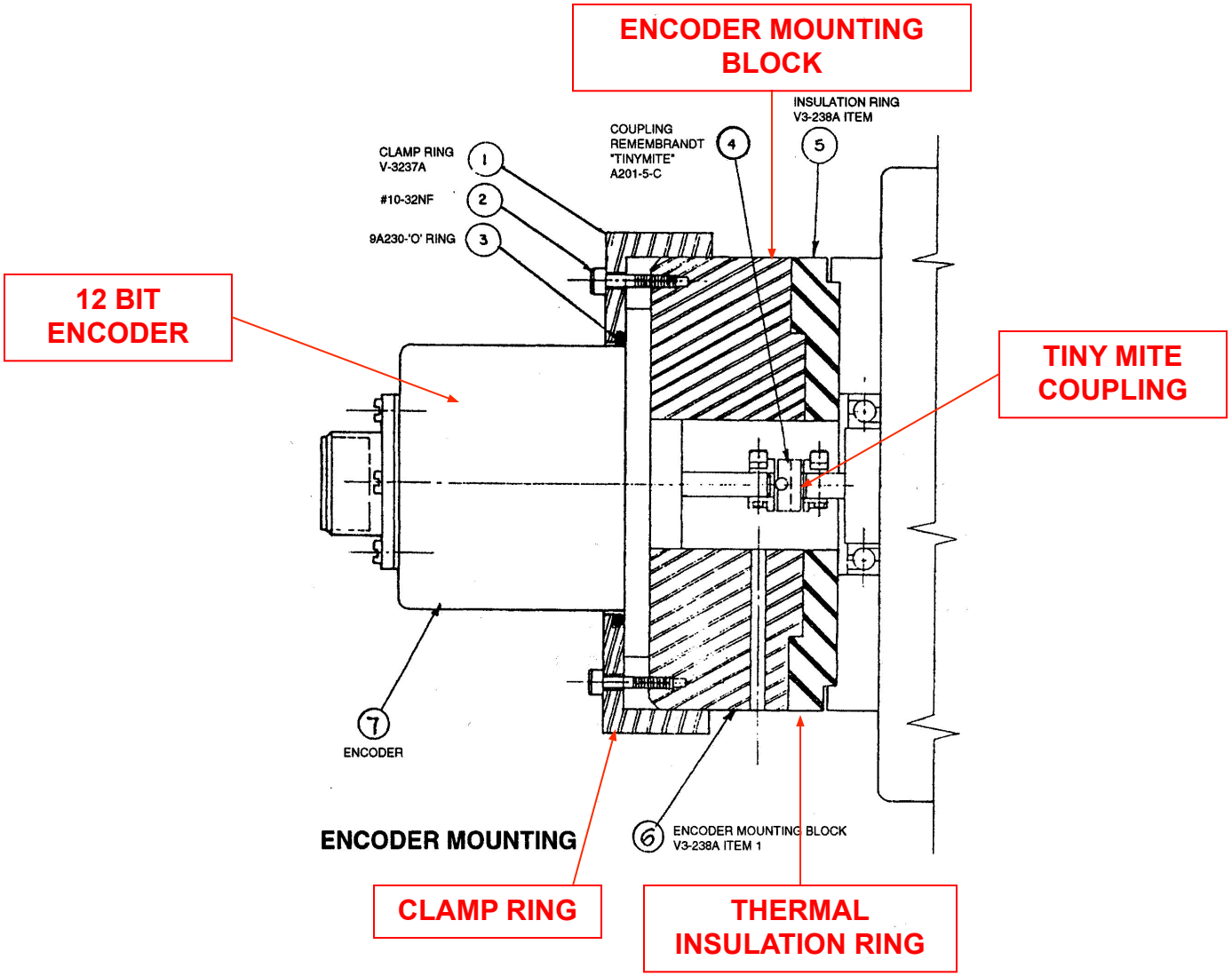


Minimum knife width is 3.25”

KNIFE ORIENTATION

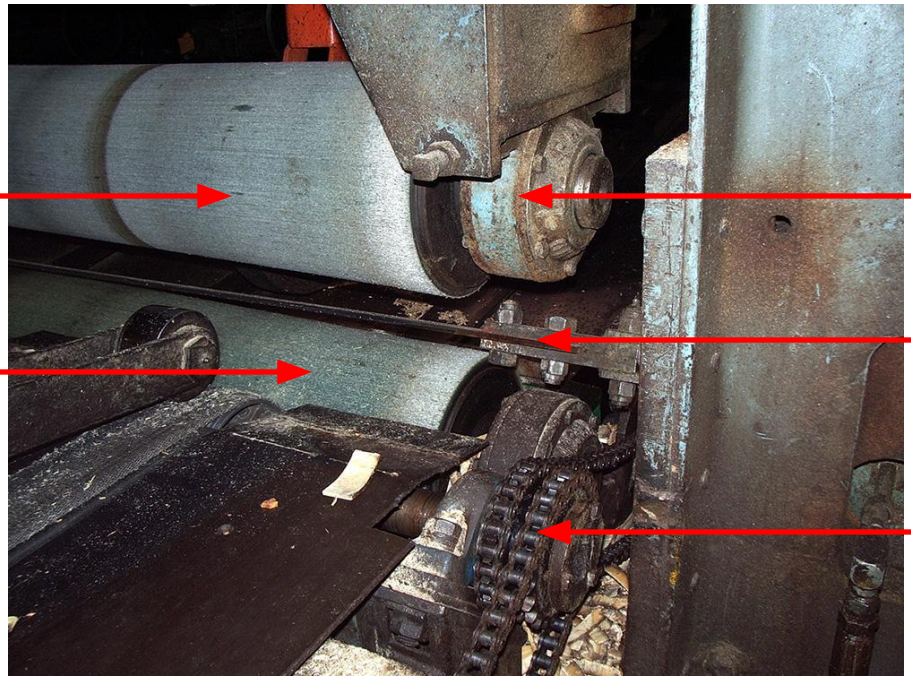
VENEER FLOW

KNIFE ENCODER ASSEMBLY



RAUTE

ANVIL ROLLS - IDLE SIDE VIEW



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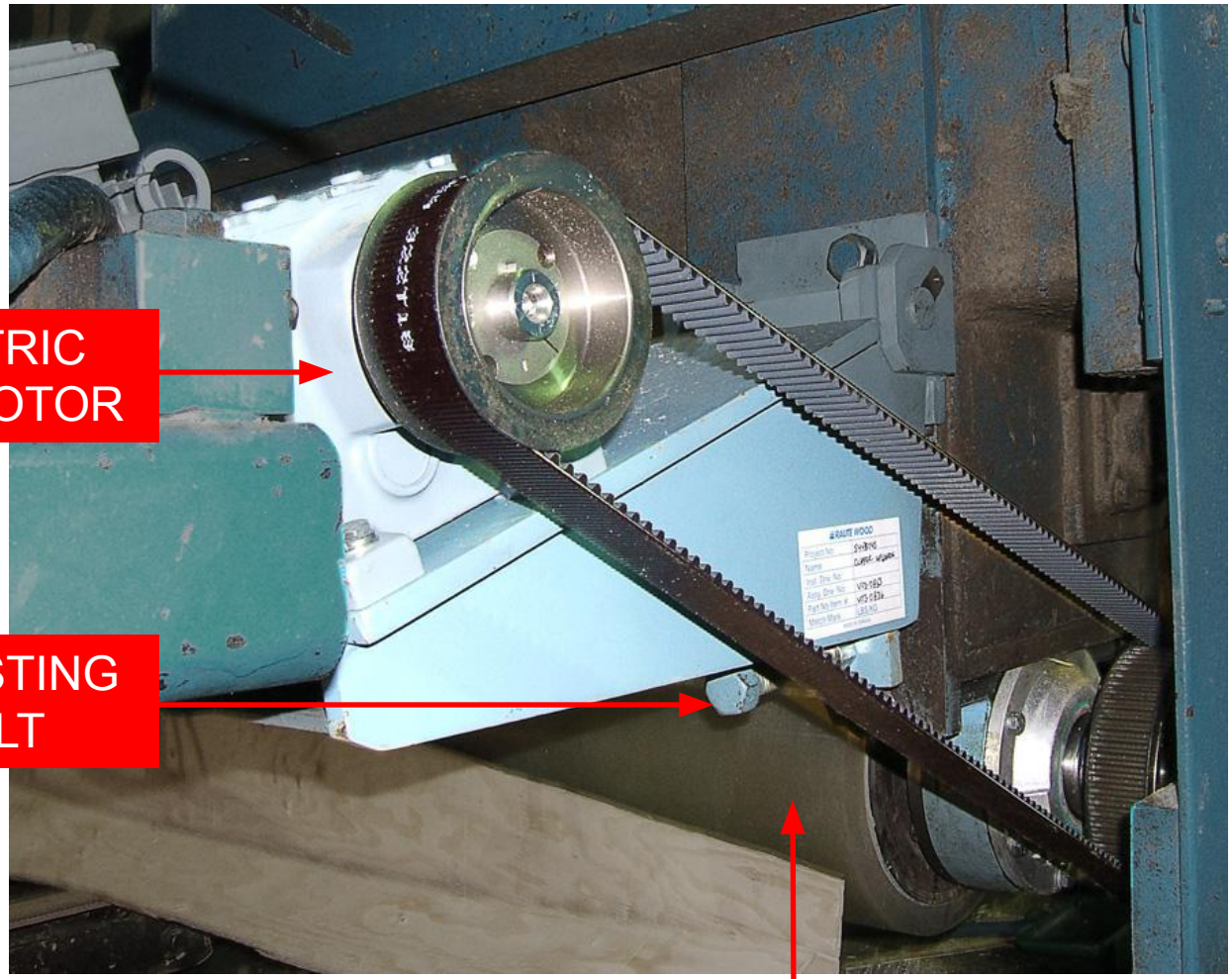
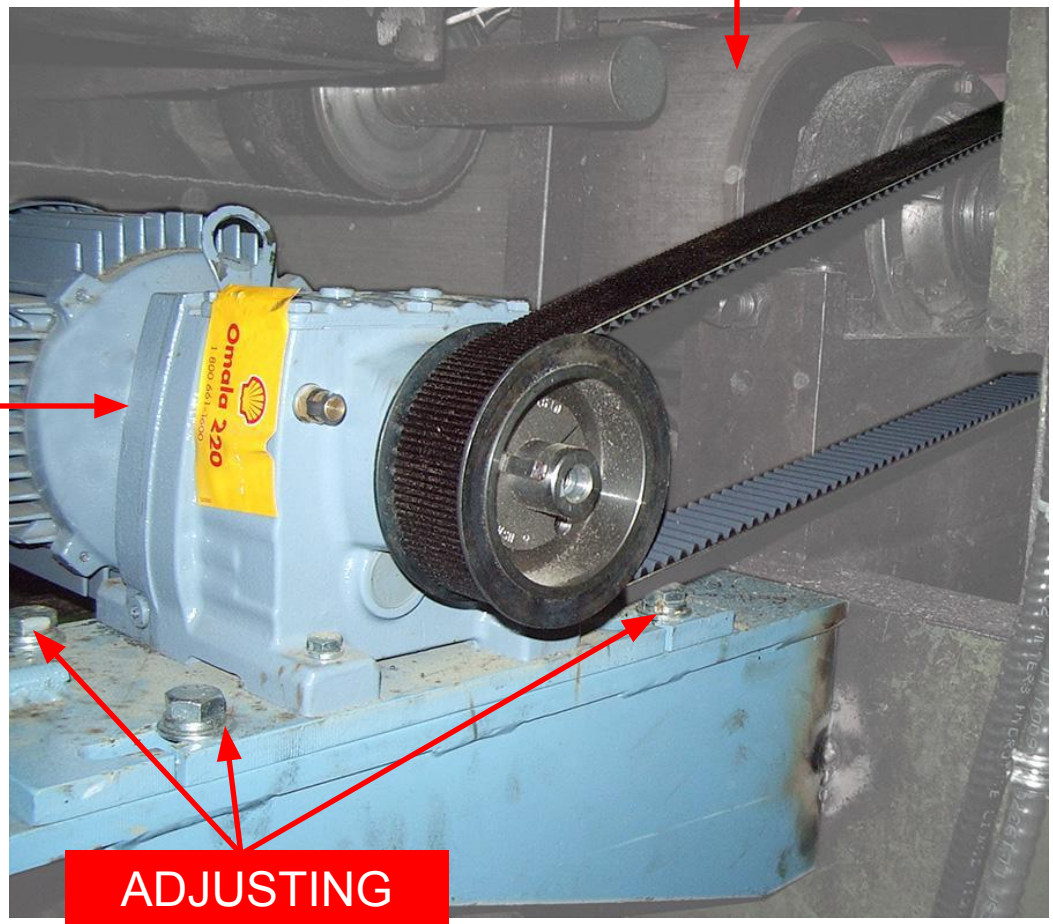
TOP ROLL ELECTRIC DRIVE



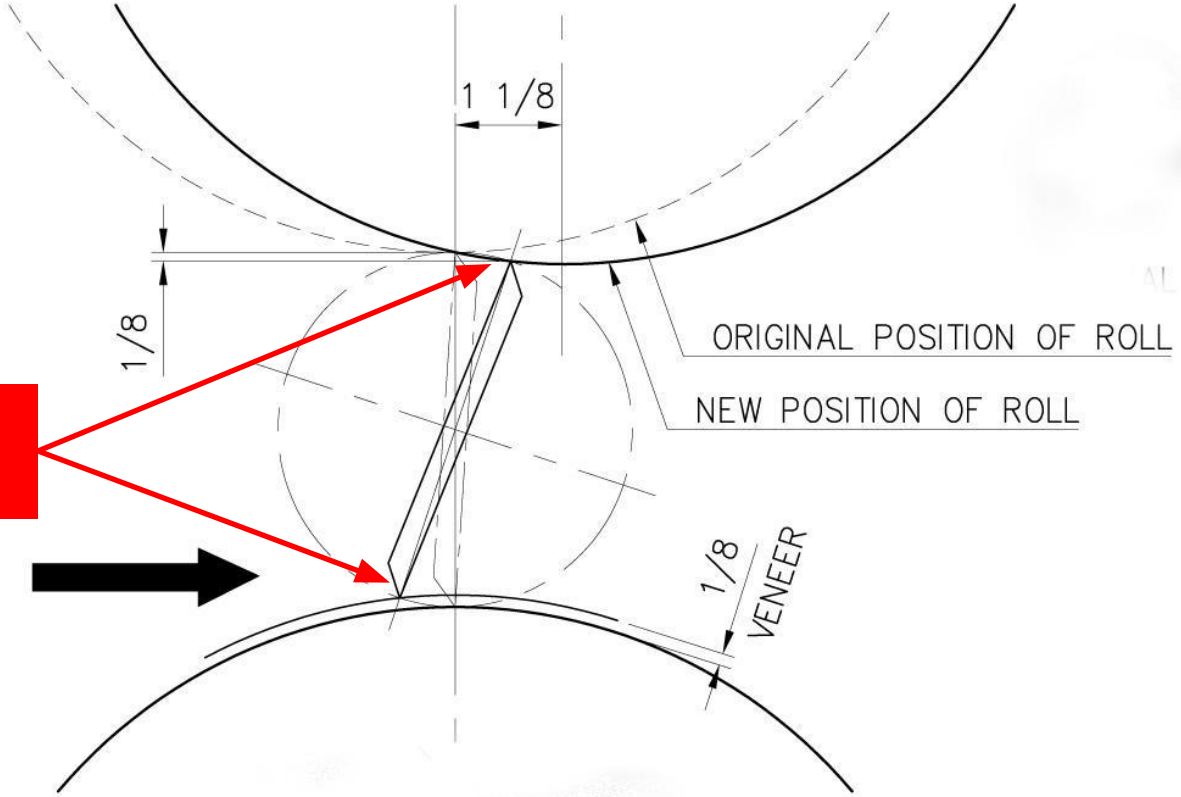
RAUTE

BOTTOM ROLL ELECTRIC DRIVE



N M E 1

TOP ROLL OFFSET

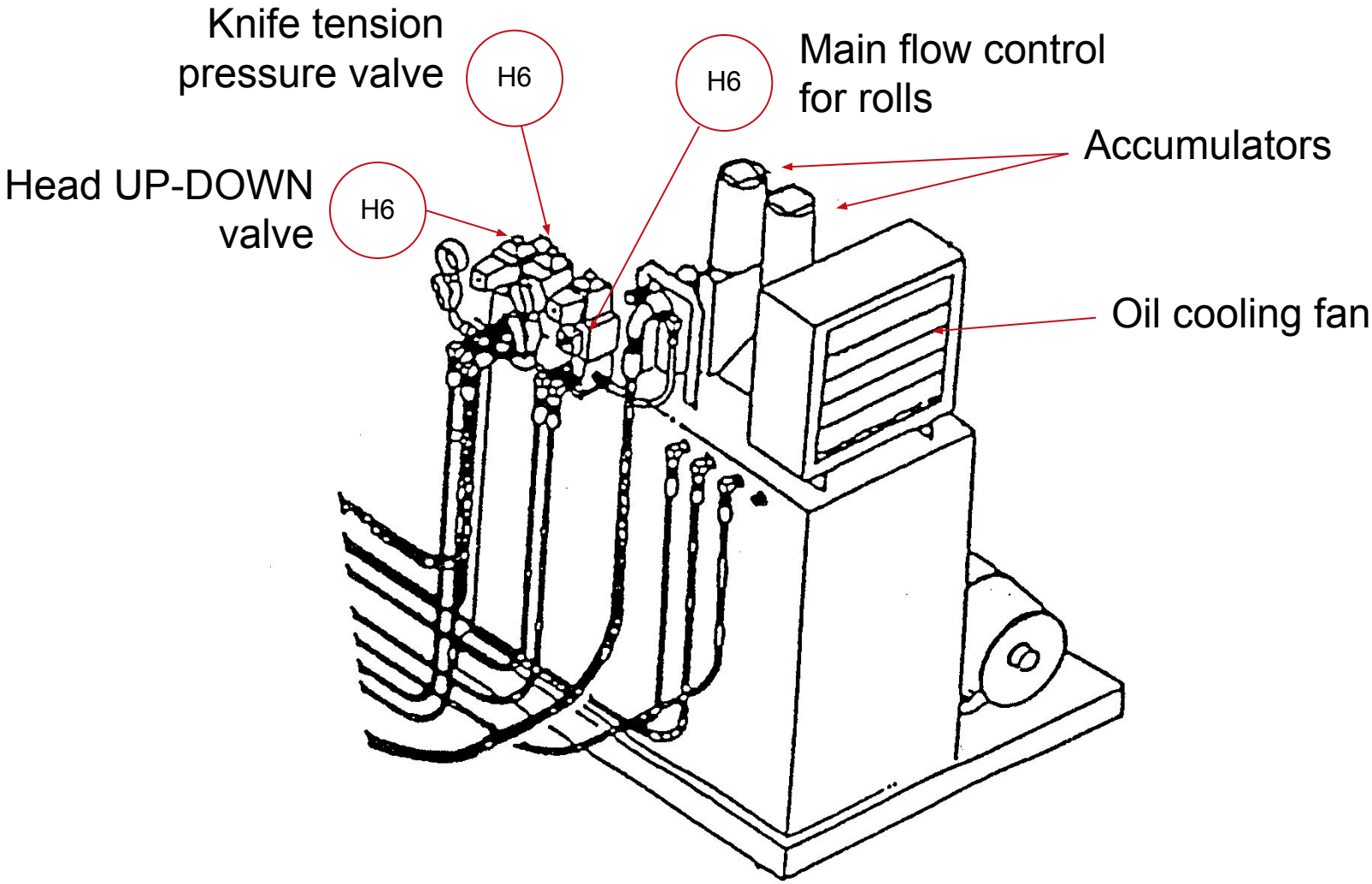


CONTACT POINTS

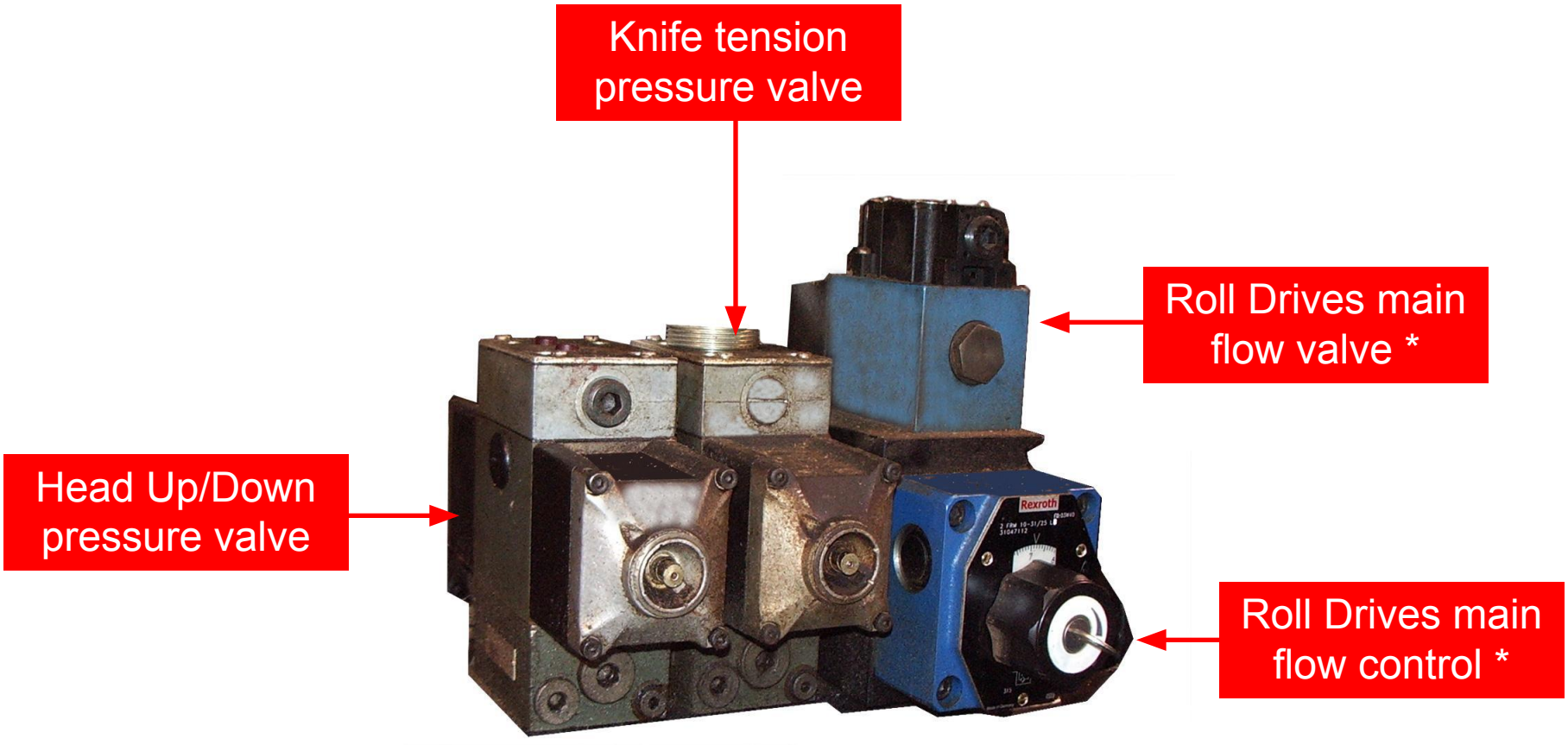
ROLL PRESSURE SETUP MUST BE DONE DIFFERENTLY!

RAUTE

HPU GENERAL VIEW

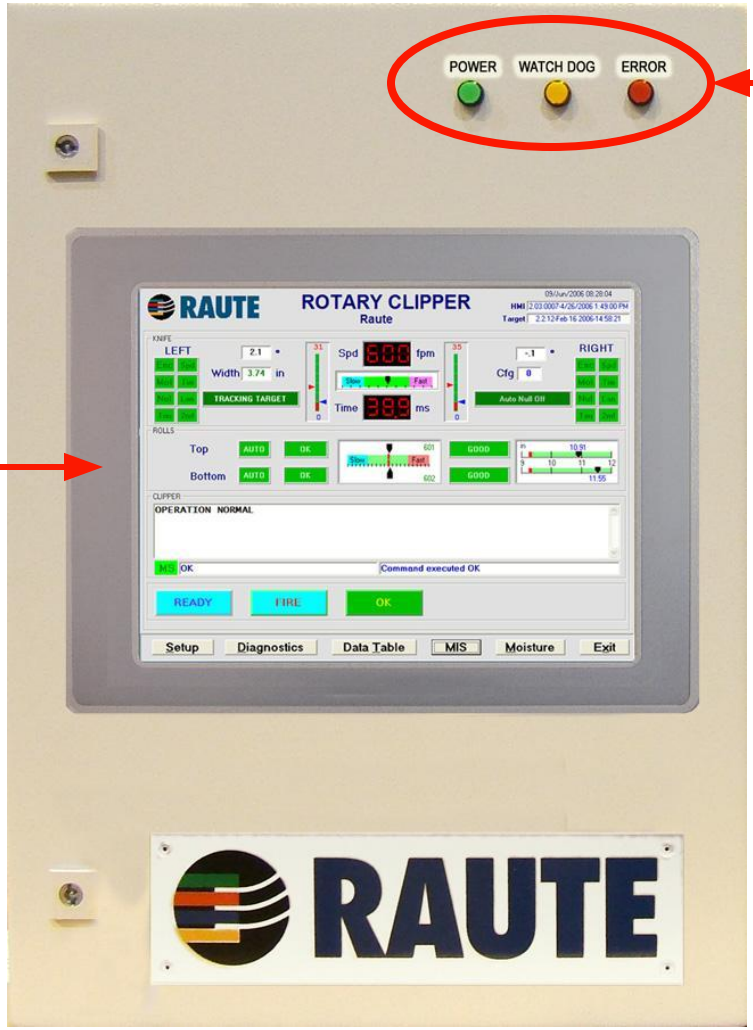


FLOW CONTROLS DETAIL



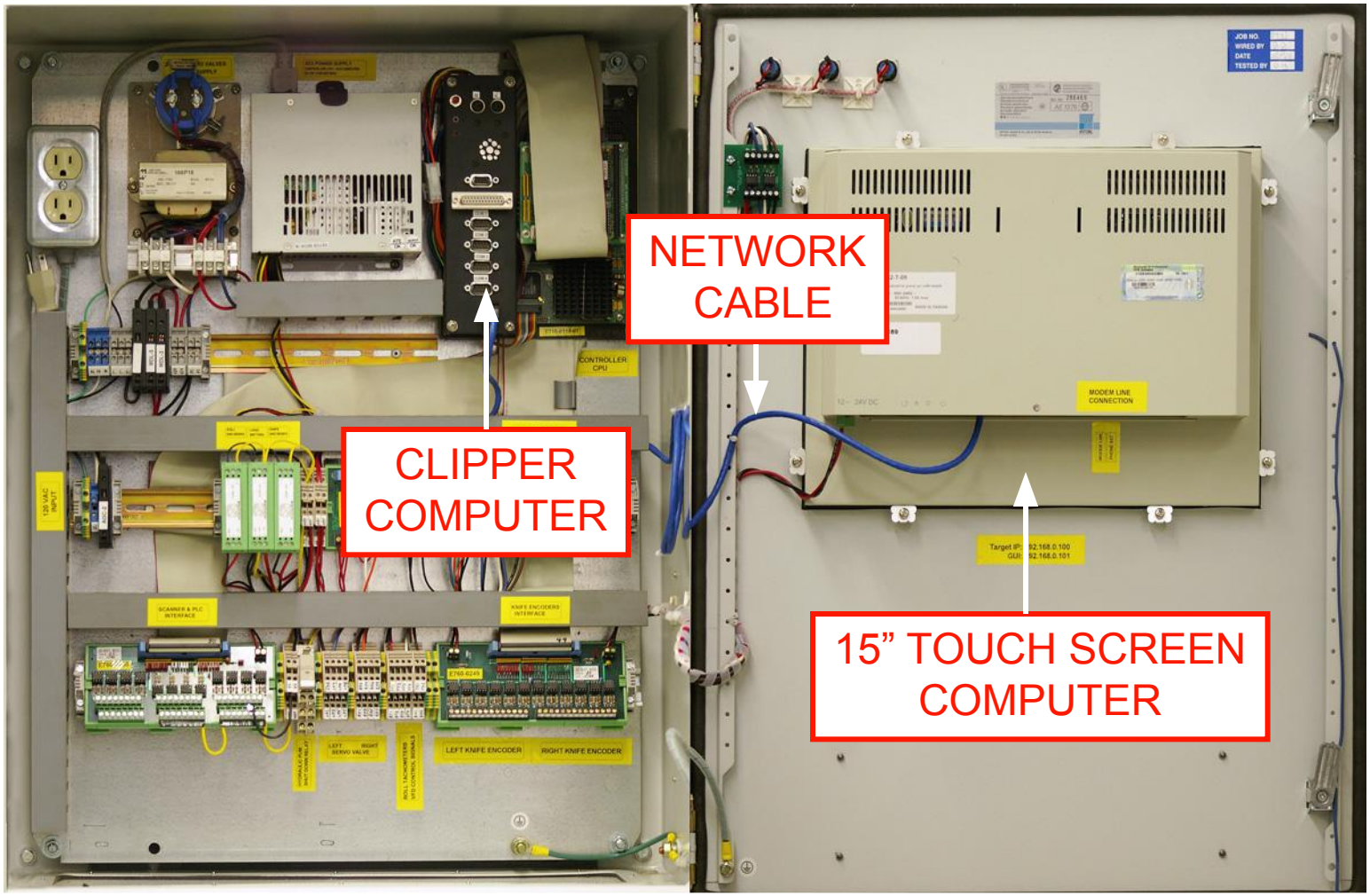
* Not used with electric roll drives

RAUTE CONTROLLER - 1



RAUTE

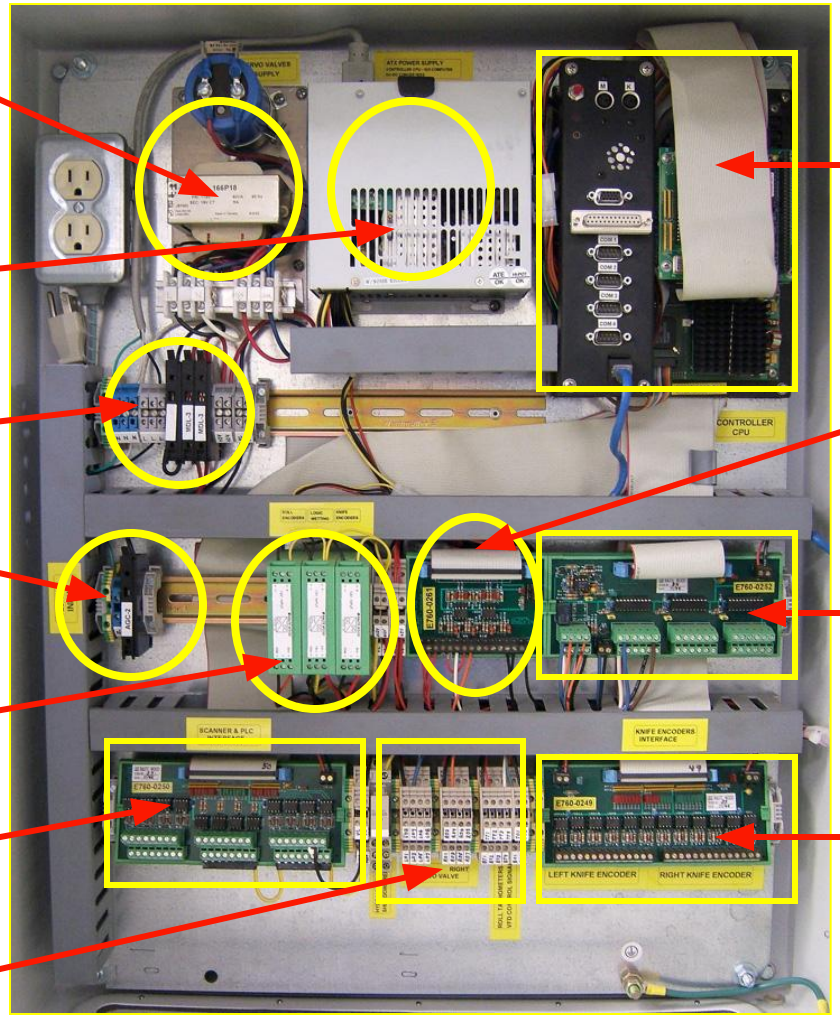
RAUTE CONTROLLER - 2



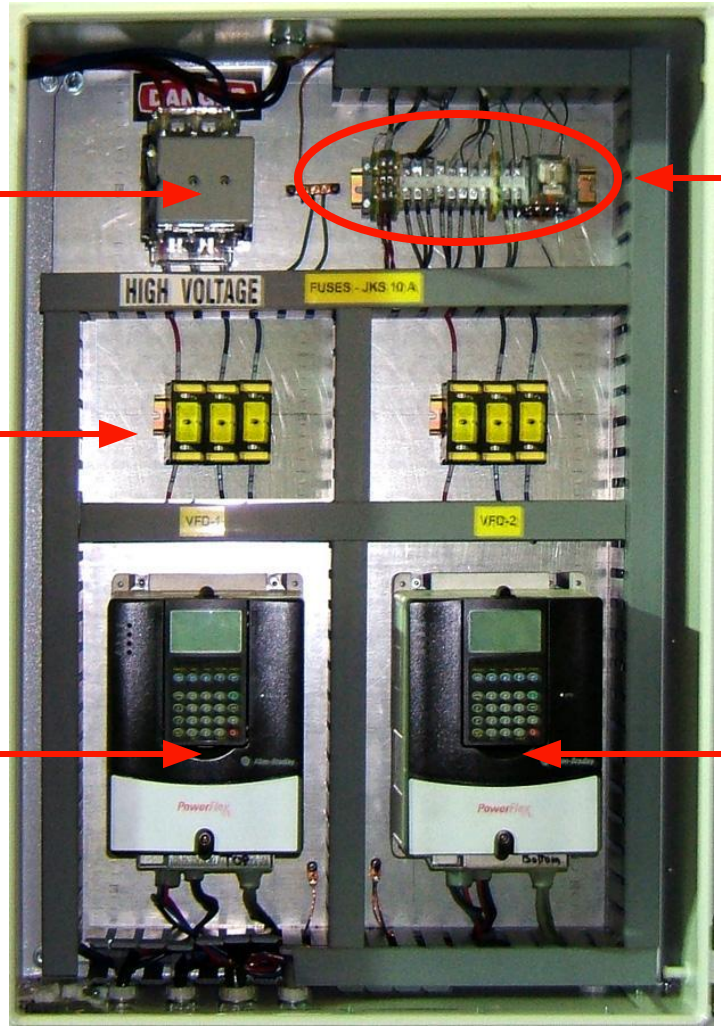
N

E 1

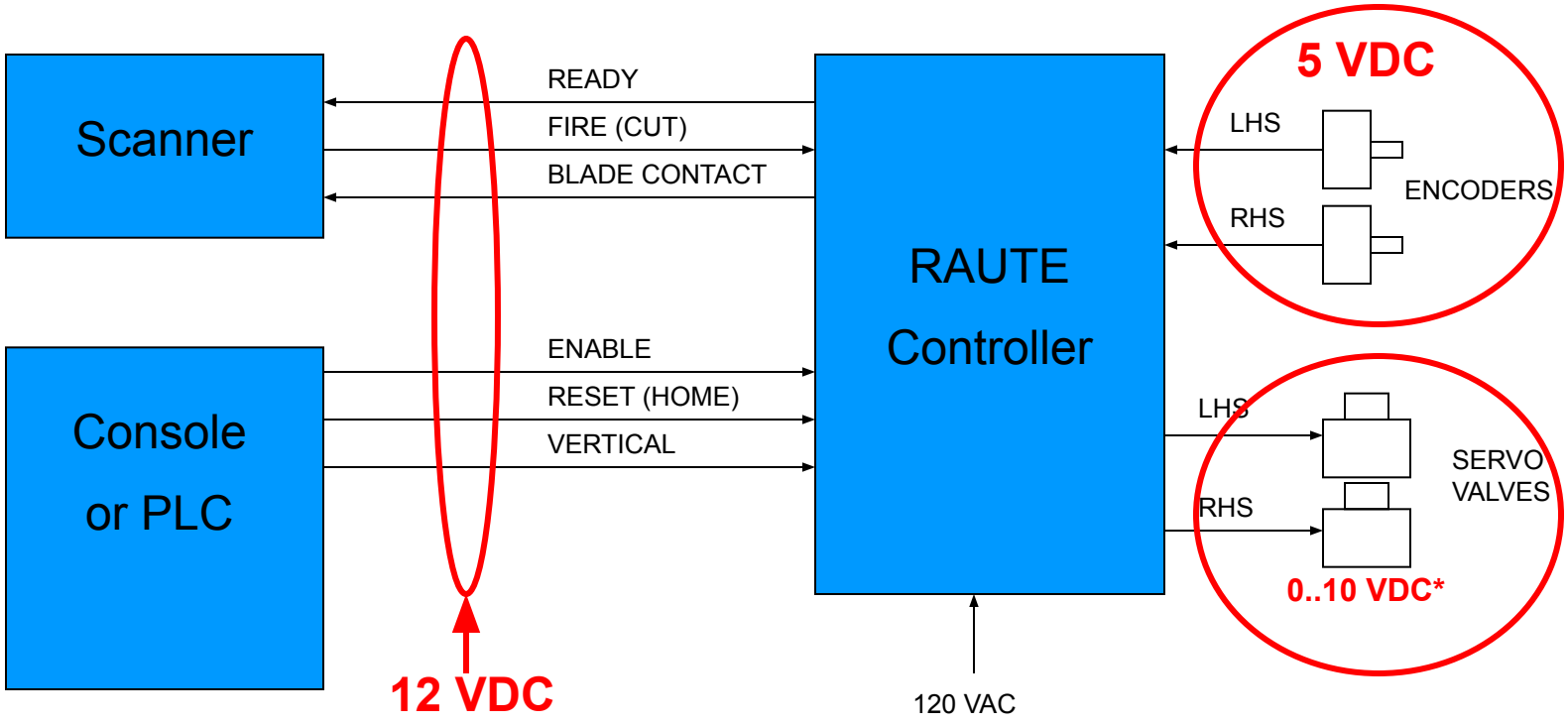
RAUTE CONTROLLER - 3



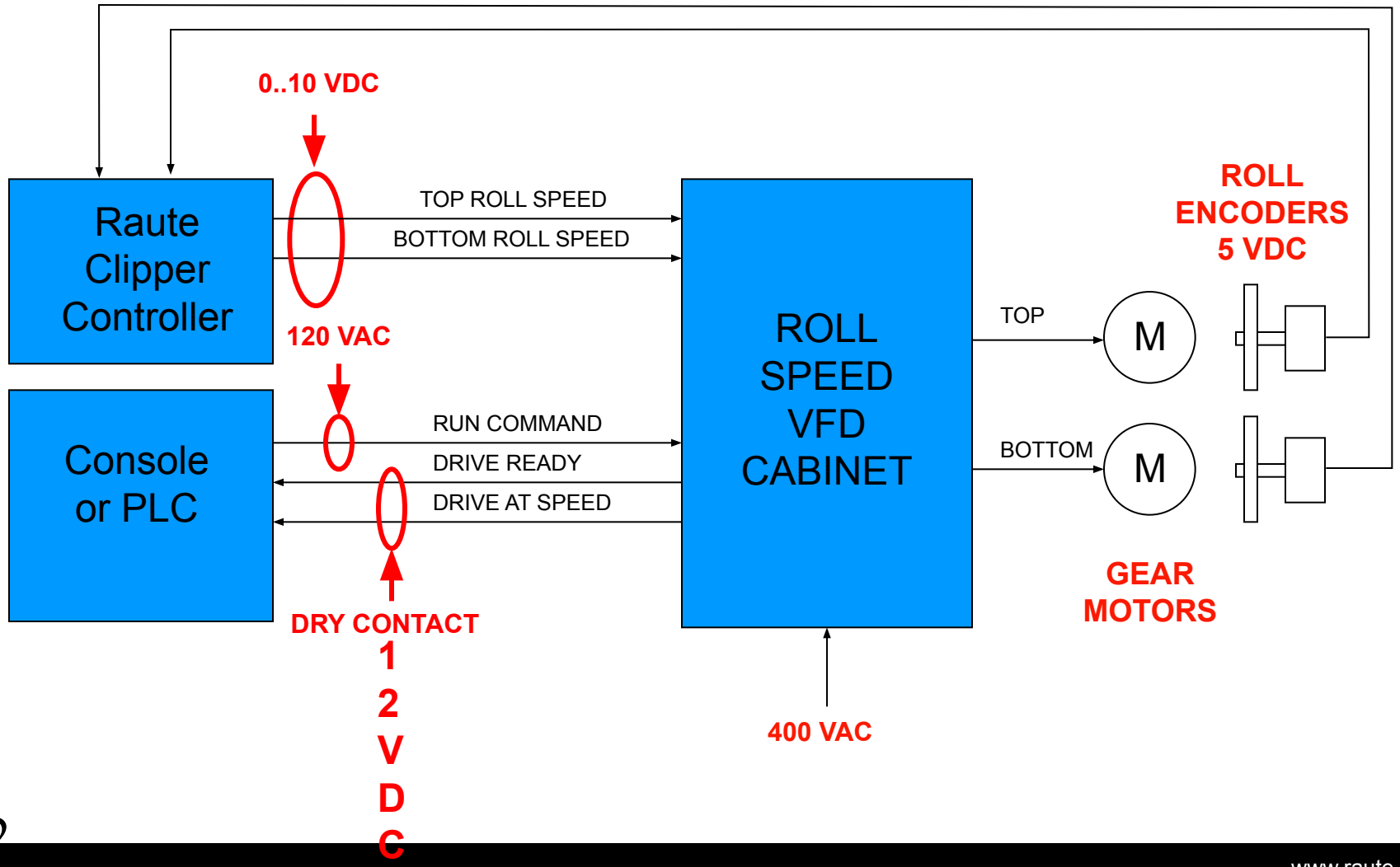
ROLLS VFD CABINET



CONTROLLER - I/O WIRING

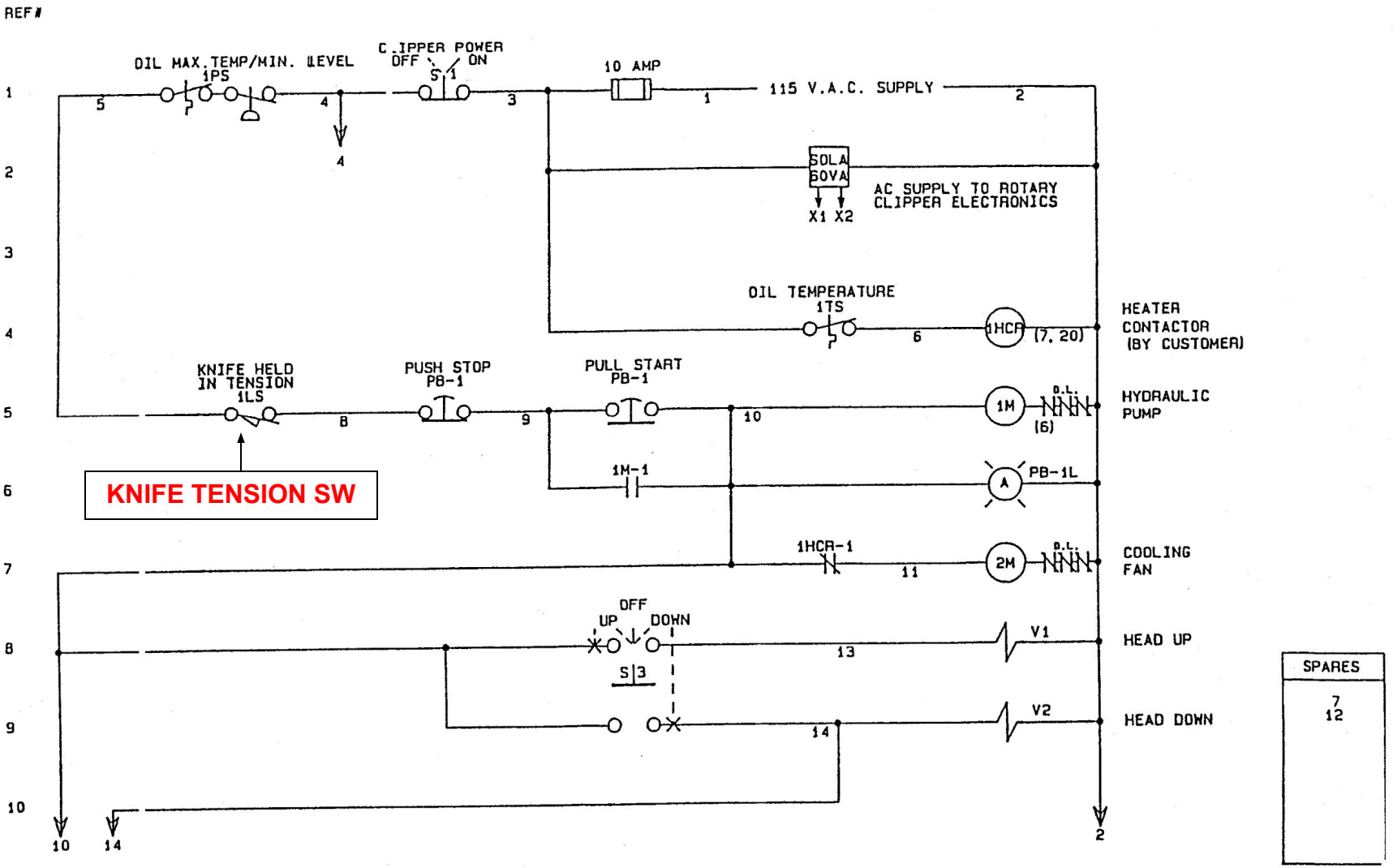


ROLL SPEED CONTROL SIGNALS

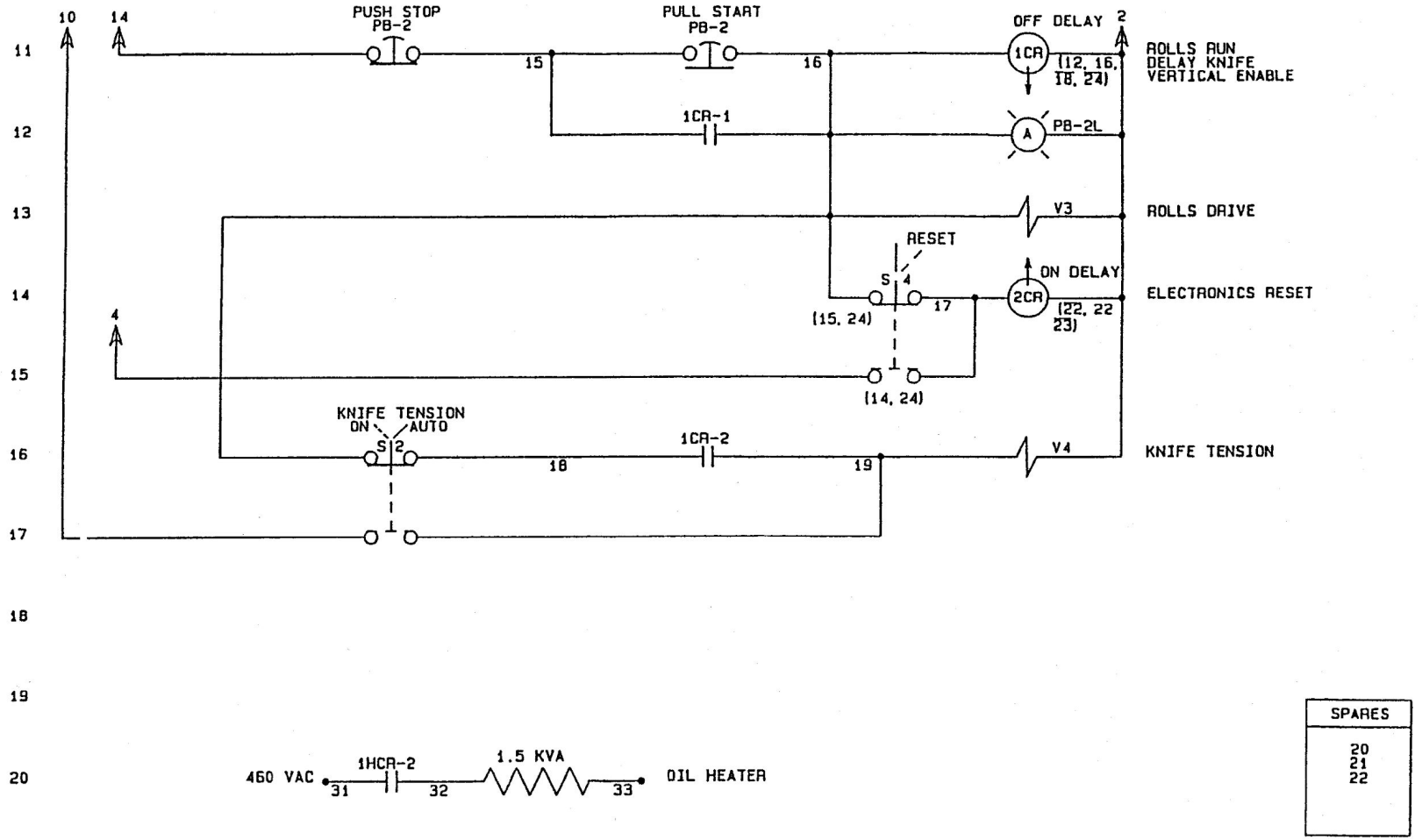


RAUTE

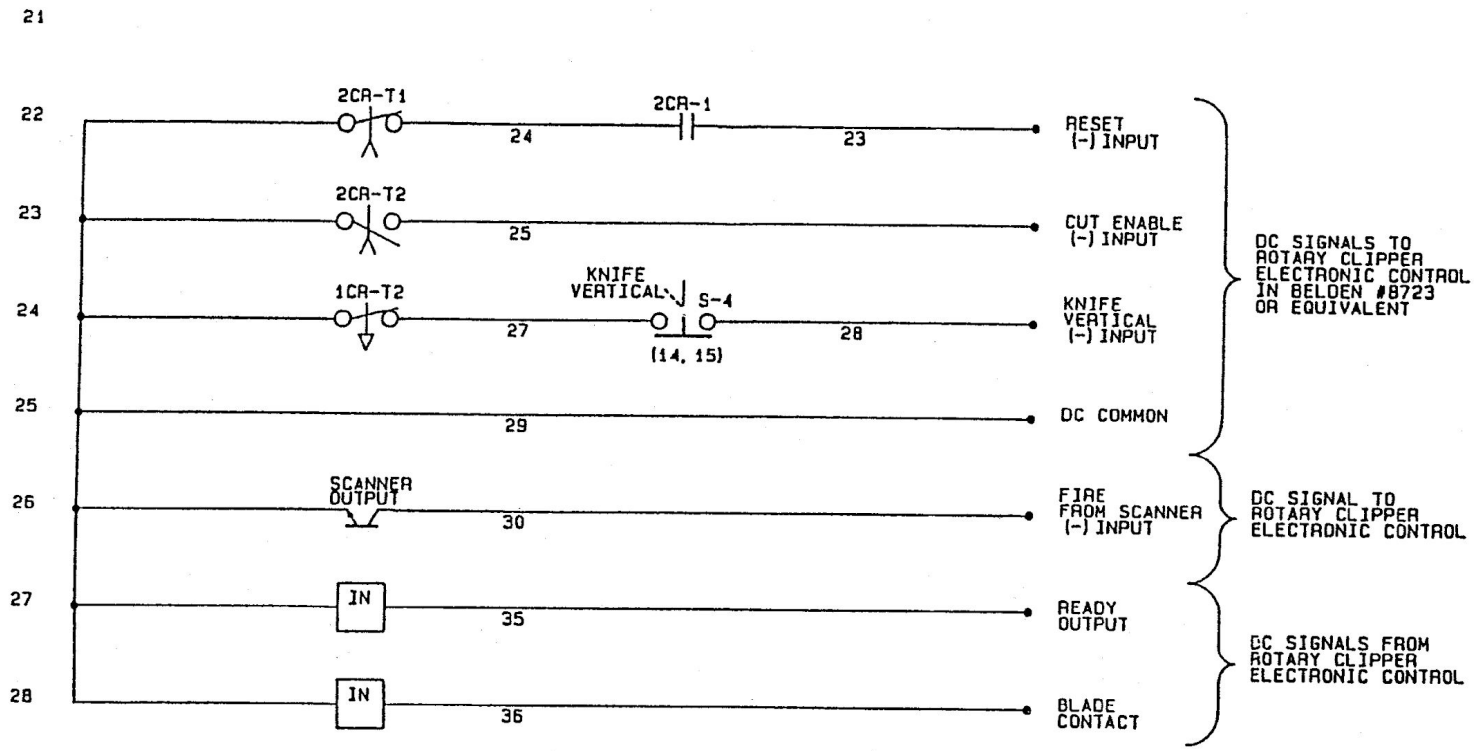
CONTROL LOGIC - PAGE 1 - AC



CONTROL LOGIC - PAGE 2 - AC



CONTROL LOGIC - PAGE 3 - DC



SECTION 3

CLIPPER THEORY

CLIPPER GOALS

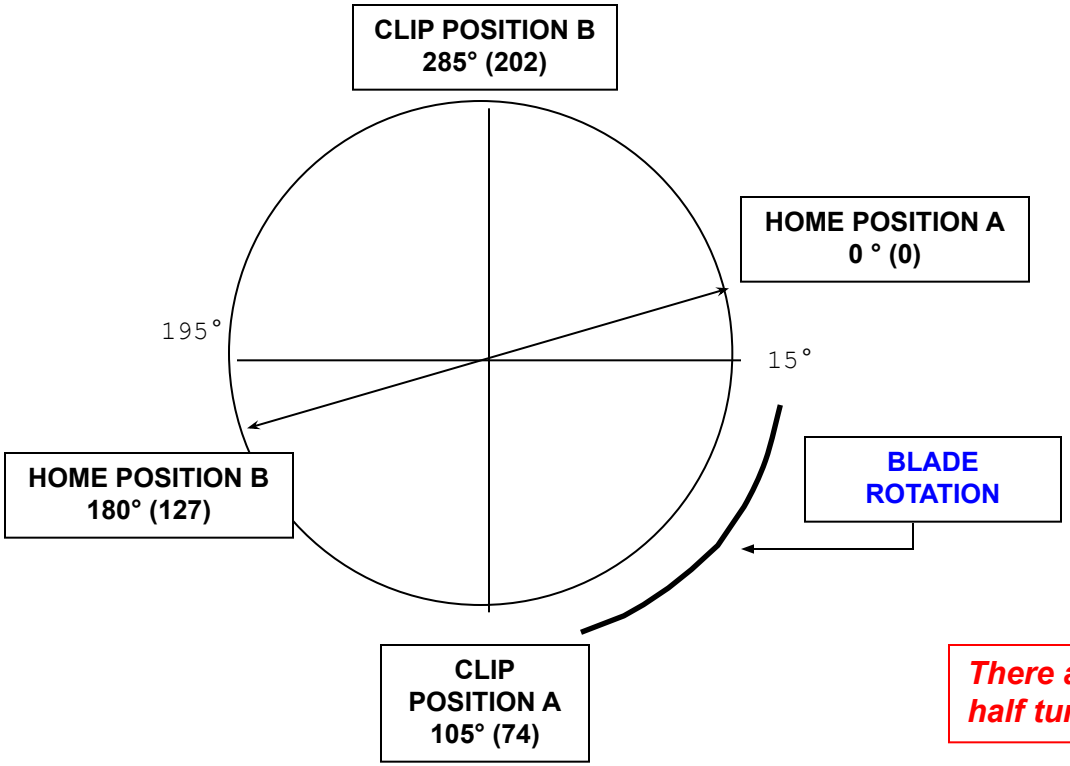
- Exact clip point
- Parallel clips
- Match knife/roll speeds
- Minimize response time
- Straight clips (no bias)

OPERATION

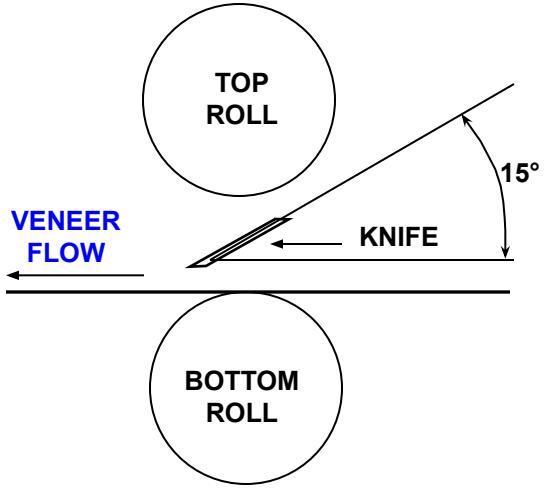
- Knife positions
- Clip steps
- Clip cycle
- Clip zone
- Knife/roll speed mismatch effects

KNIFE POSITIONS

BLADE ANGLE



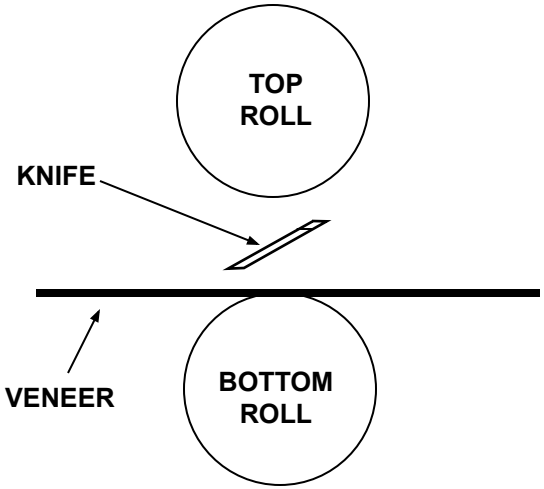
HOME POSITION



There are two home positions separated by half turn of the blade

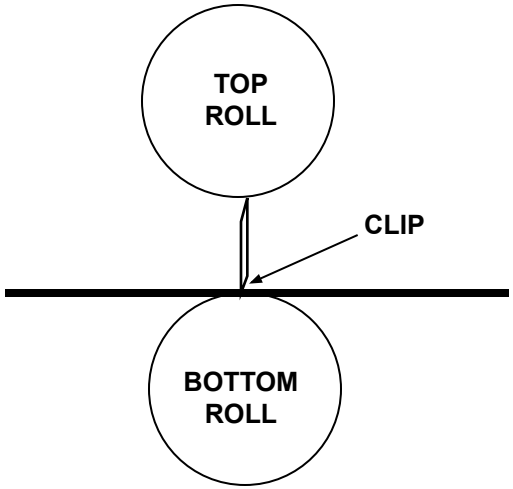
CLIP STEPS

1 - HOME POSITION (A)
Knife begins to move upon receiving a FIRE signal from scanner



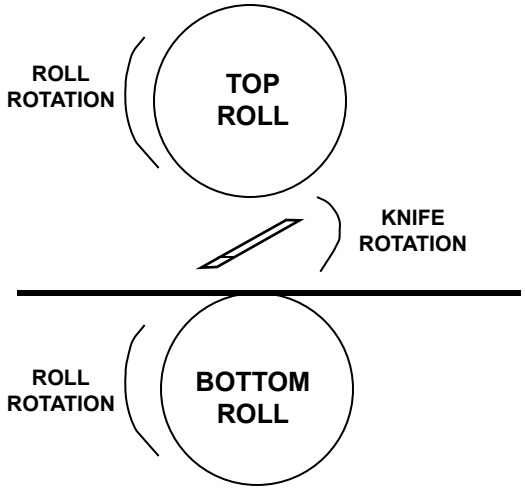
0°

2 - CLIP POSITION
Knife in vertical position. Veneer is clipped between the blade and the bottom roll



105°

3 - HOME POSITION (B)
Knife stops after rotating half turn (180 degrees)



180°

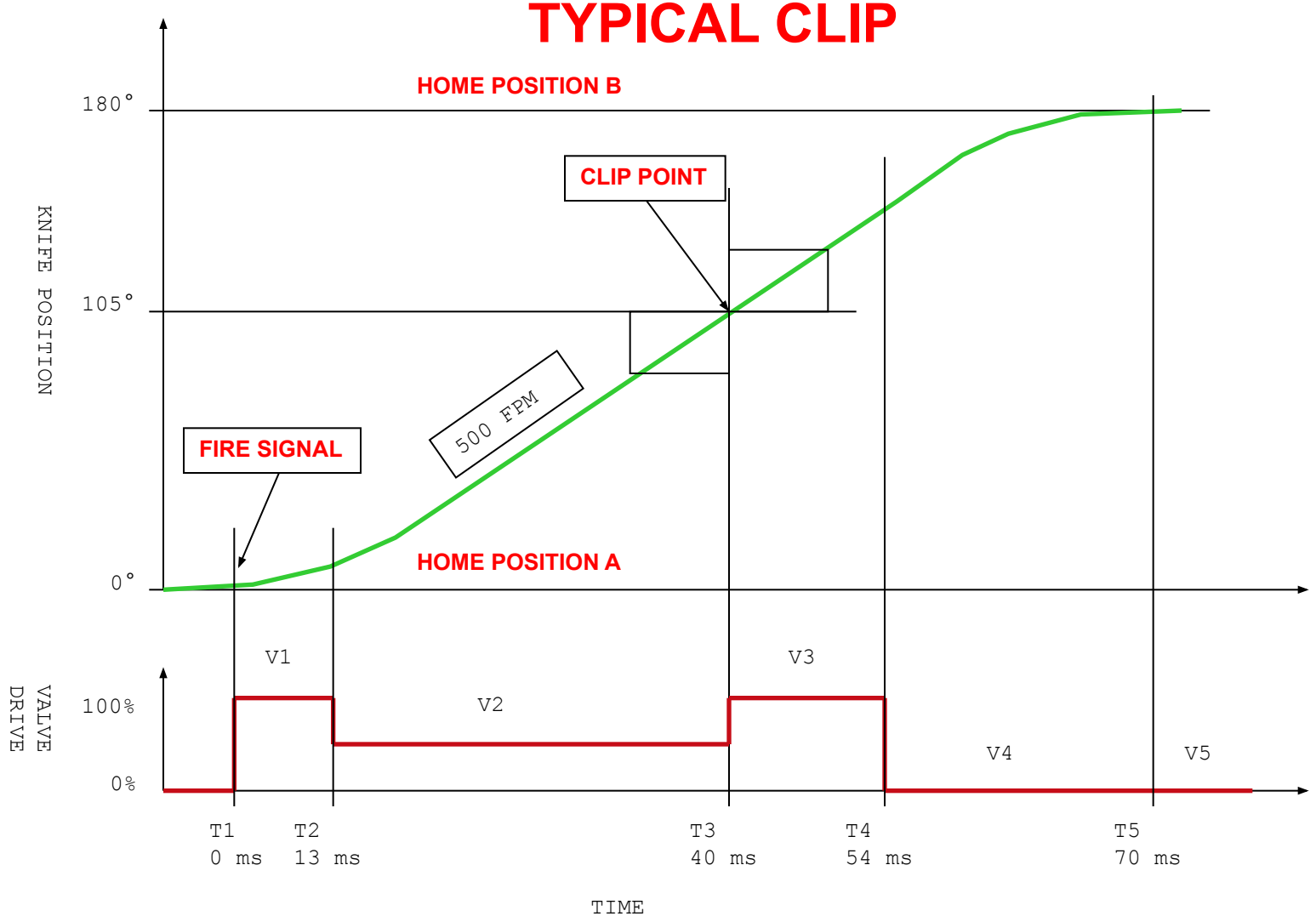
VENEER FLOW

M E 1

RAUTE

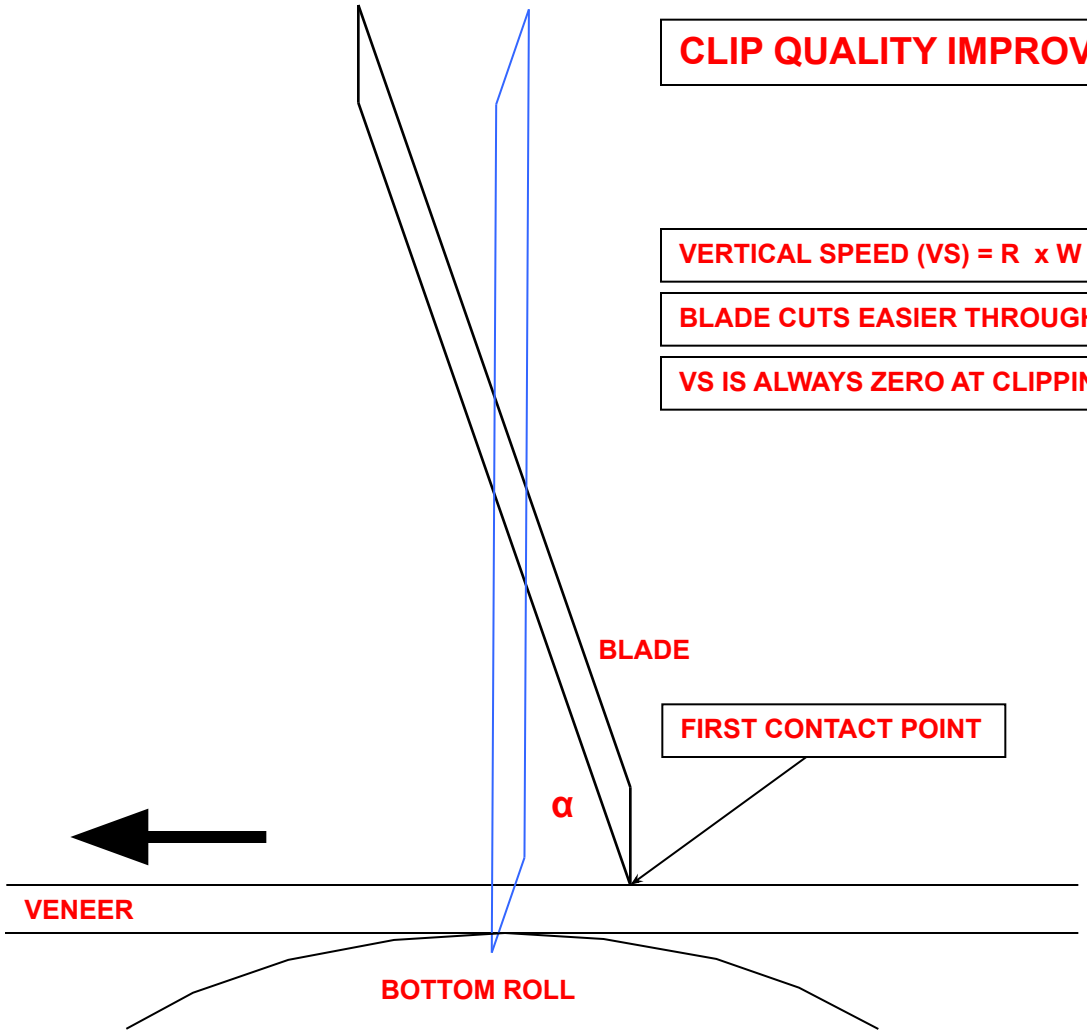
CLIP CYCLE

TYPICAL CLIP



M E 1

CLIP ZONE



CLIP QUALITY IMPROVES WITH KNIFE SPEED

VERTICAL SPEED (VS) = R x W x cos (α)

BLADE CUTS EASIER THROUGH VENEER AS THE VS INCREASES

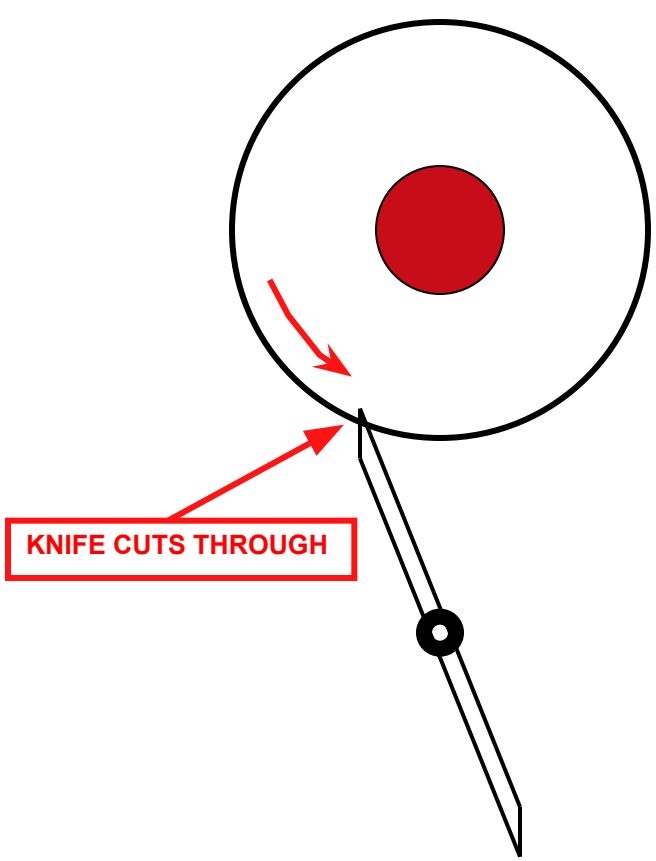
VS IS ALWAYS ZERO AT CLIPPING POINT

M E 1

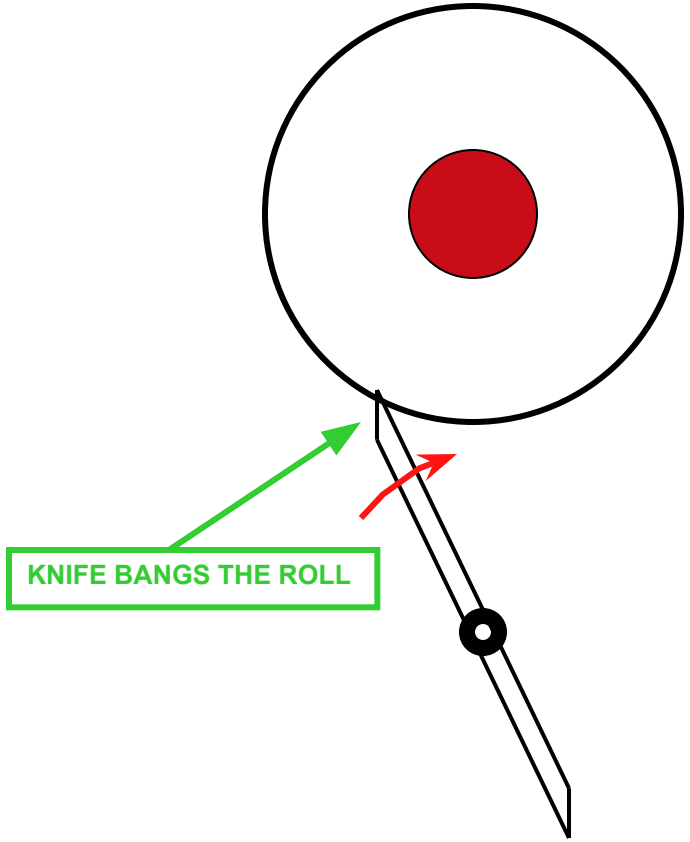
RAUTE

KNIFE/ROLL SPEED MISMATCH

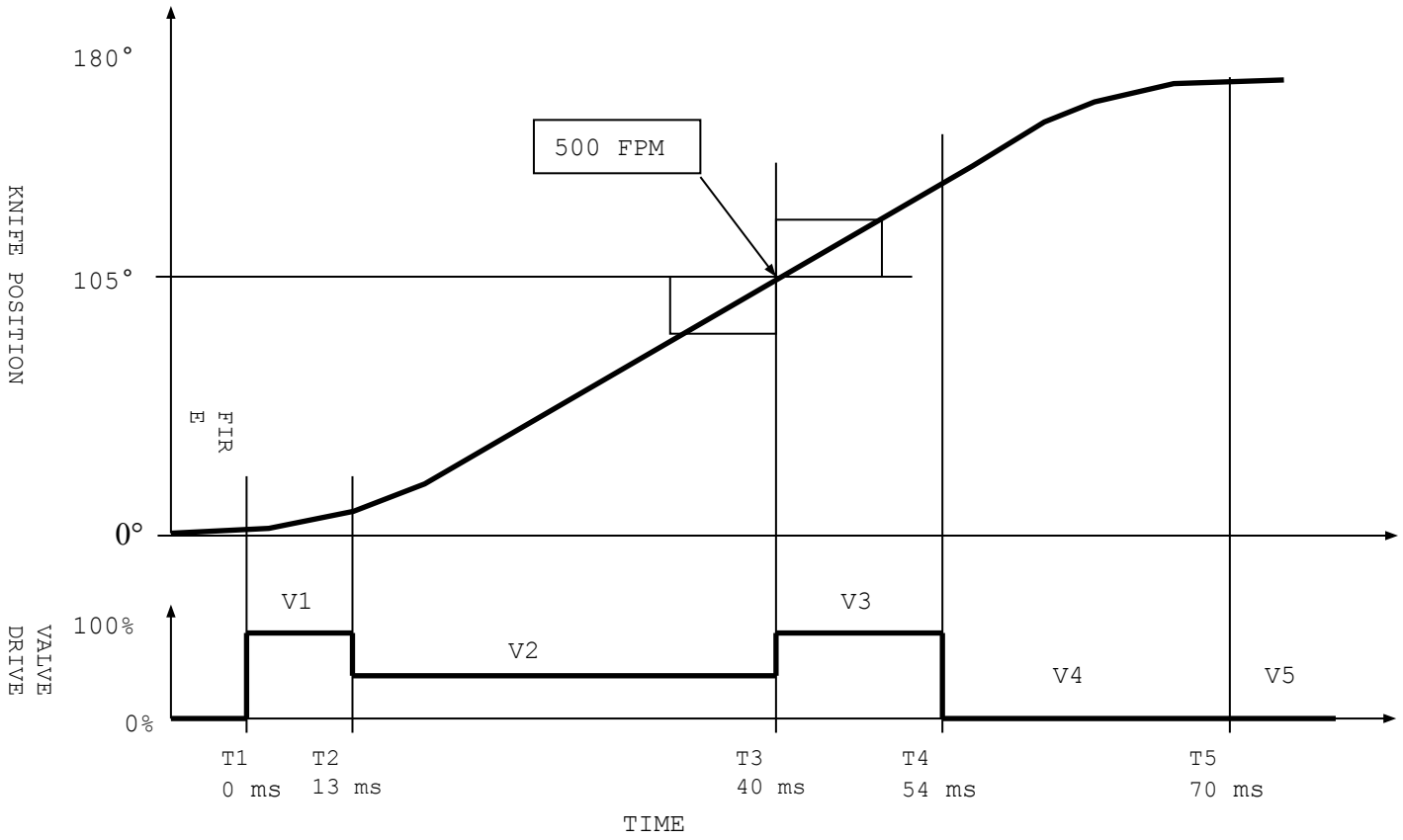
ROLL > KNIFE
MORE WEAR



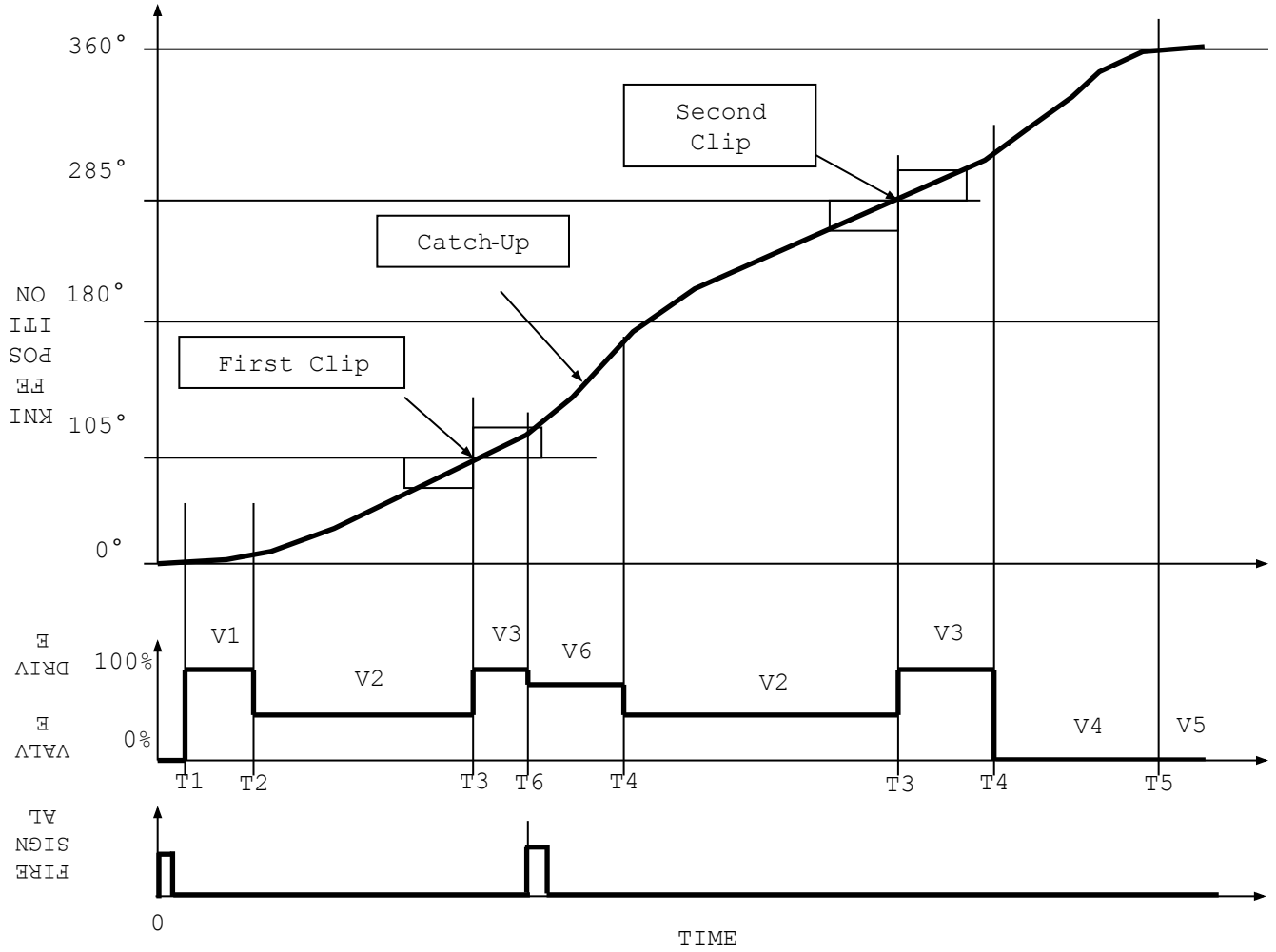
ROLL < KNIFE
LESS WEAR



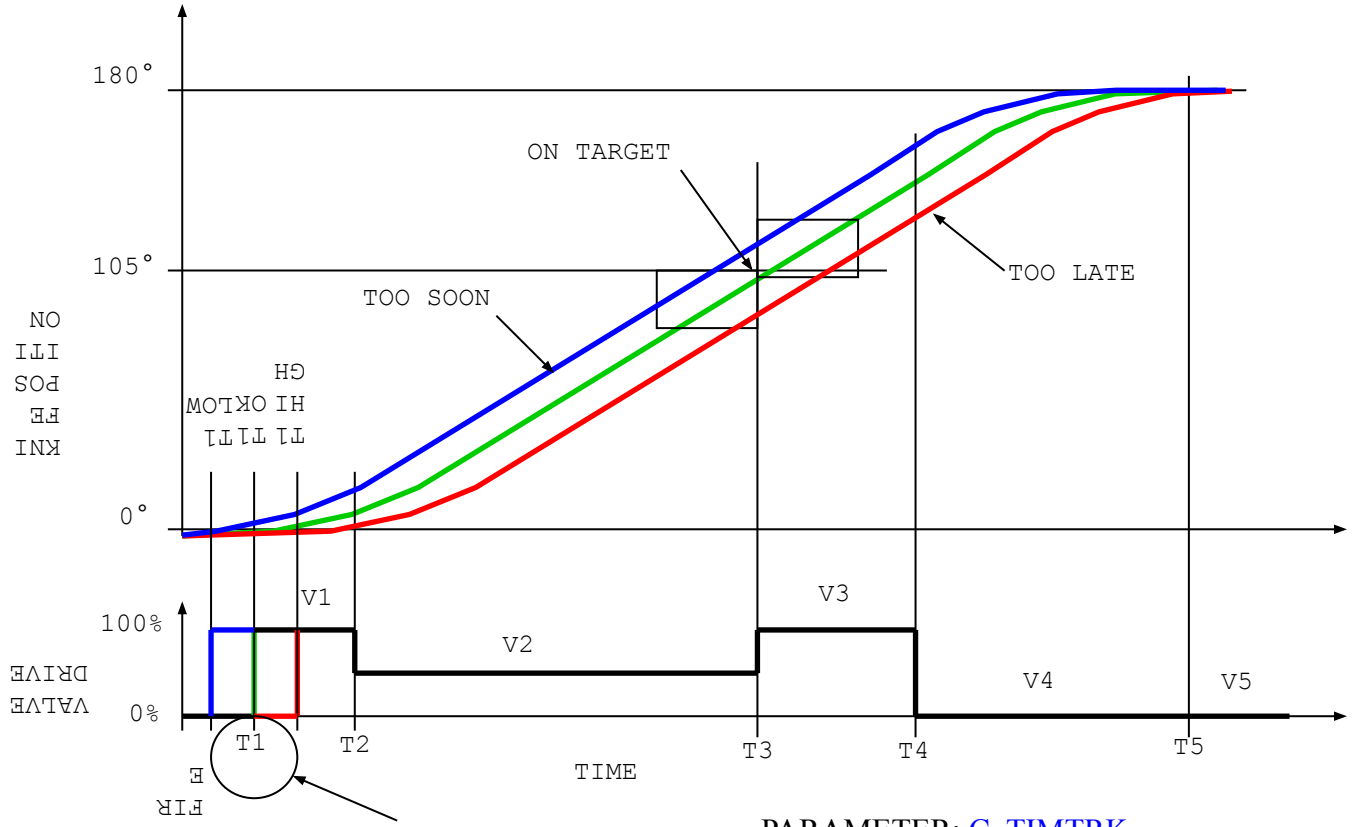
TYPICAL CLIP RESPONSE



SECOND CLIP CATCH-UP



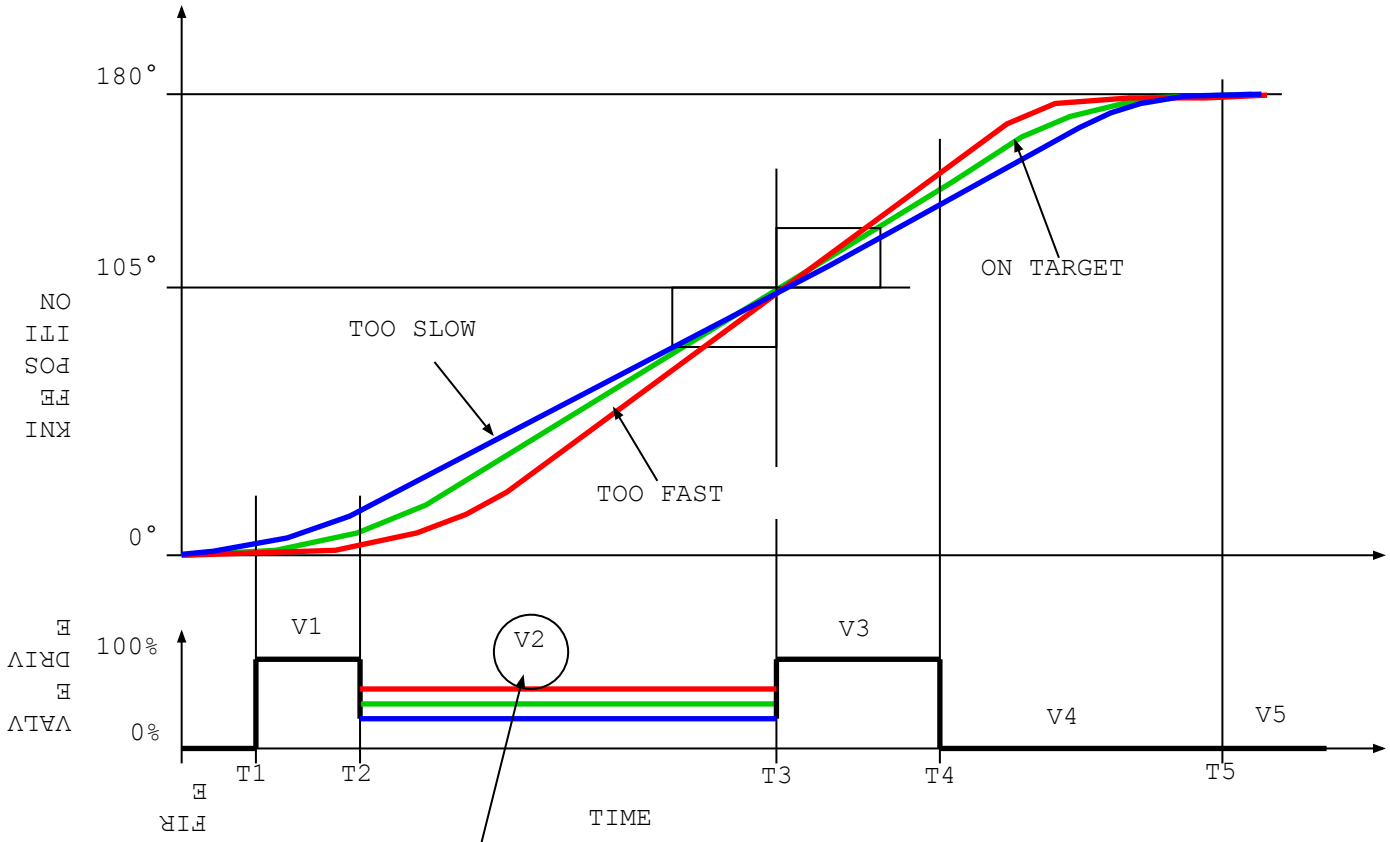
TIME RESPONSE ADJUSTMENT



D_LTIME1 = LEFT
D_RTIME1 = RIGHT

PARAMETER: C_TIMTRK
FALSE=MANUAL MODE
TRUE=AUTO TRACK MODE

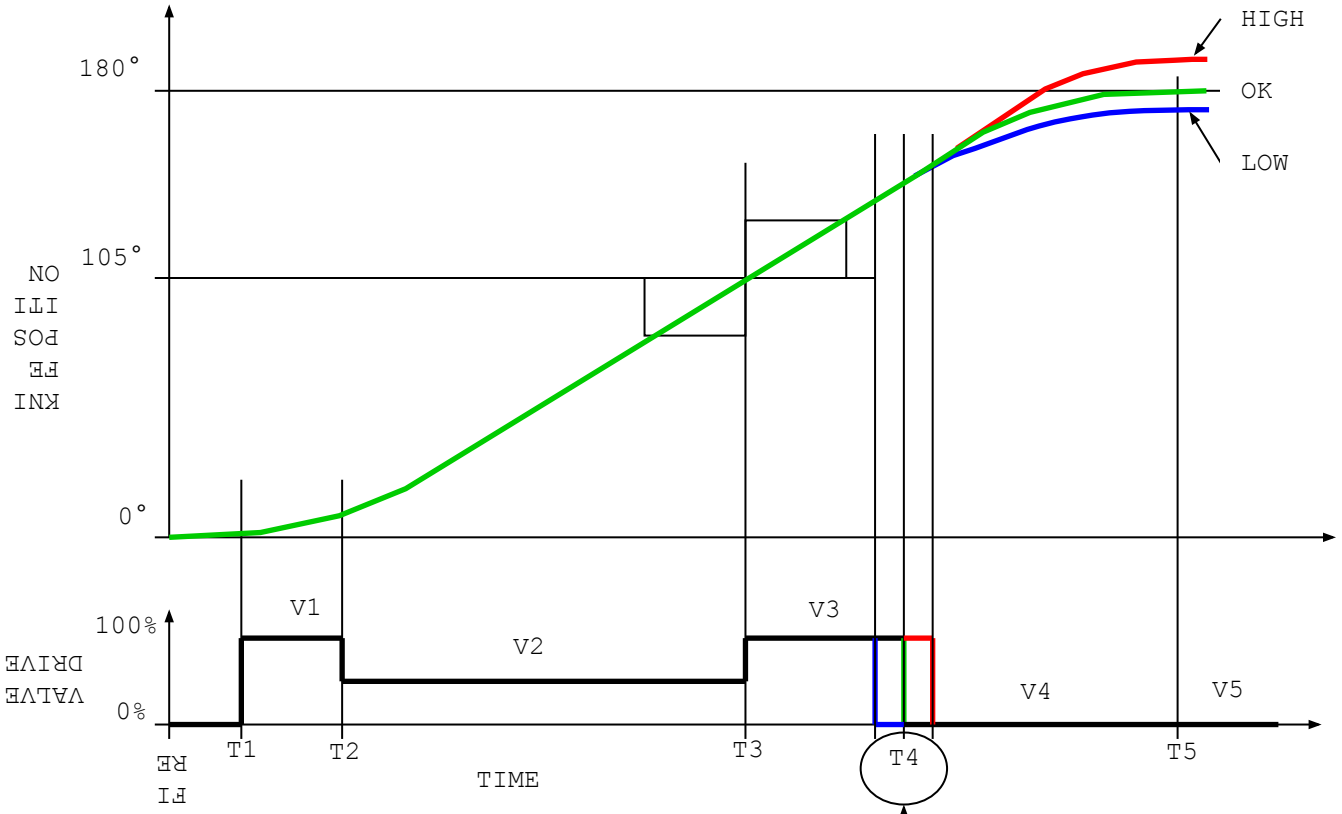
SPEED RESPONSE ADJUSTMENT



D_LVALV2 = LEFT
D_RVLAV2 = RIGHT

PARAMETER: C_SPDTRK
FALSE=MANUAL MODE
TRUE=AUTO TRACK MODE

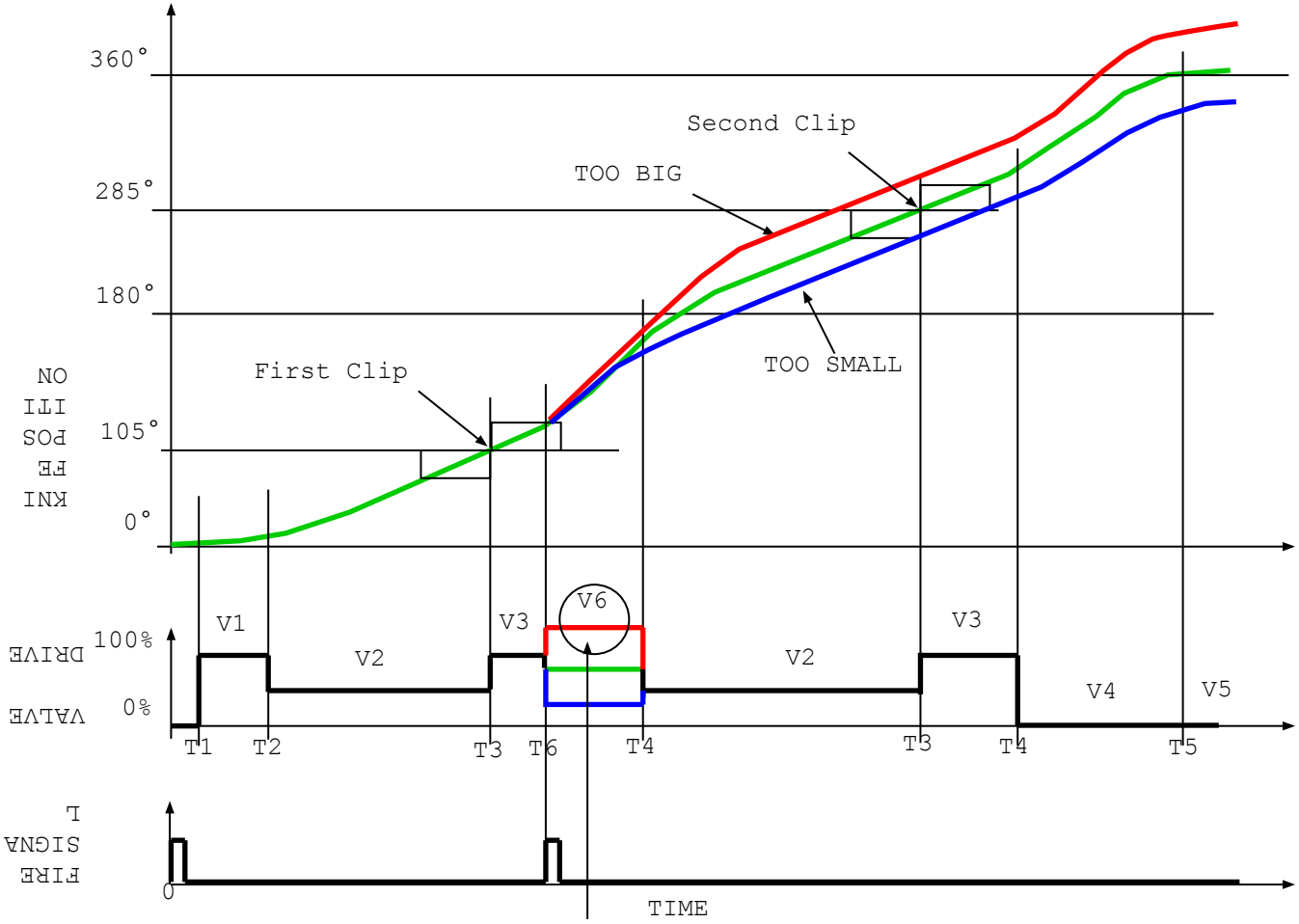
LANDING POSITION ADJUSTMENT



PARAMETER: C_LANTRK
FALSE=MANUAL MODE
TRUE=AUTO TRACK MODE

D_LTIME4 = LEFT
D_RTIME4 = RIGHT

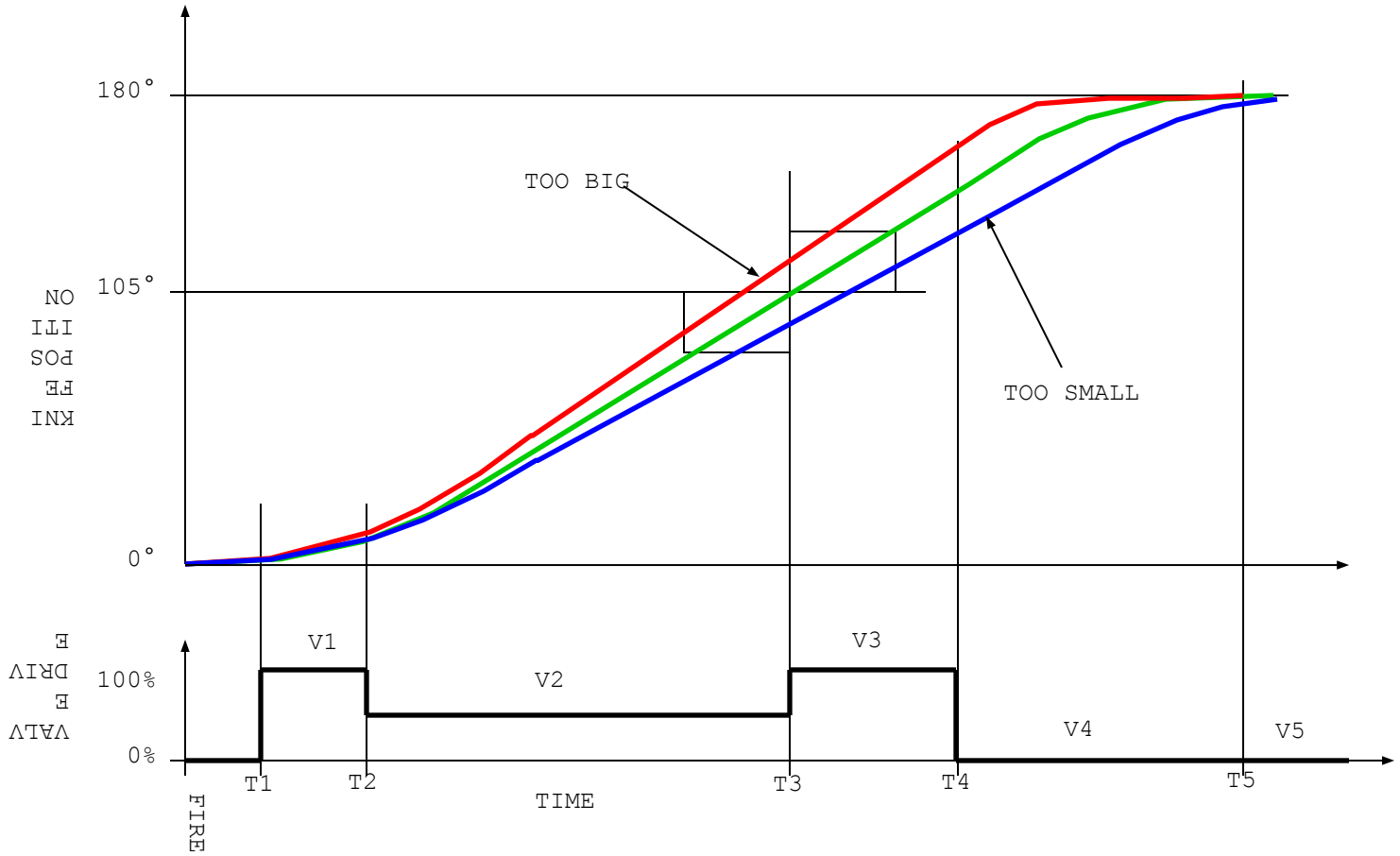
SECOND CLIP ADJUSTMENT



D_LVALV6 = LEFT
D_RVALV6 = RIGHT

PARAMETER: C_2NDTRK
FALSE=MANUAL MODE
TRUE=AUTO TRACK MODE

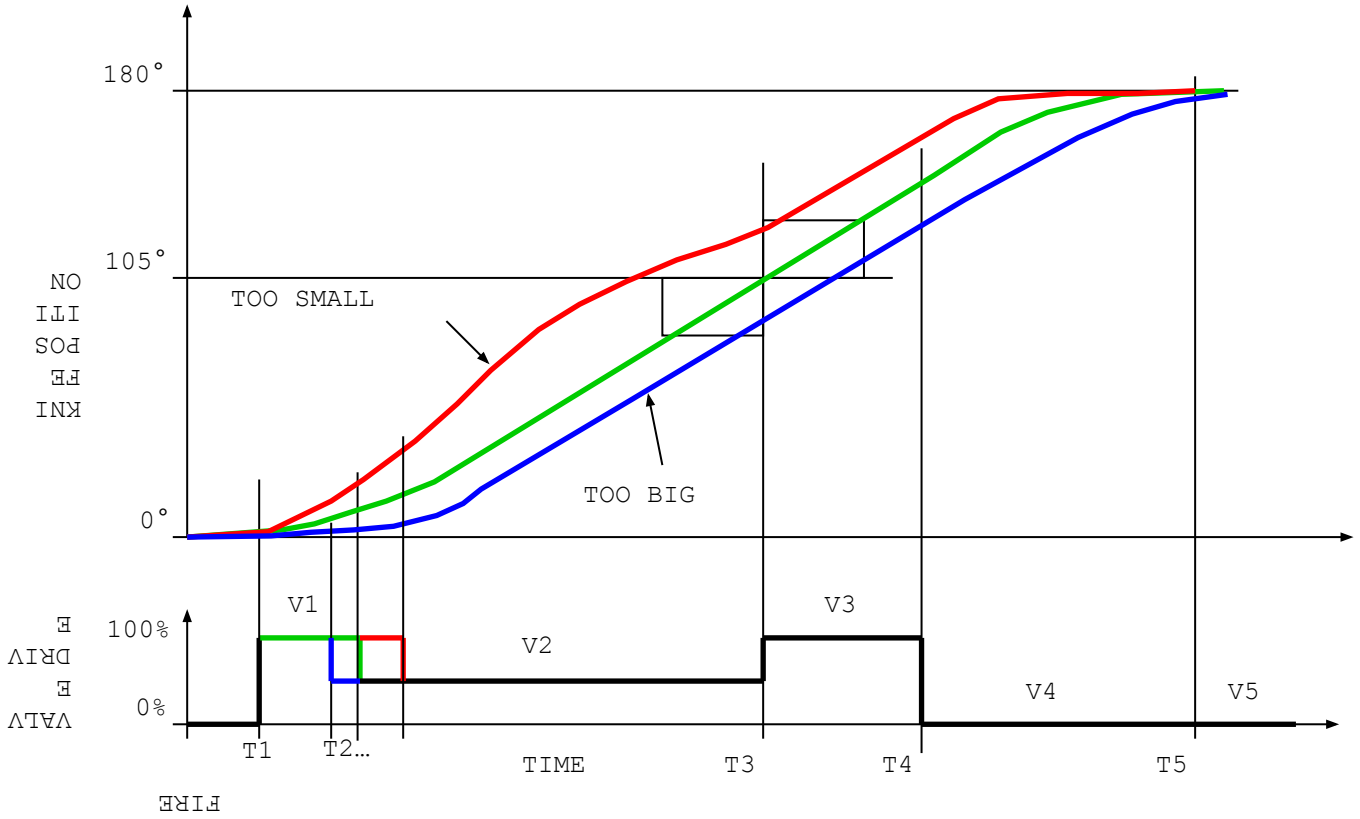
SPEED FACTOR



V2 = Vtarget / Speed Factor(DEFAULT)
ΔV2 = ΔVtarget / Speed Factor (AUTO TRACK)

D_LSPFAC = LEFT
D_RSPFAC = RIGHT

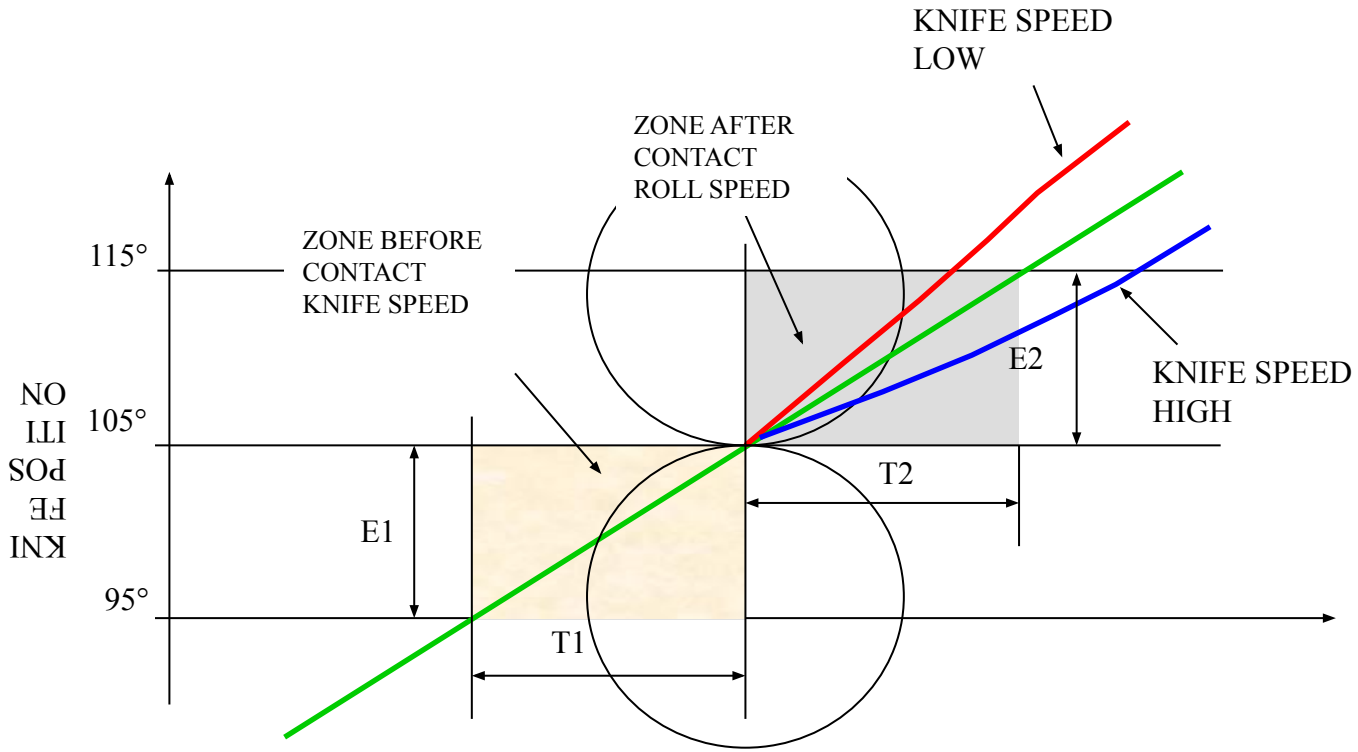
ACCELERATION FACTOR



T2-T1 = Vtarget / Accel Factor(DEFAULT)
Δ(T2 –T1)= ΔVtarget / Accel Factor(AUTO TRACK）

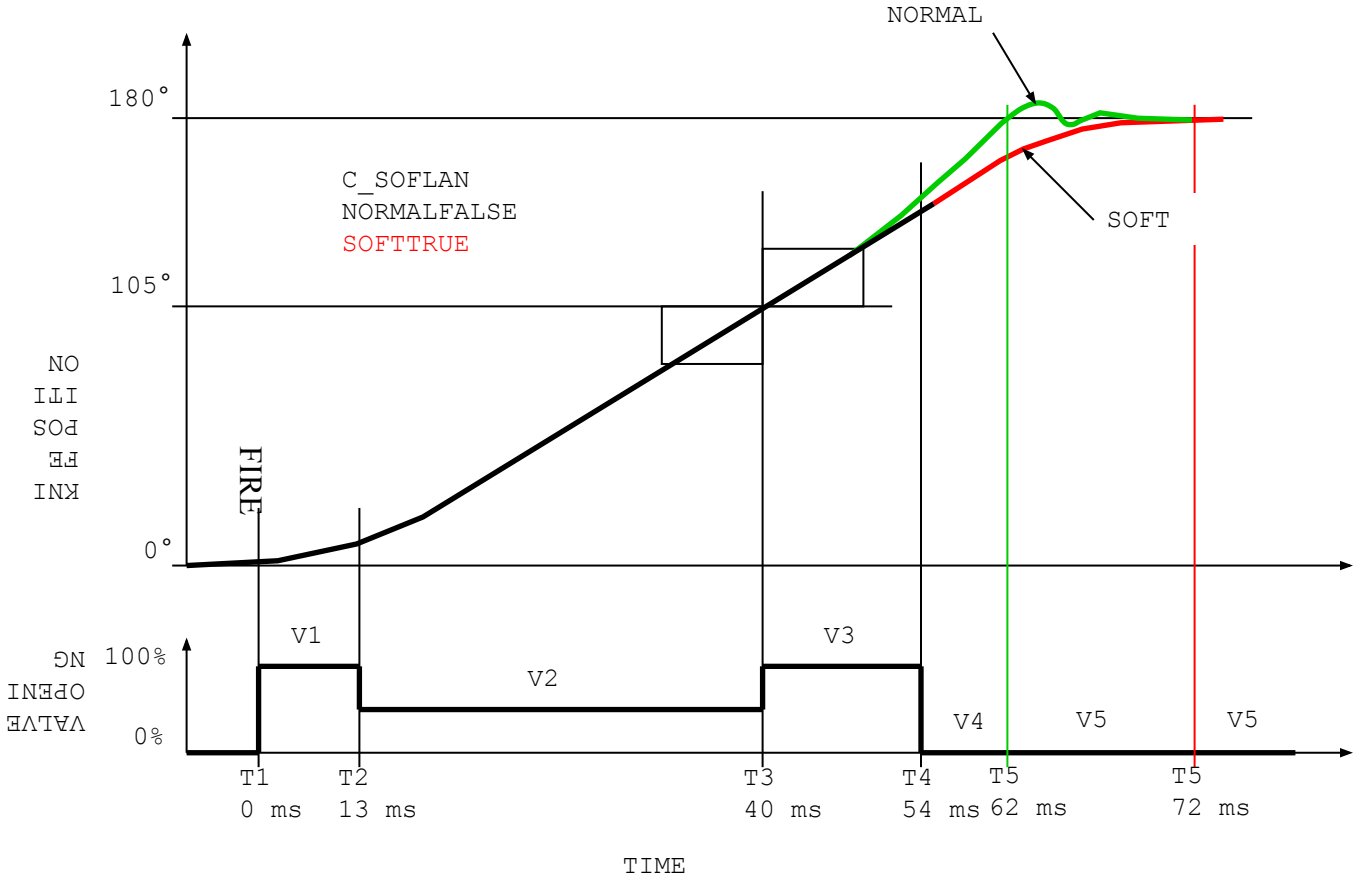
D_LSPFAC = LEFT
D_RSPFAC = RIGHT

KNIFE/ROLL SPEED MEASURE

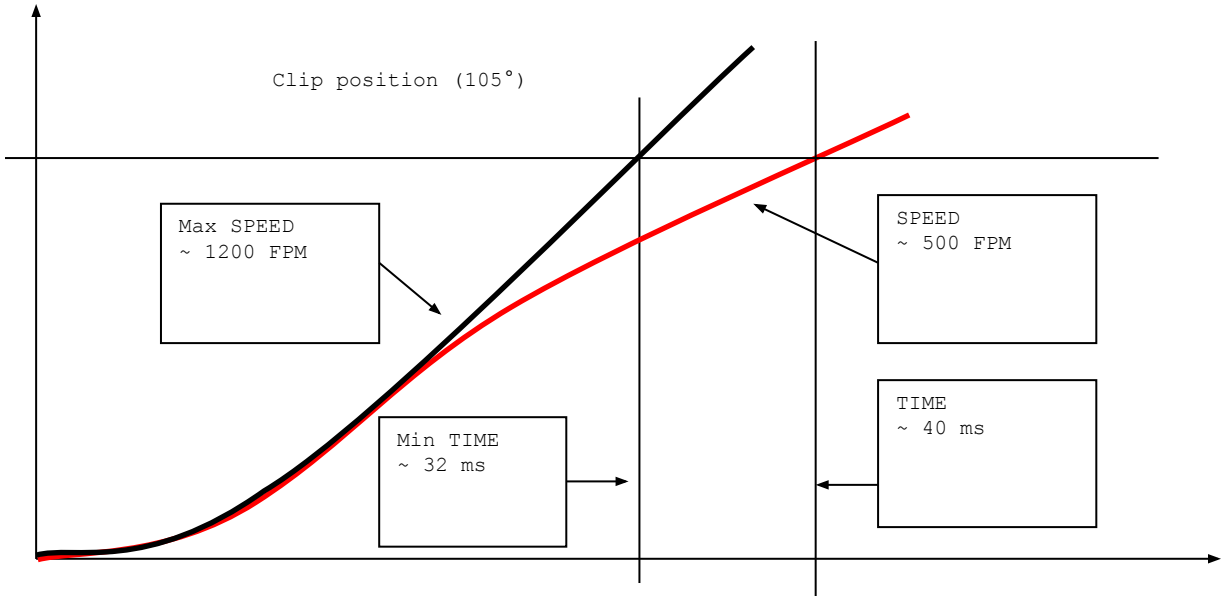


Speed Before = E1/T1 . Knife Diam . Π
Speed After = E2/T2 . Knife Diam . Π

NORMAL/SOFT LANDING



RESPONSE VERSUS KNIFE SPEED



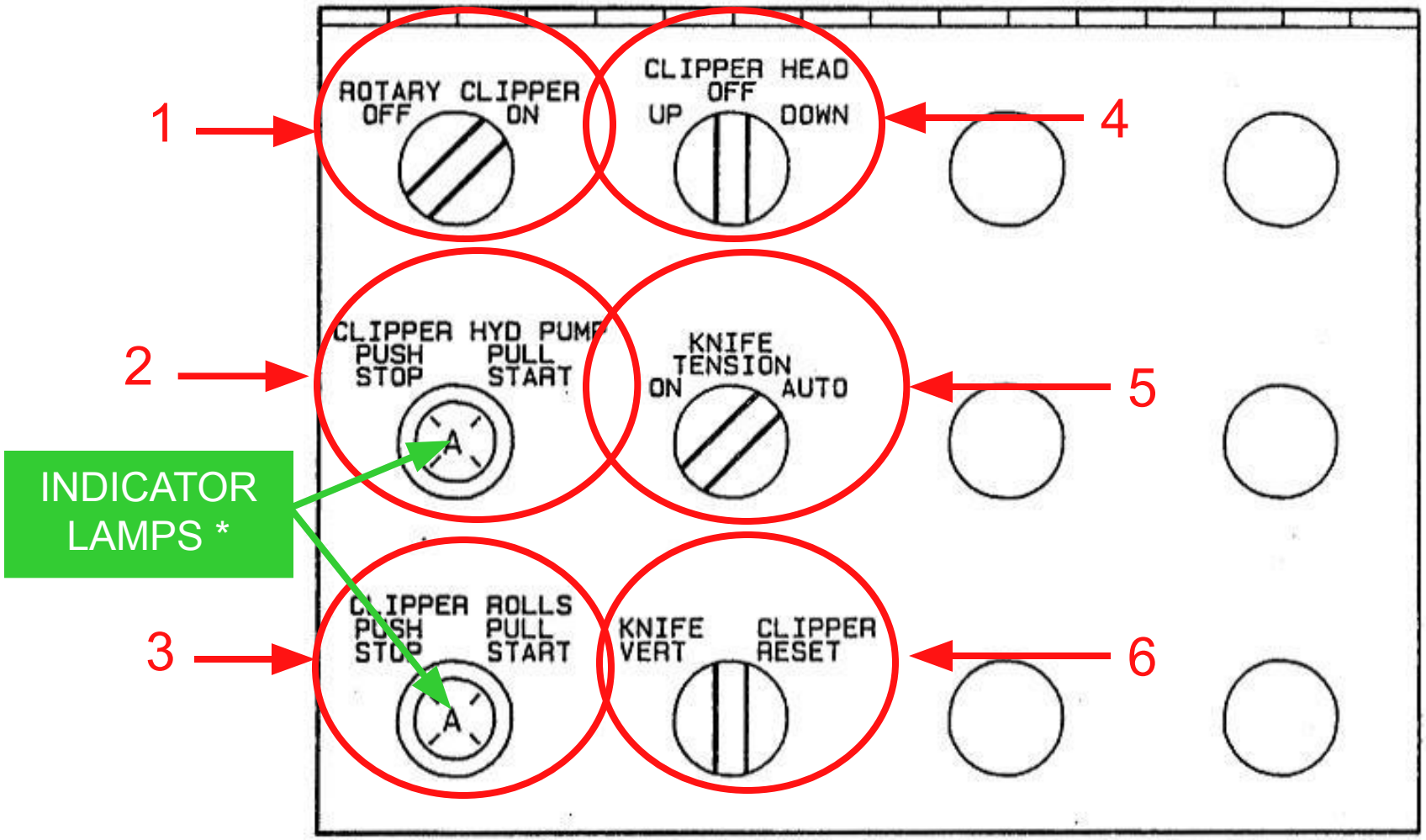
SECTION 4

OPERATION

CLIPPER CONSOLE	Operator's PB and SW console
CONTROLLER	Raute controller cabinet

M E 1

CLIPPER CONSOLE LAYOUT



*LAMPS BLINKING INDICATE FAULT

M E 1 2

STARTUP SEQUENCE

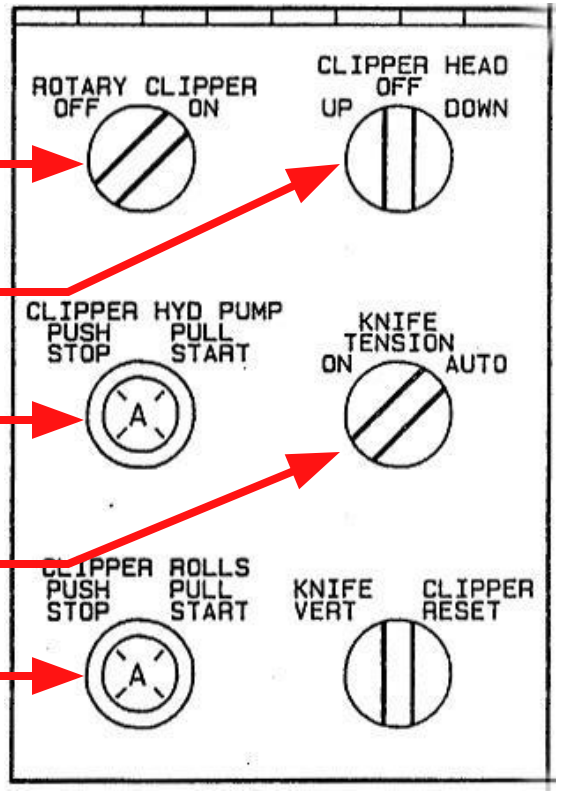
1 - CLIPPER POWER ON

2 - HEAD DOWN

3 - HYDRAULIC PUMP ON

4 - KNIFE TENSION AUTO

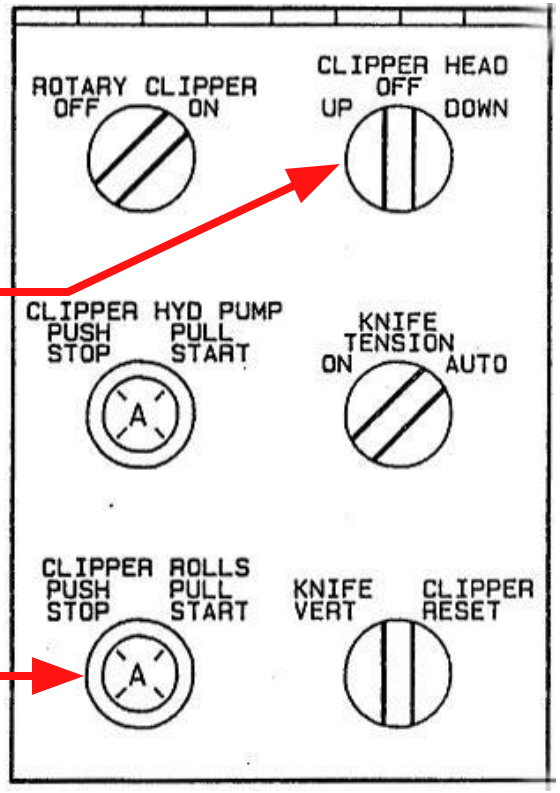
5 - ROLLS ON



STOP TO CLEAR SEQUENCE

2 - HEAD UP

1 - ROLLS OFF



DO NO ENTER THE CLIPPER AREA!!

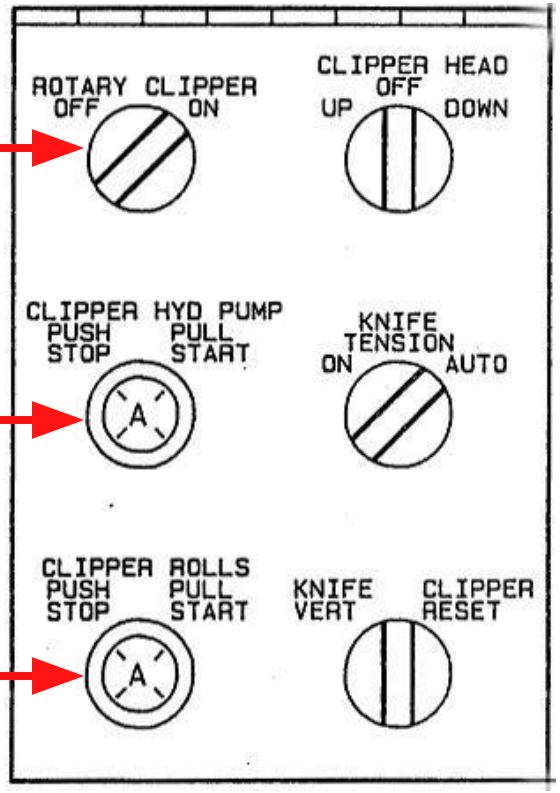
RAUTE

FULL STOP SEQUENCE

3 - CLIPPER POWER OFF

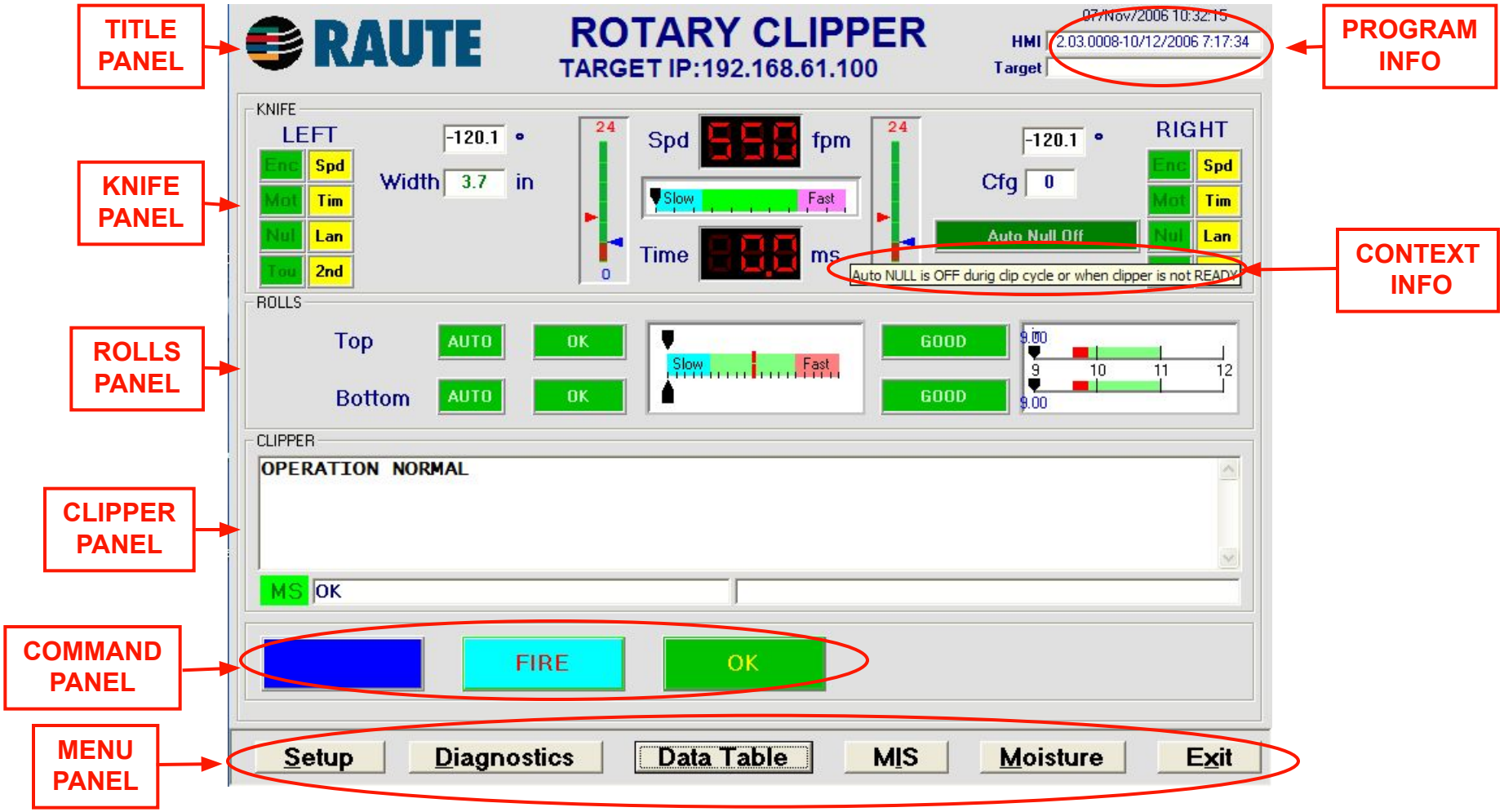
2 - HYDRAULIC PUMP OFF

1 - ROLLS OFF

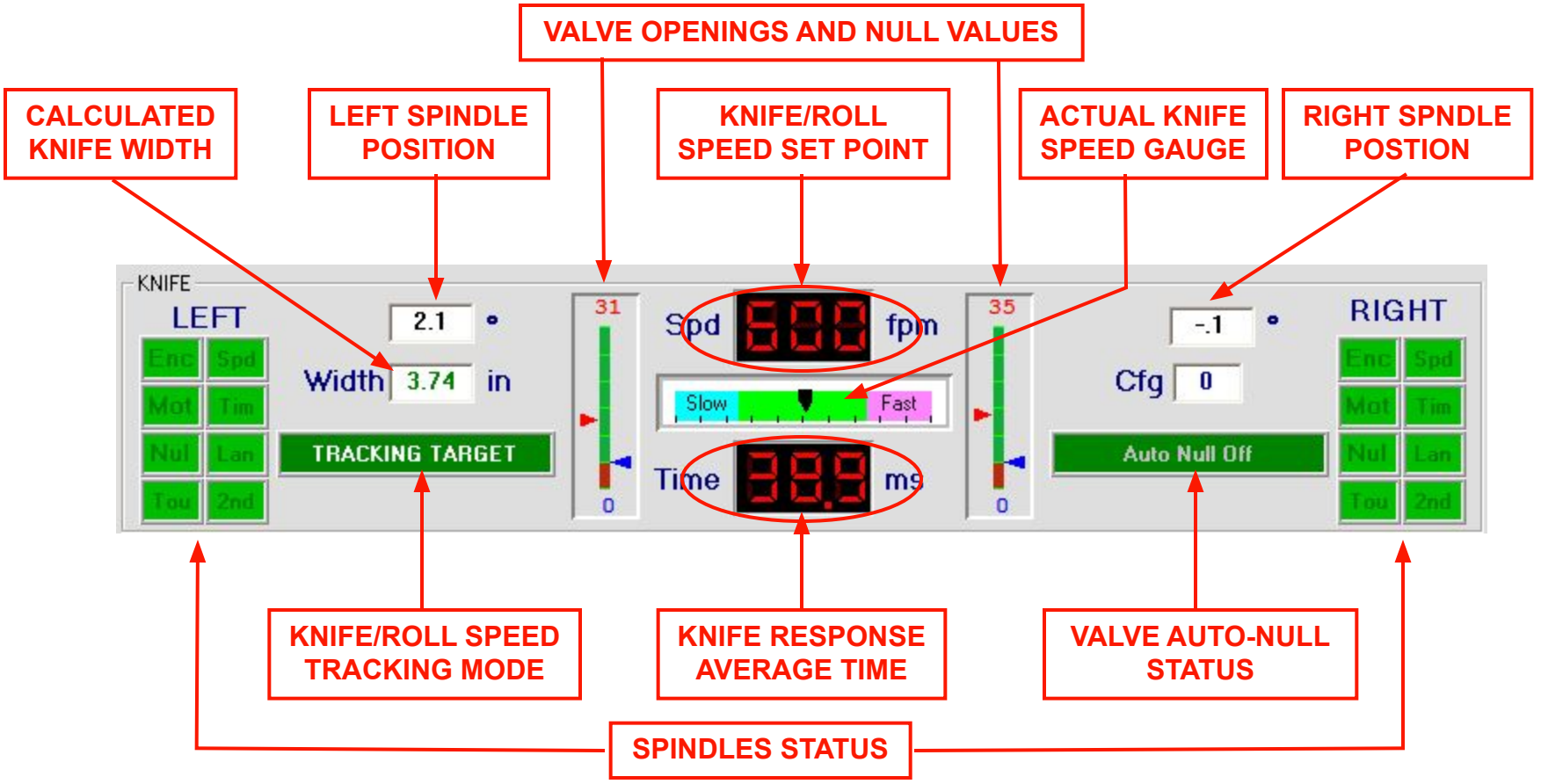


RAUTE

HMI - MAIN SCREEN

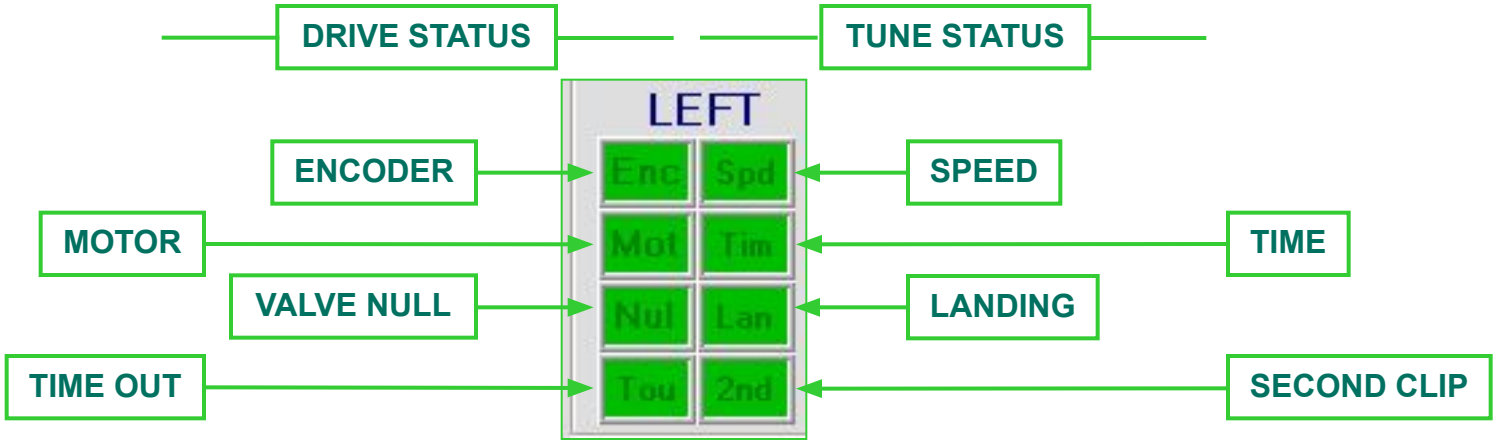


HMI MAIN SCREEN - KNIFE PANEL



MAIN SCREEN - KNIFE STATUS

NORMAL CONDITION

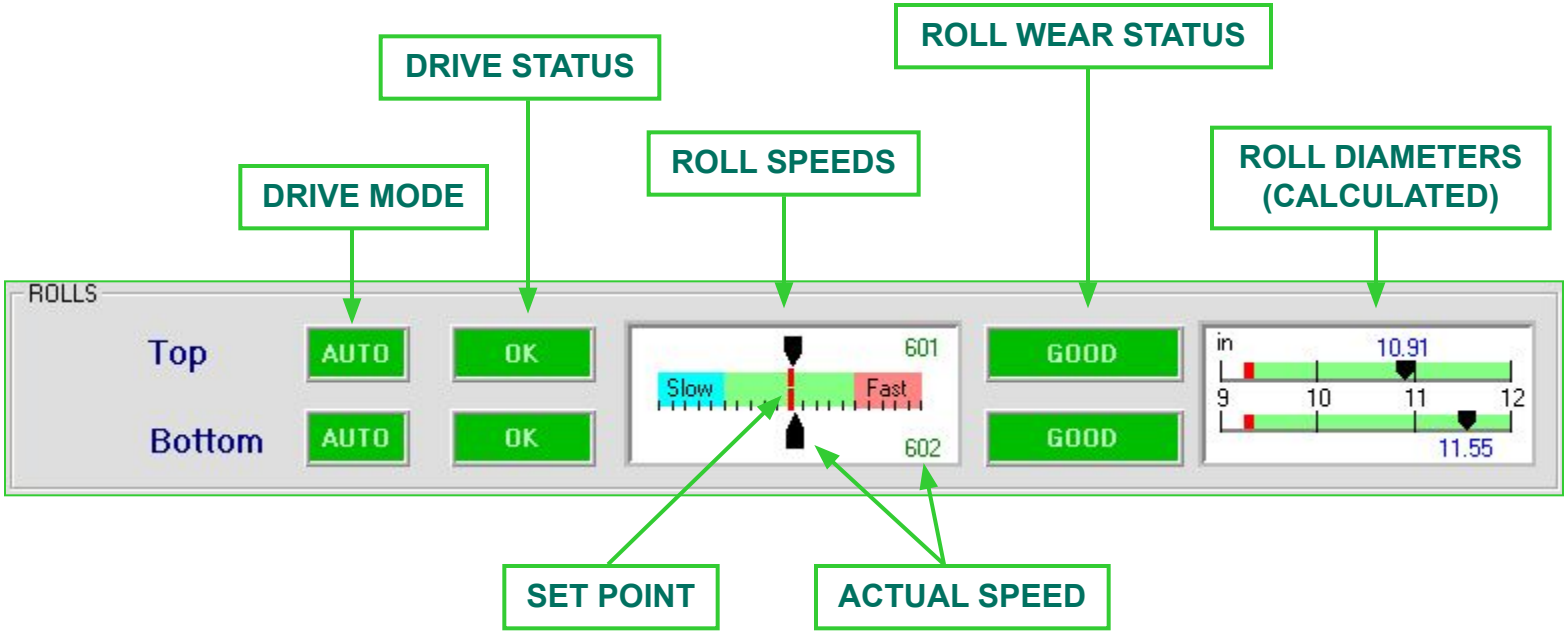


WARNING CONDITION

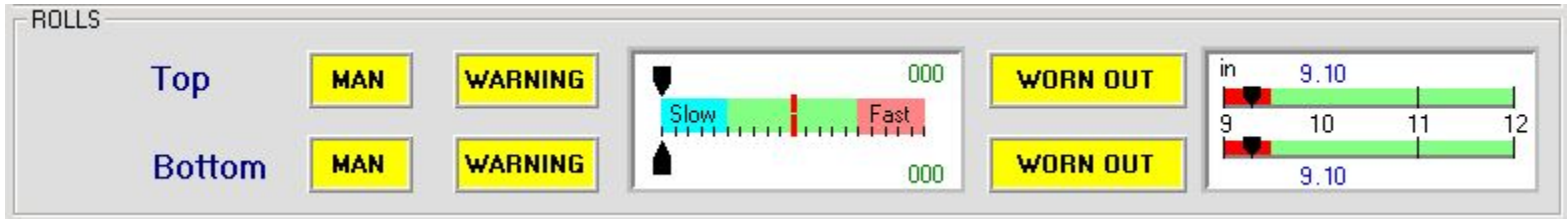
RAUTE

HMI MAIN SCREEN - ROLLS PANEL

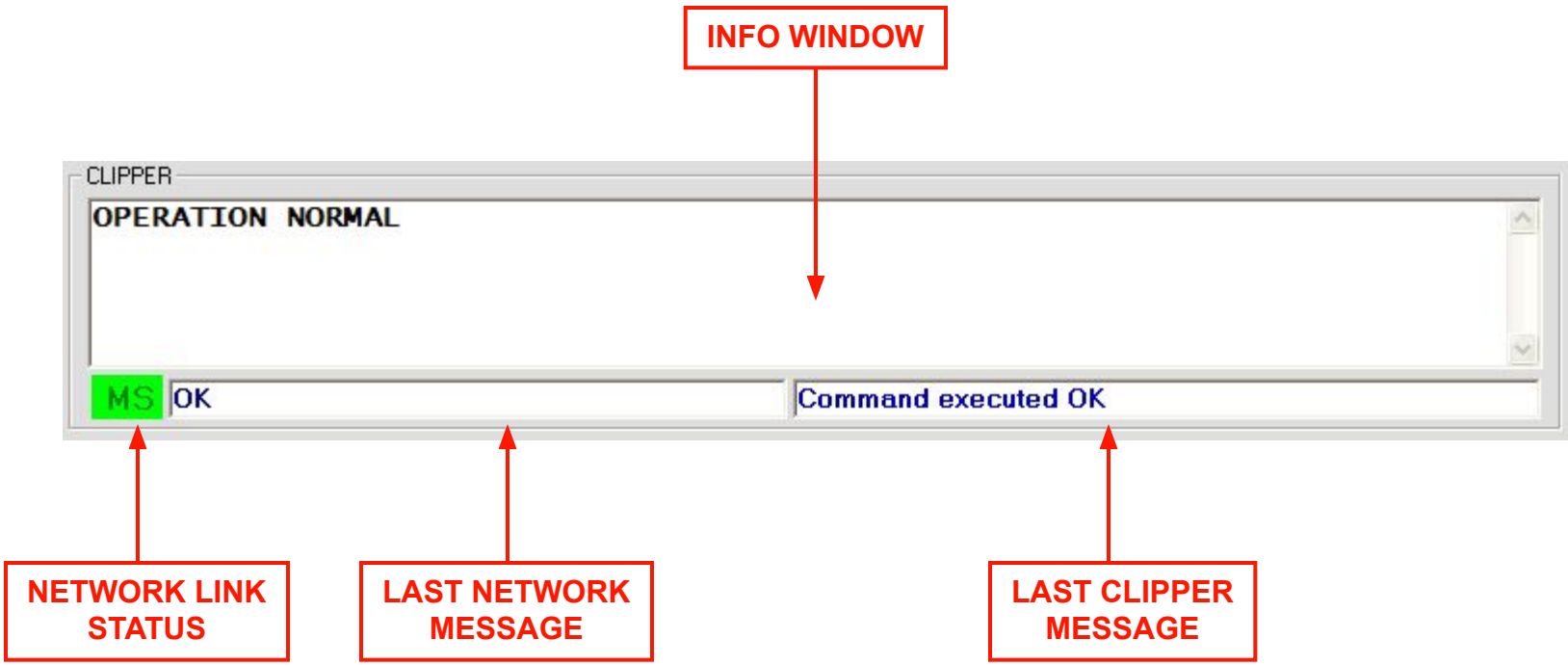
NORMAL CONDITION



WARNING CONDITION

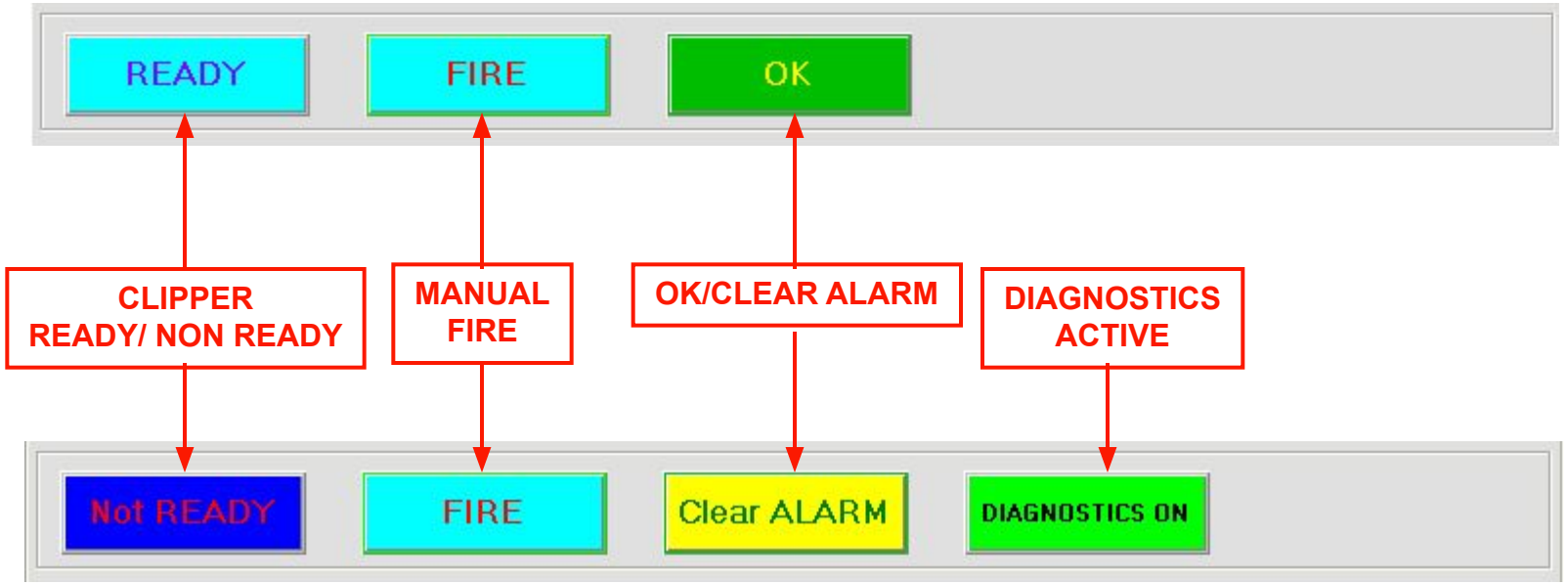


HMI MAIN SCREEN - INFO PANEL



HMI MAIN SCREEN - BUTTONS

COMMAND BUTTONS



MENU BUTTONS

N

E 1

HMI - KNIFE SETUP SCREEN

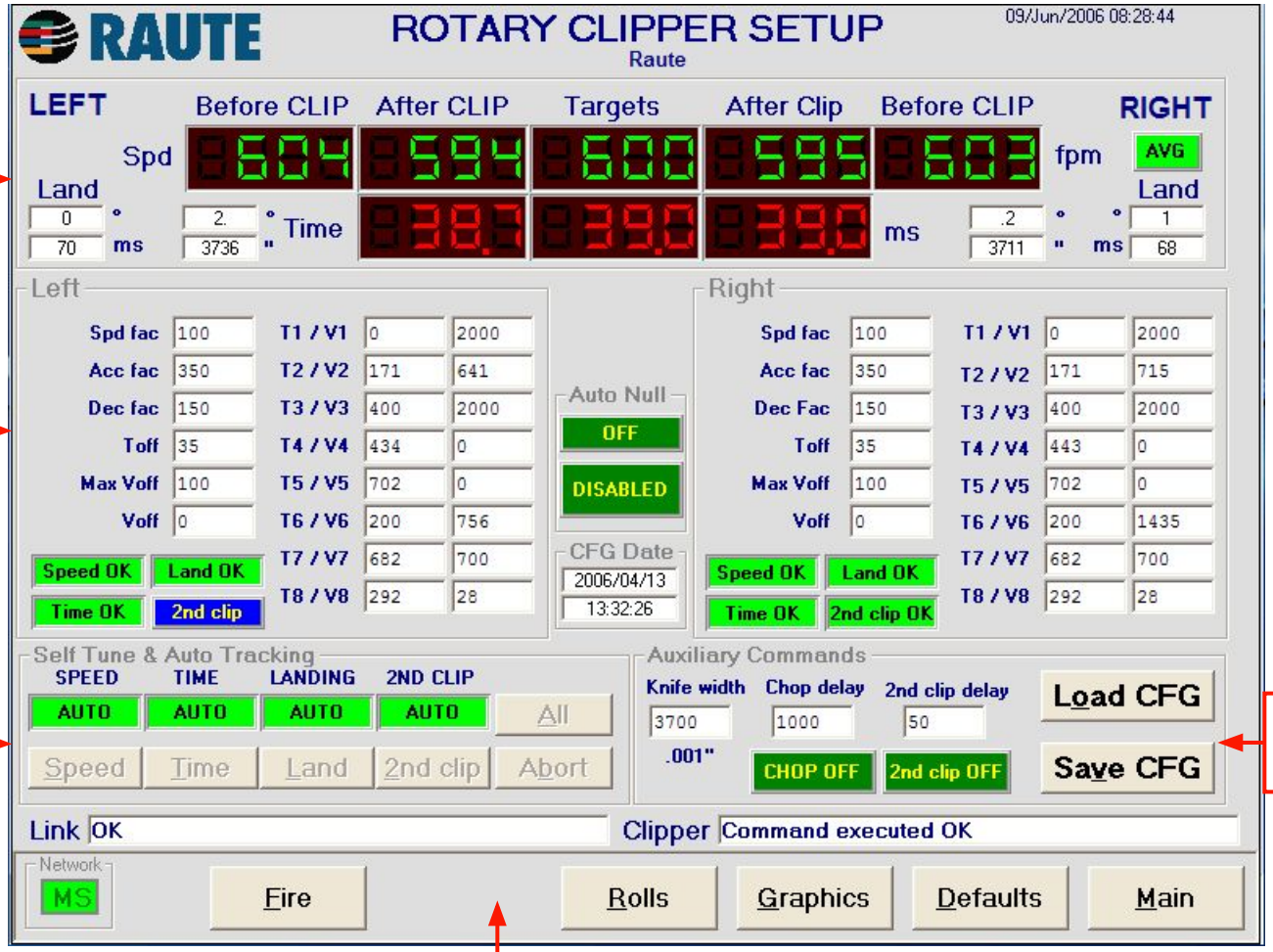
ACTUAL VALUES

CLIP PARAMETERS

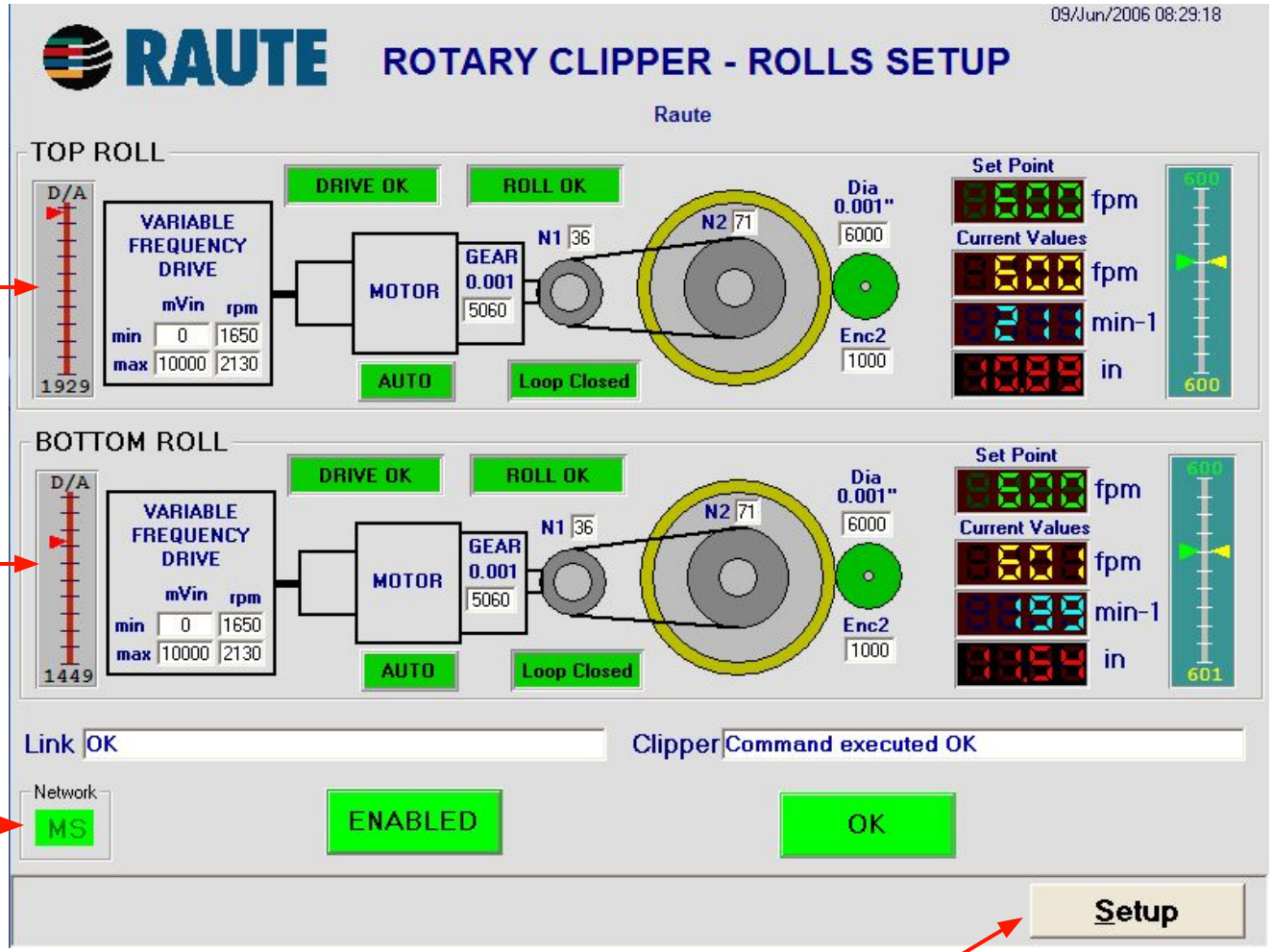
TUNE CONTROLS

AUX. CTRLS.

COMMANDBUTTONS



HMI - ROLLS SETUP SCREEN



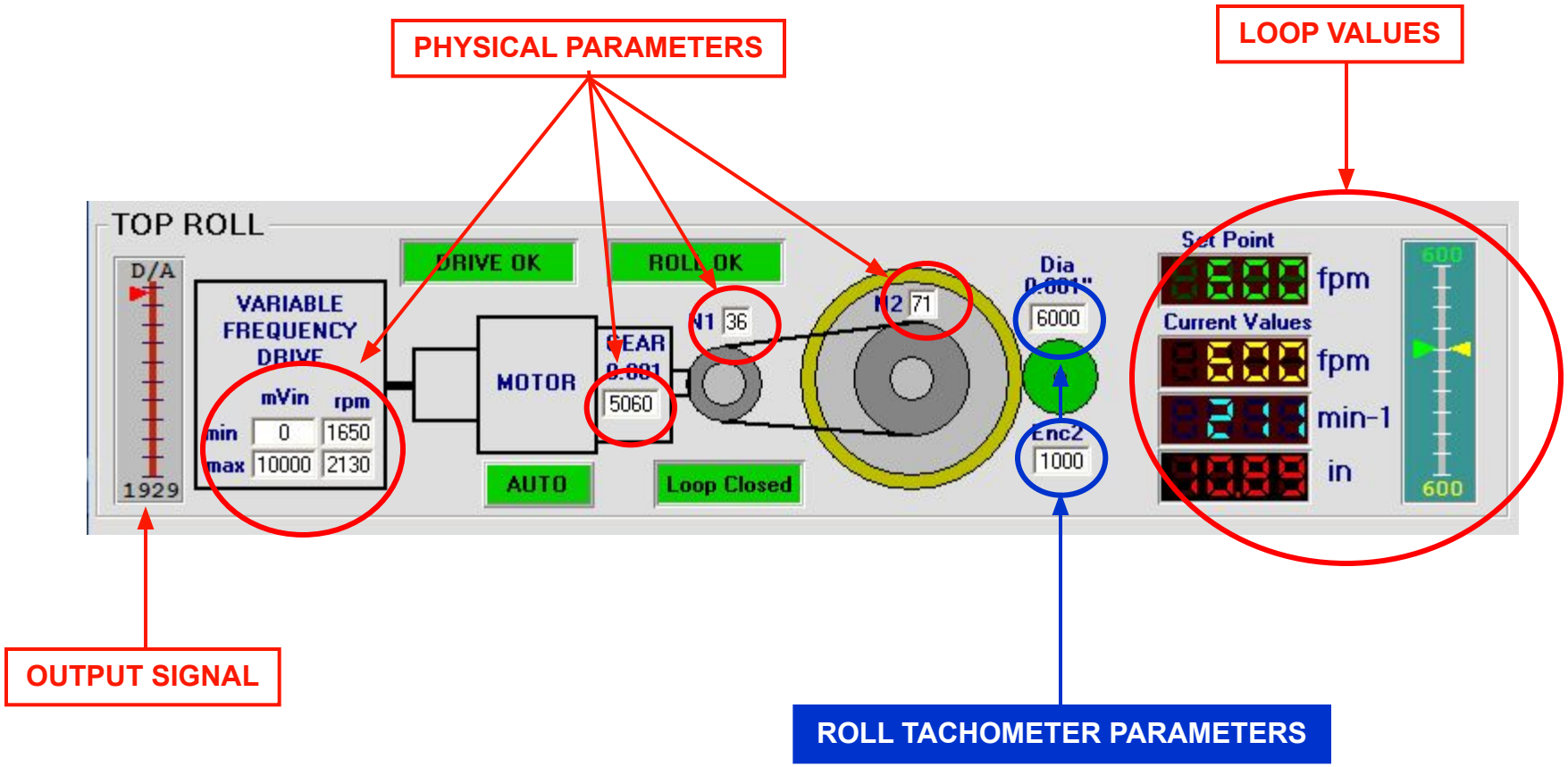
TOP ROLL

BOTTOM ROLL

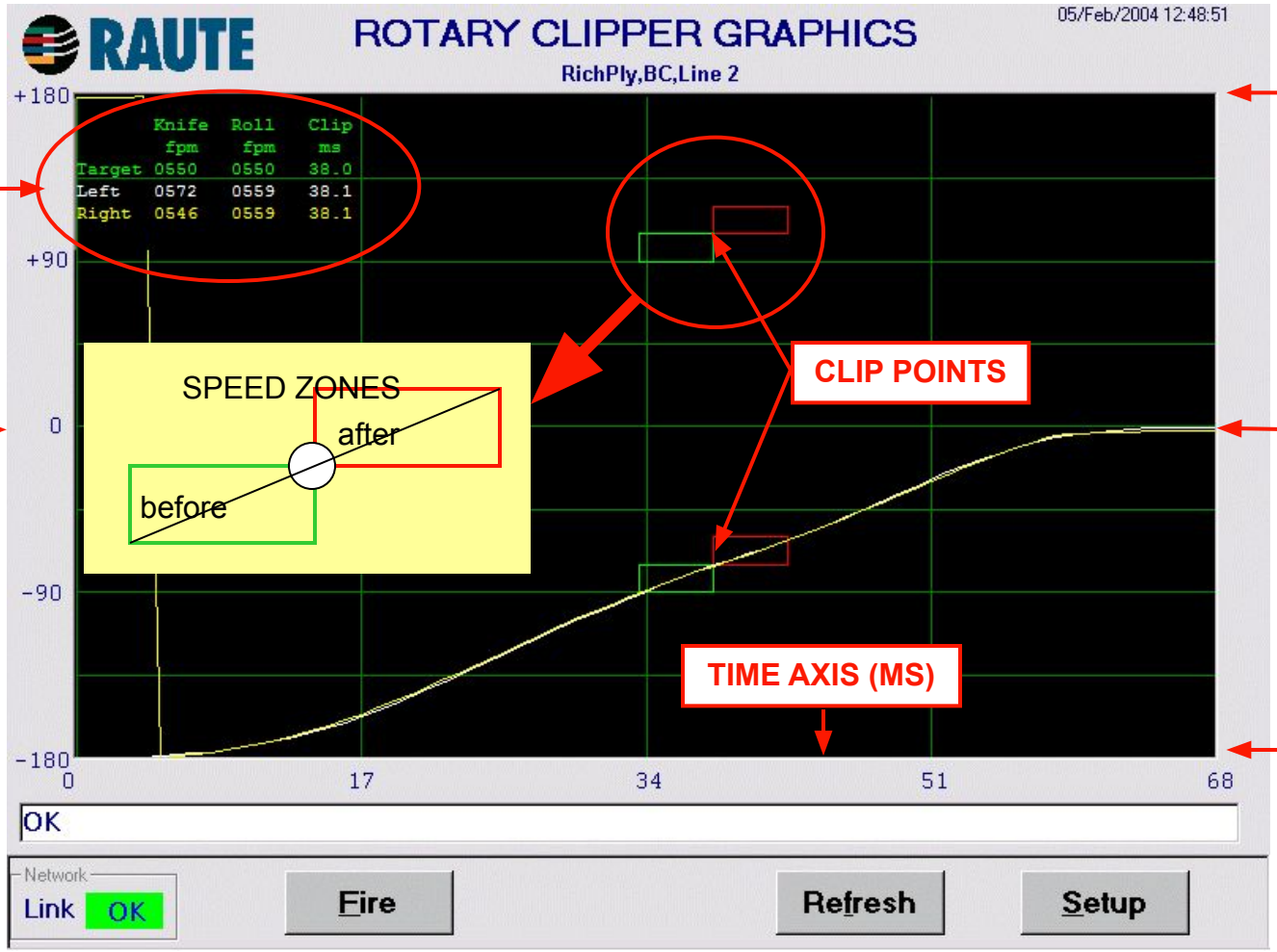
BUTTONS

BACK TO PREVIOUS SCREEN

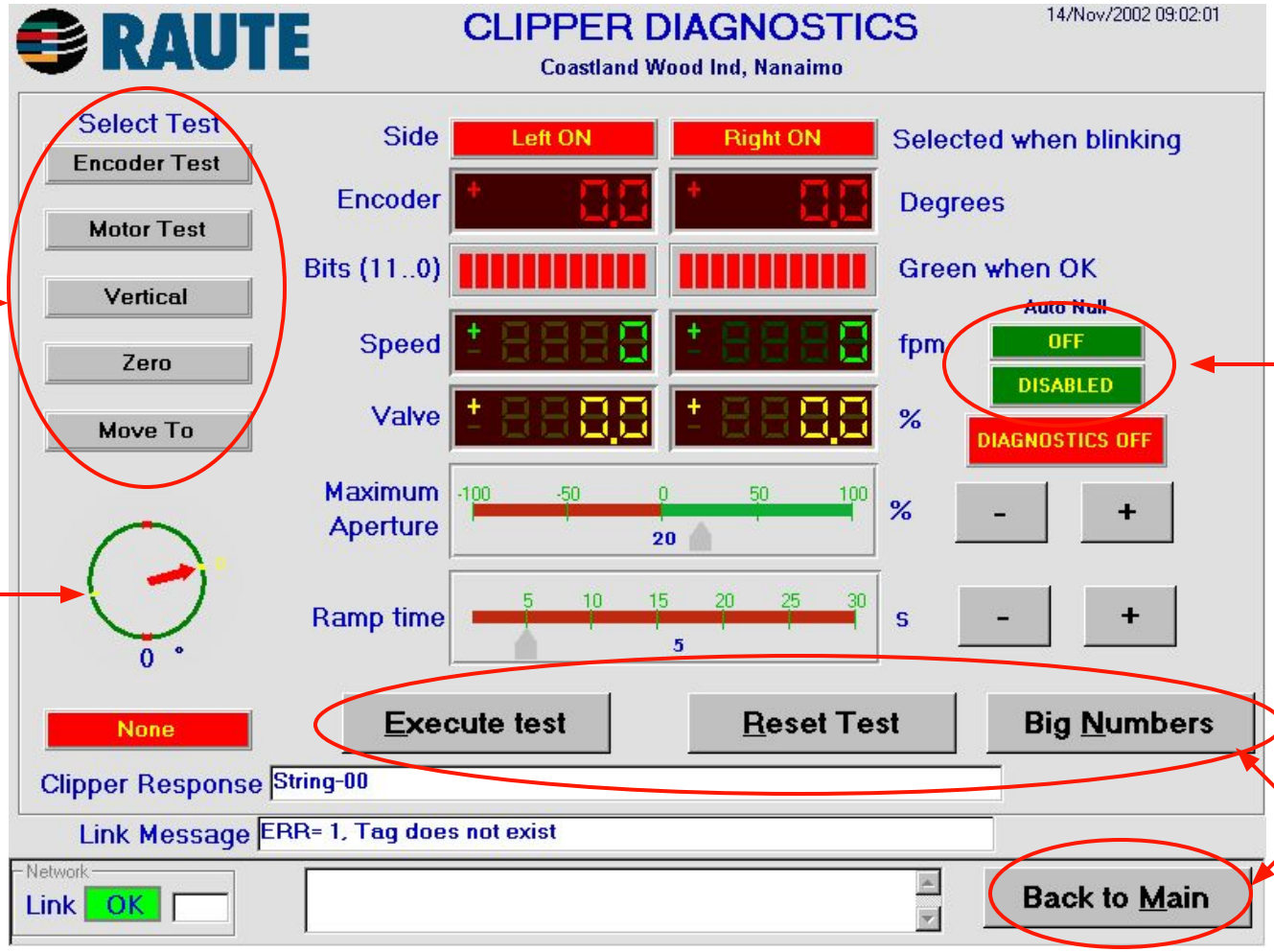
HMI - TOP ROLL SETUP PANEL



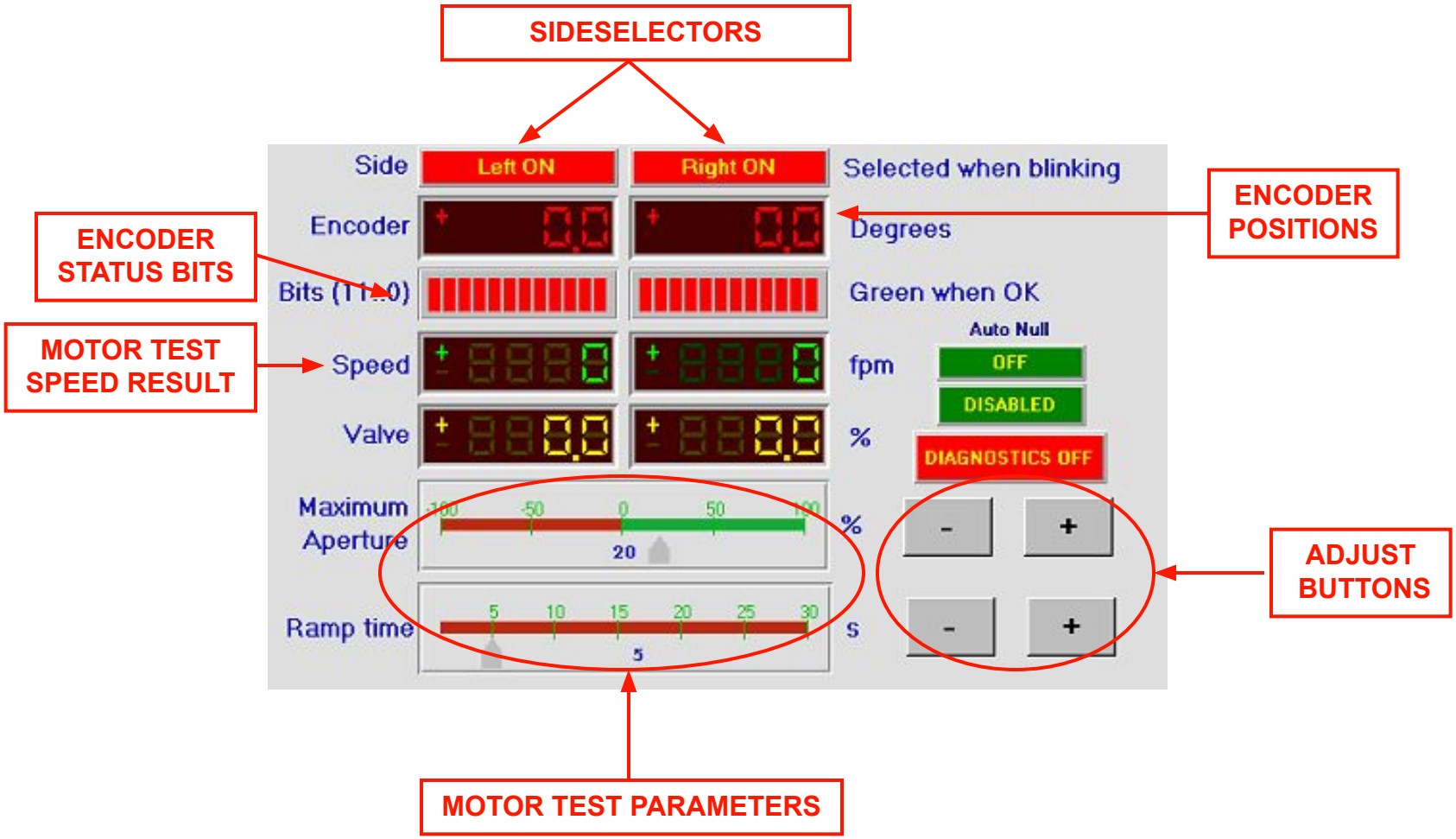
HMI - GRAPHICS SCREEN



HMI - DIAGNOSTICS SCREEN



HMI - DIAGNOSTICS SCREEN

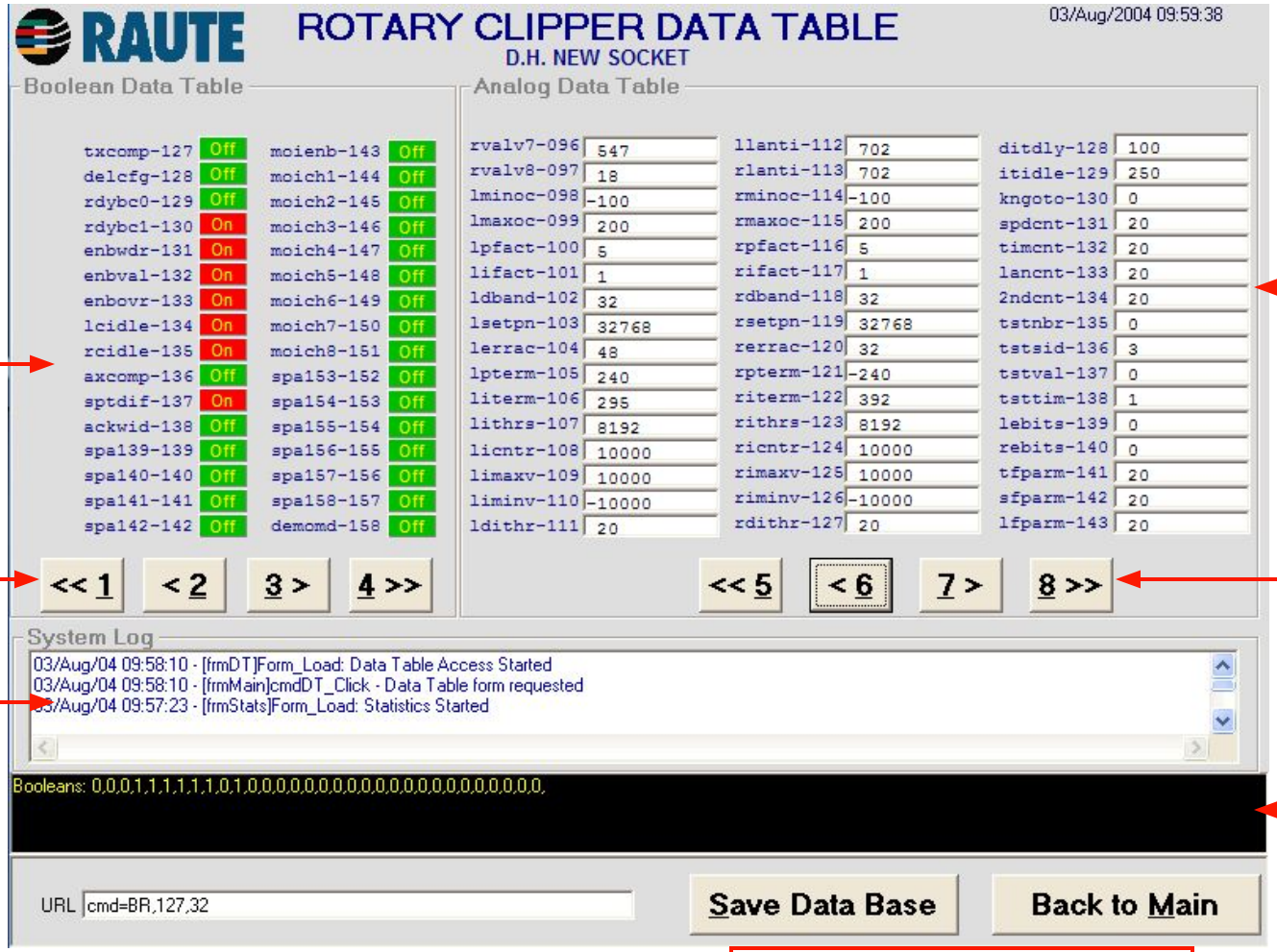


N

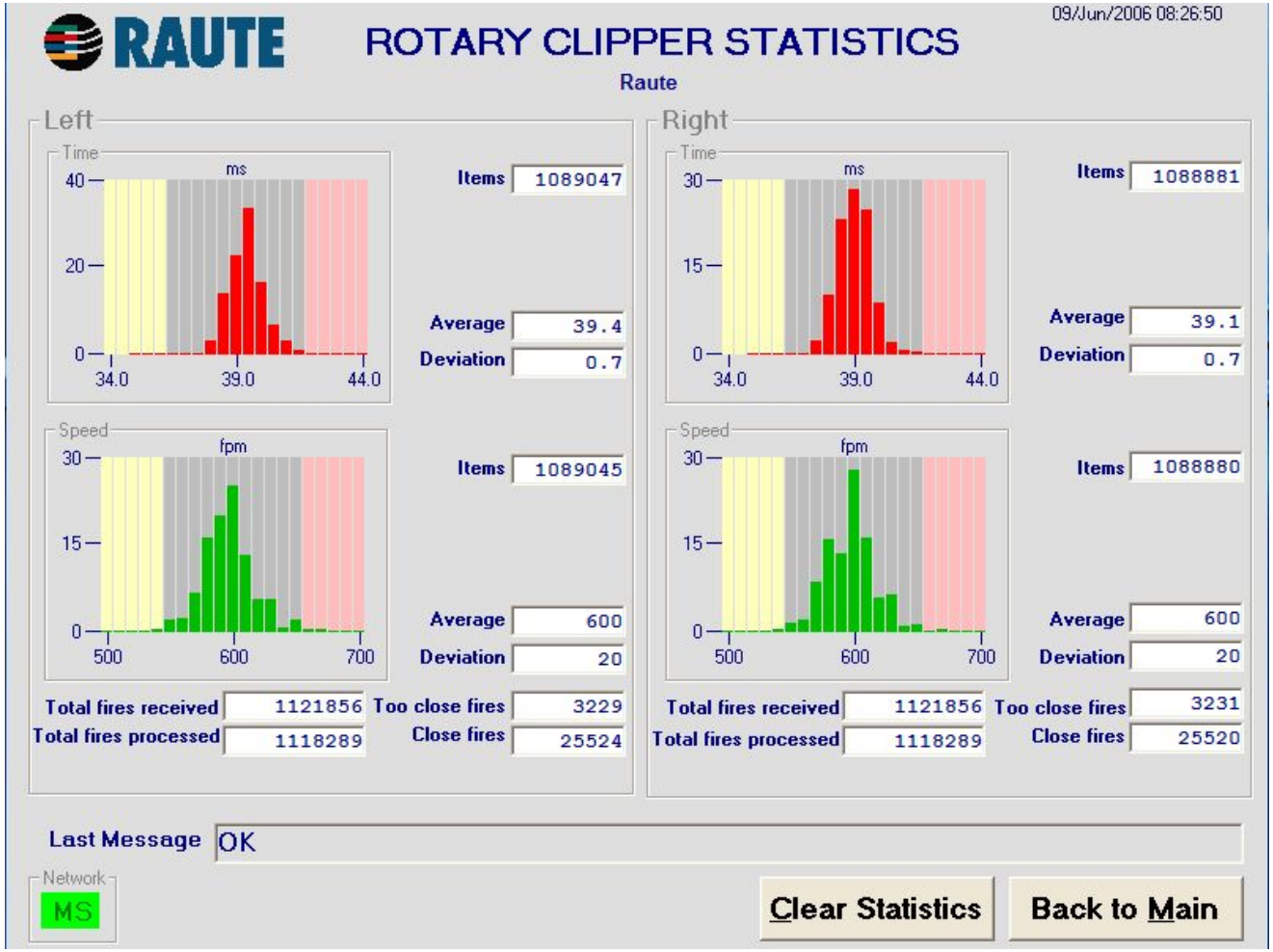
E 1

RAUTE

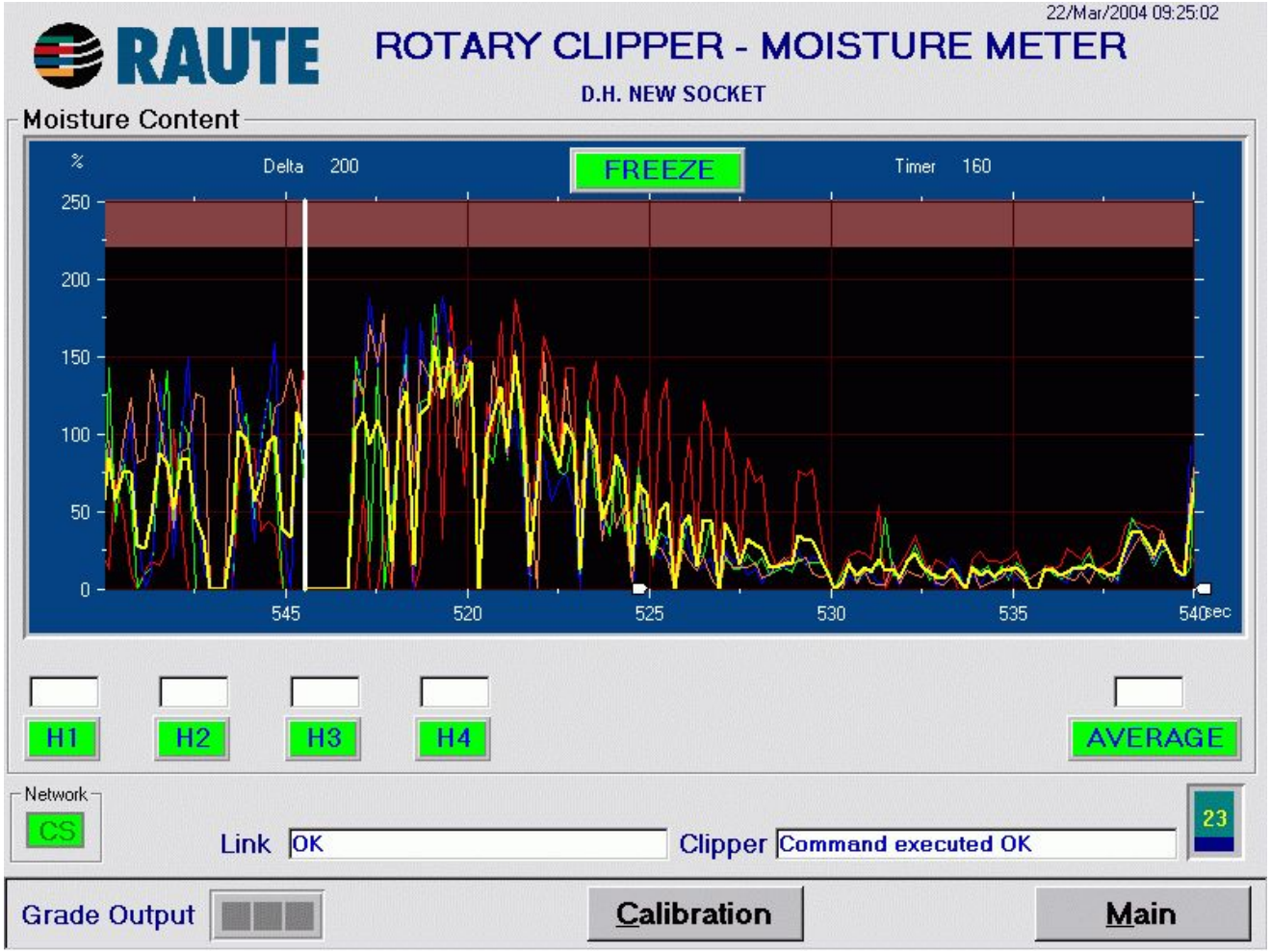
HMI - DATA TABLE SCREEN



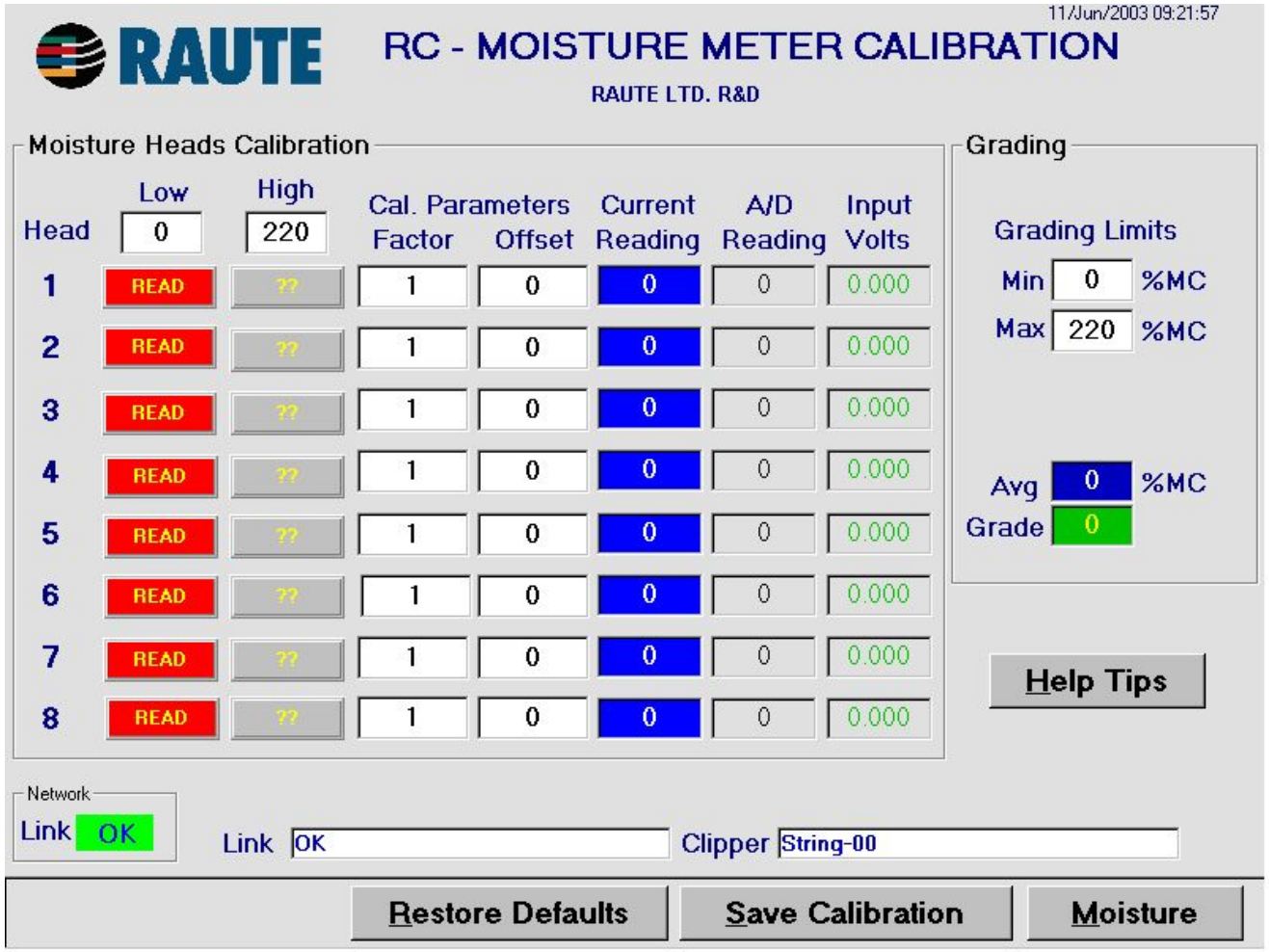
HMI - MIS SCREEN



HMI - MOISTURE SCREEN



HMI - MOISTURE SETUP SCREEN



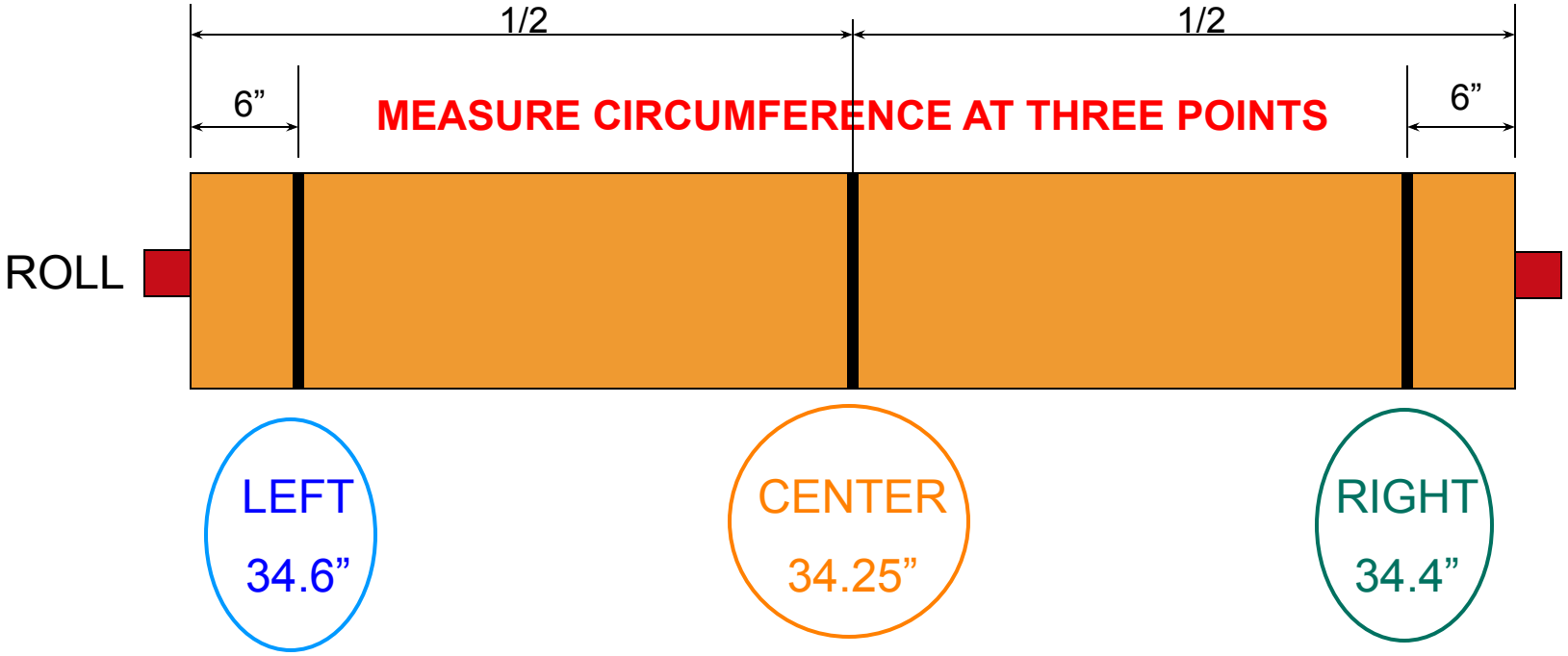
SECTION 5

MAINTENANCE

QUICK CHECKS	Roll wear Servo, Spindles RPM Filters Shafts and bearings
HYDRAULIC SETUP	Adjusting the hydraulic pressures
ROLL ALIGNMENT	Vertical alignment Horizontal alignment
ROLL SPEED SETUP	Match roll speed to knife speed
KNIFE HANDLING	Removal/Installation Setup
ENCODERS SETUP	General procedure Only one spindle removed Encoder replacement

ROLL WEAR & MISALIGNMENT

CLIPPER MUST BE LOCKED OUT FOR THIS PROCEDURE!



AVERAGE OF LEFT/RIGHT = (34.6” + 34.4)/2 = 34.5”

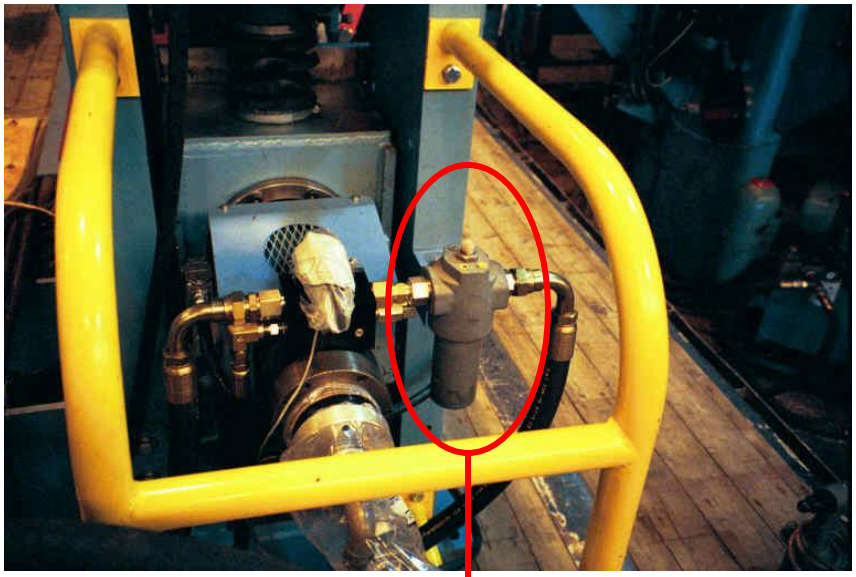
ROLL WEAR (L,R - CENTER) = 34.5” - 34.25 = 0.25”

ROLL VERT. MISSALIGNMENT (L-R) = 34.6” - 34.4 = 0.2”

EXAMPLE VALUES !

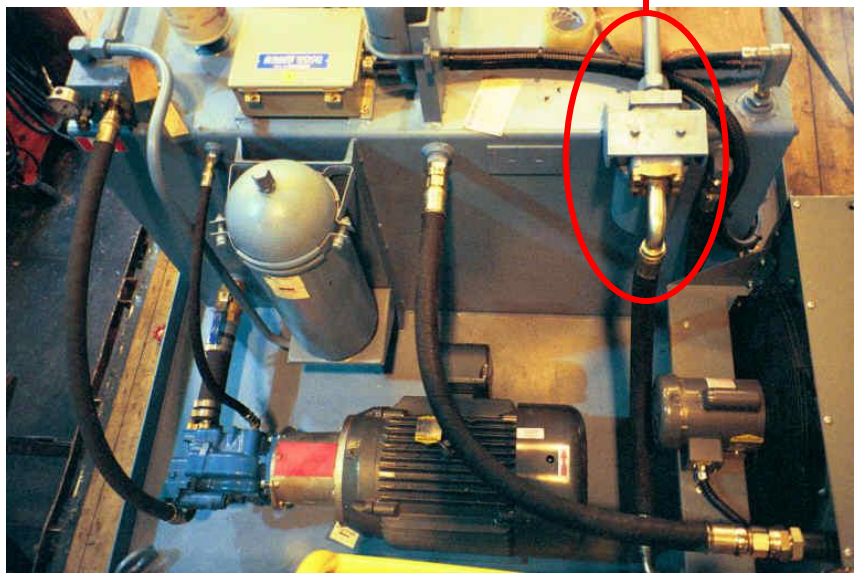
RAUTE

OIL FILTERS, CLASSIC CLIPPER



REPLACE FILTERS EVERY 3 MONTHS

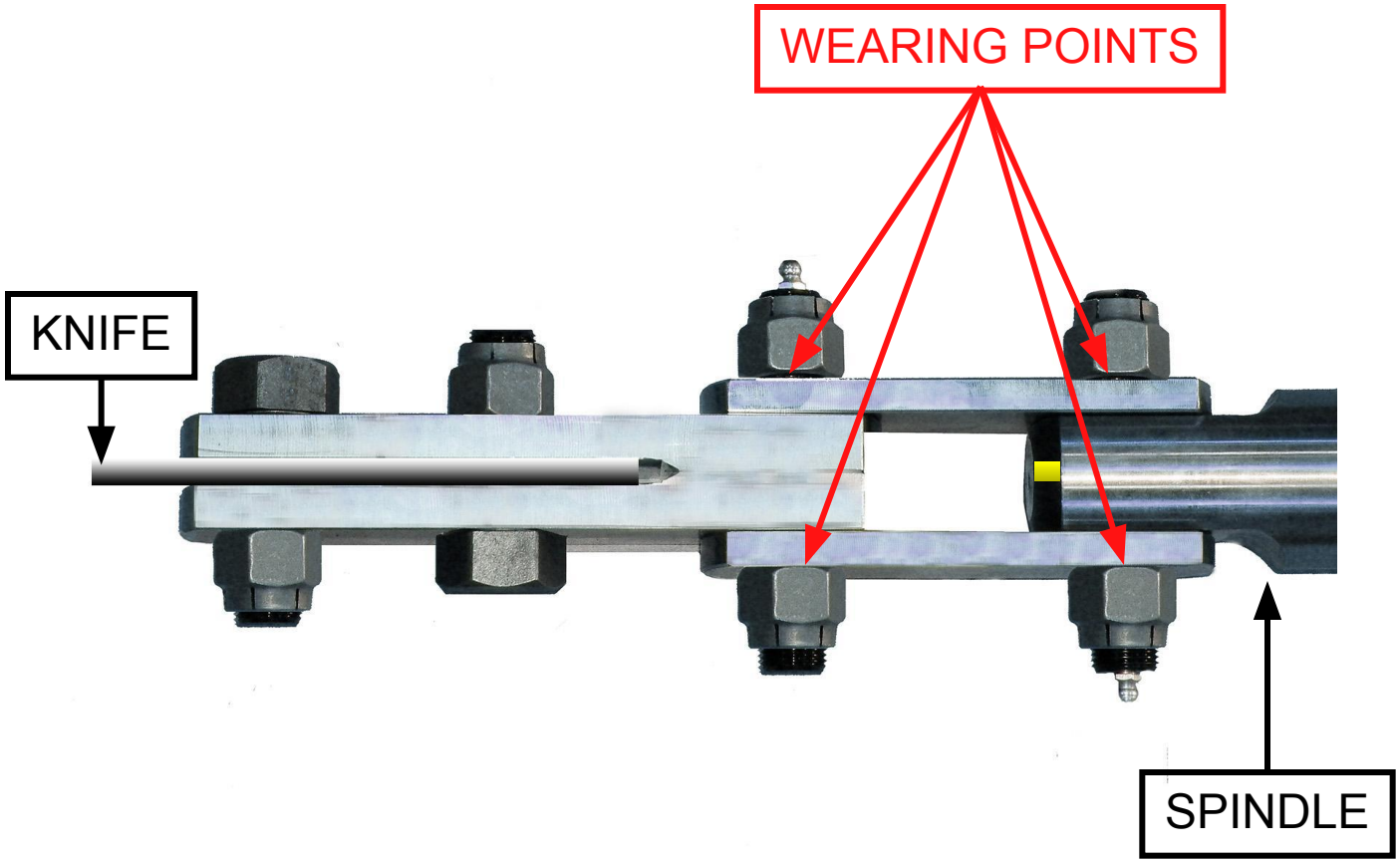
LOW PRESSURE FILTER



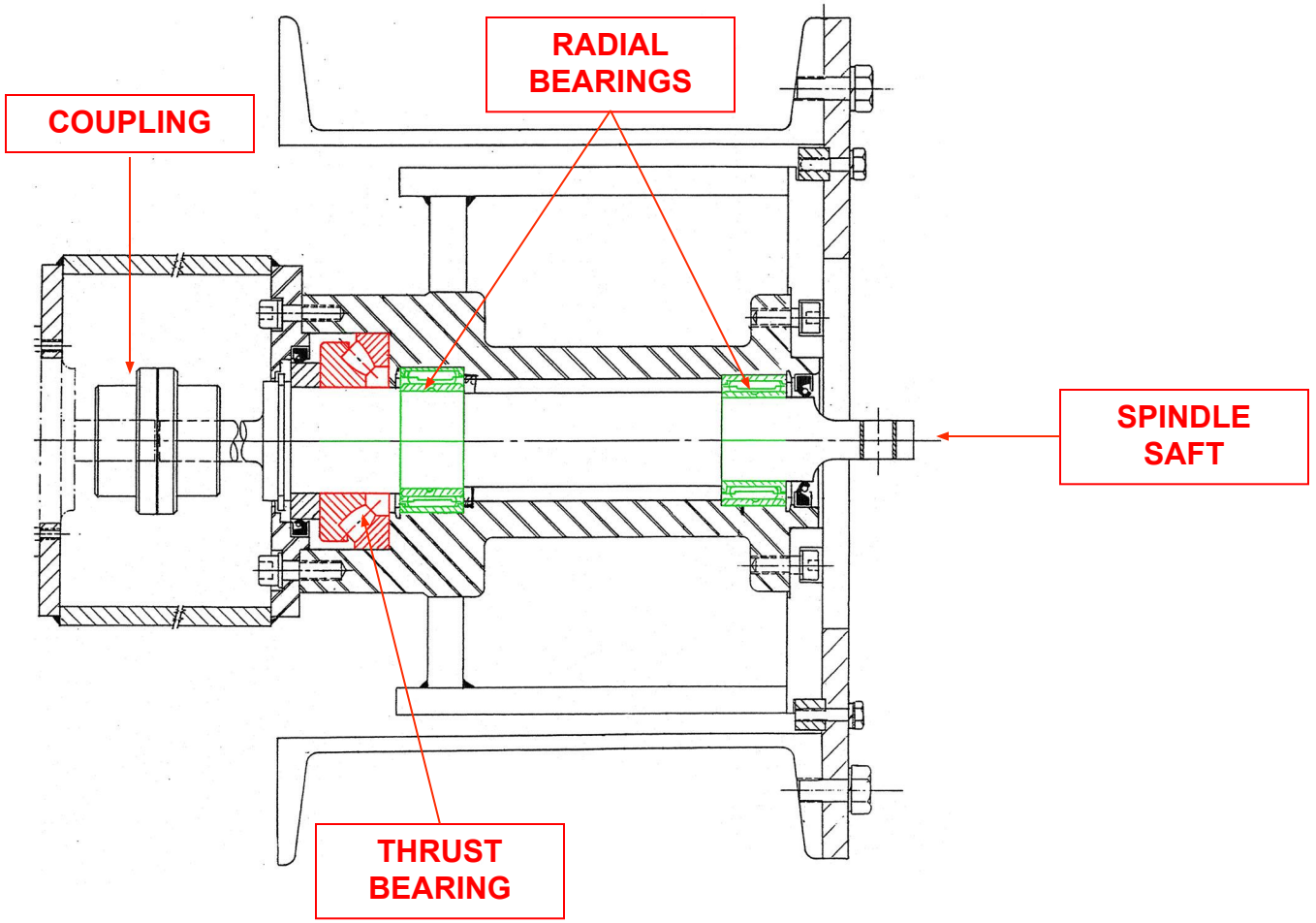
HIGH PRESSURE FILTERS (ONE PER SPINDLE) *

* Not present in upgraded clipper

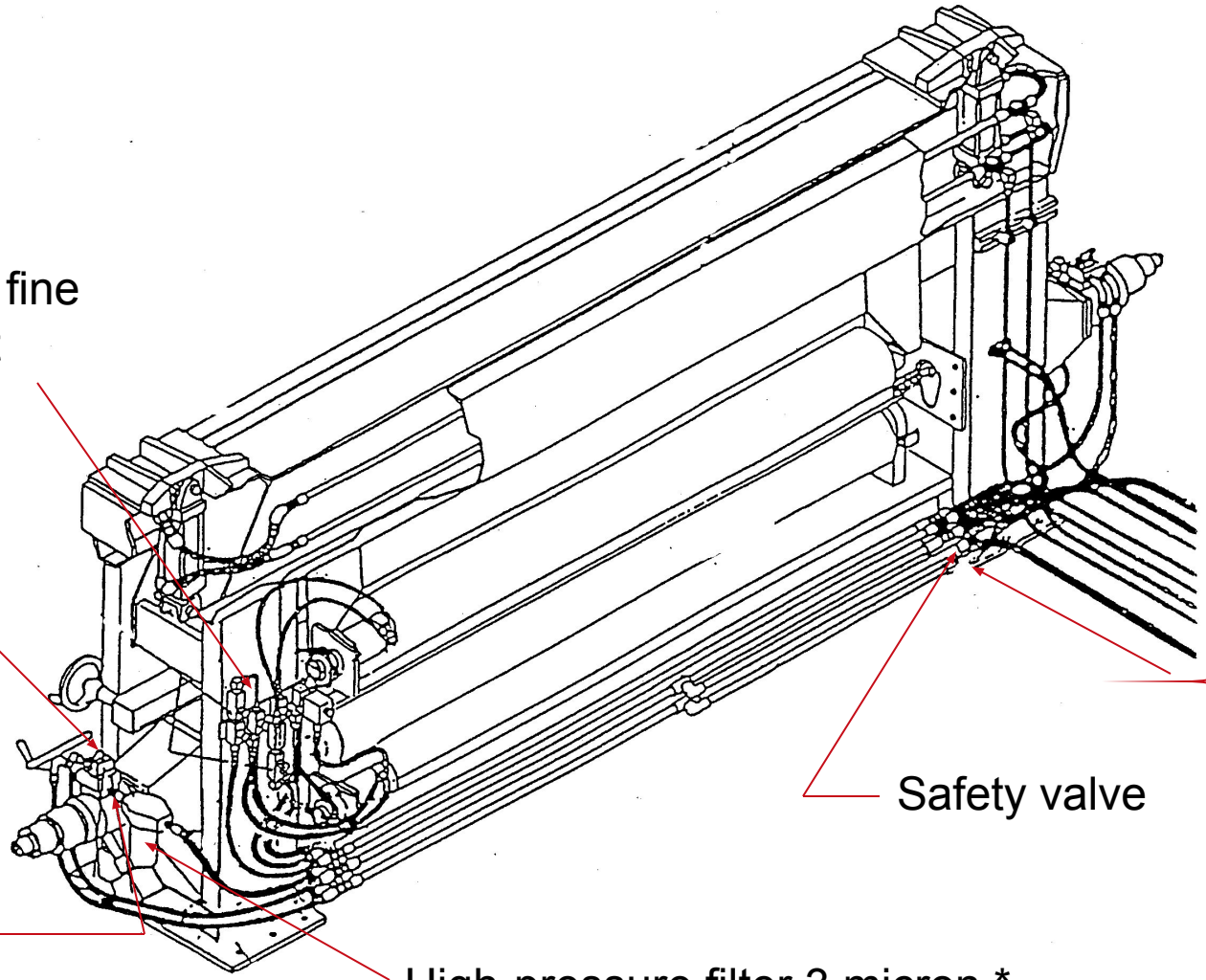
SPINDLES TOGGLES



SPINDLES BUSHINGS



HYDRAULICS SETUP - 1



Roll speed fine adjustment

Servo valve

Cross port relief

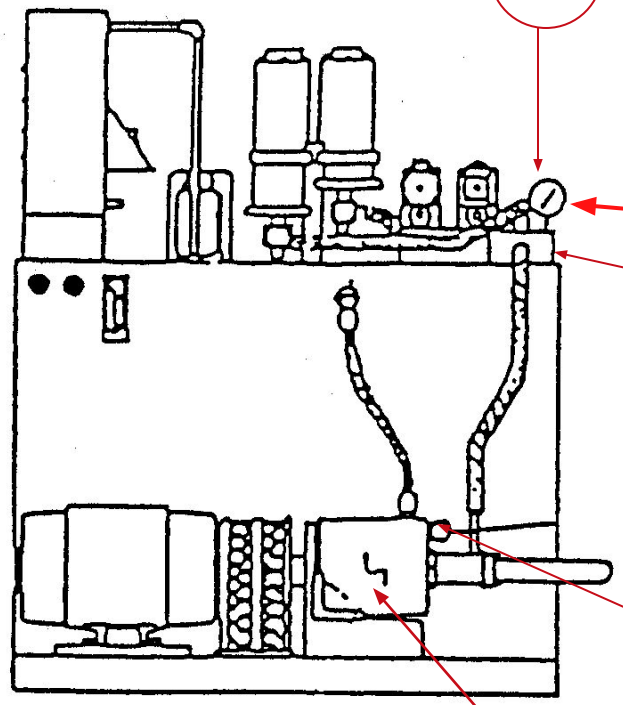
High-pressure filter 3 micron *

Safety valve

- Main pressure to servo valve and knife
- Always close when changing or working on any part of the knife assembly
- Valve is shown in the OPEN position
- It may be located as shown or on the hydraulic reservoir

* Not present in upgraded

HYDRAULICS SETUP - 2



H1 Pressure gauge

H6 Main relief valve

H2 Pump compensator
Adjust to 1750-1800 PSI
reading on H1

Hydraulic pump

HYDRAULICS SETUP - 3

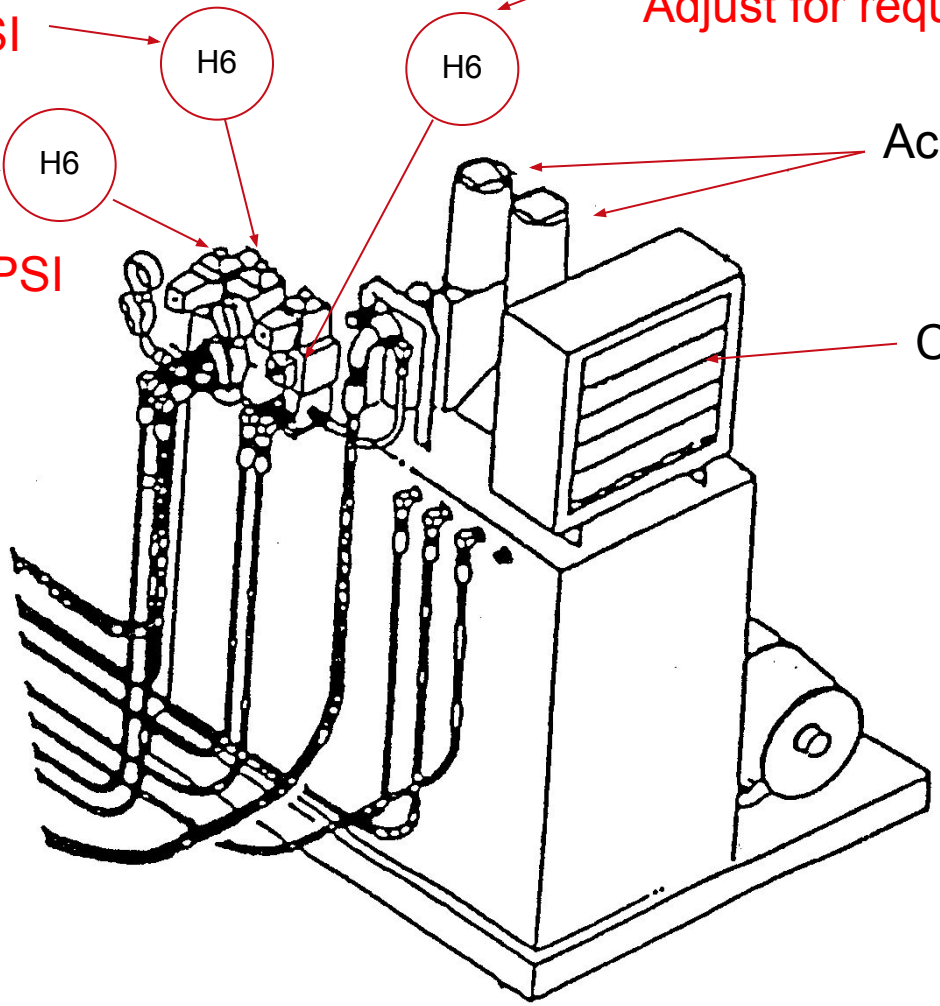
Knife tension pressure valve
Adjust to 550-600 PSI

Head UP/Down pressure valve
Adjust to 900-1000 PSI

Main flow control for rolls
Adjust for required roll speed

Accumulators

Cooling fan



ROLL ALIGNMENT PROCEDURE

ROLL ALIGNMENT TOOL SET *

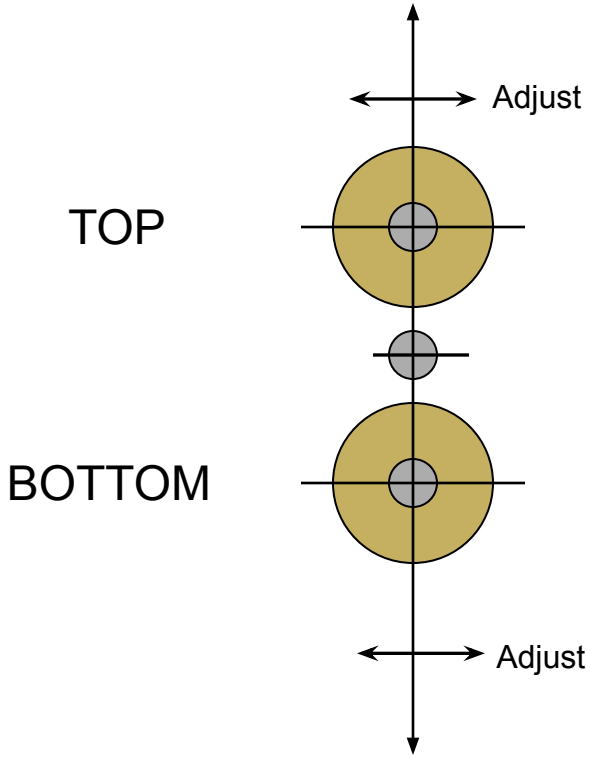
TAIL END T-BAR

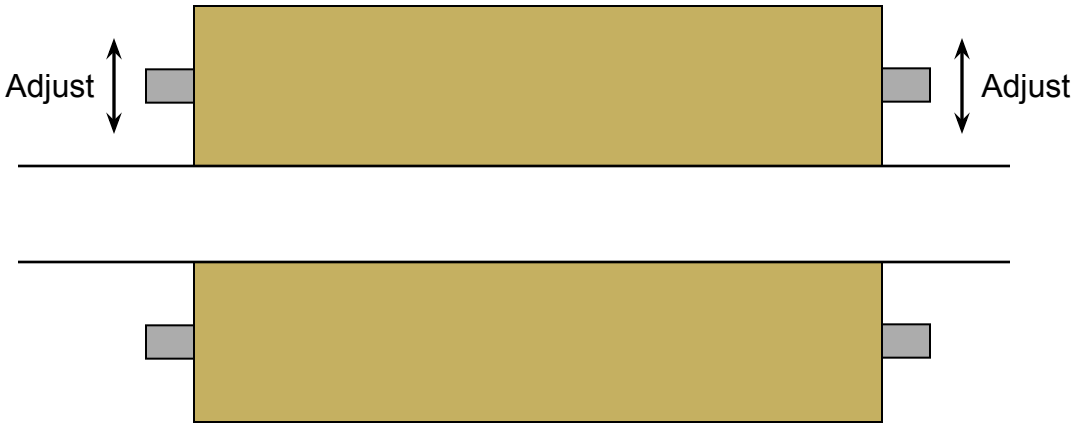
SLEEVE

DRIVE END T-BAR

* NOTE: There is a different set of T-bars for the clipper with top offset roll

ROLL ALIGNMENT - GOALS





VERTICAL ALIGNMENT

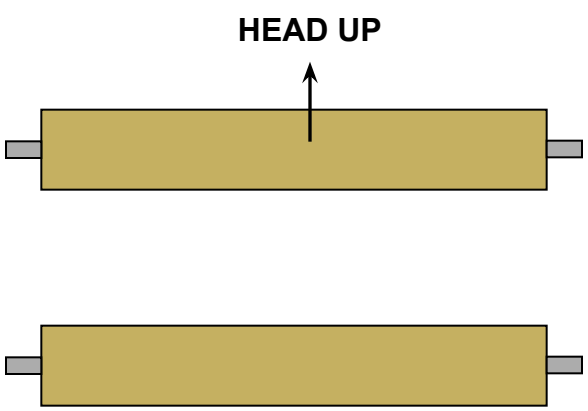
Rolls and spindle axis must be aligned

HORIZONTAL ALIGNMENT

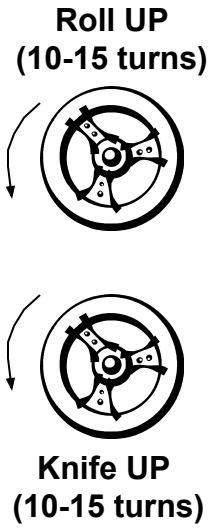
Rolls must be parallel

ROLL ALIGNMENT - SETUP

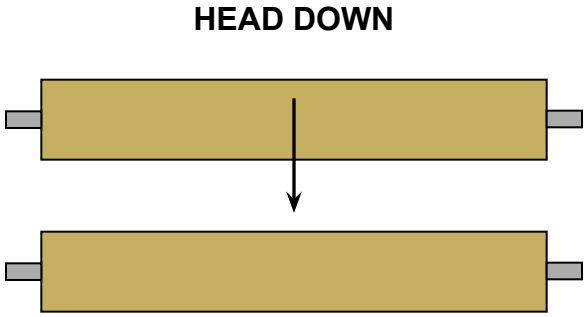
1 - Head UP



2 - Raise rolls & knife



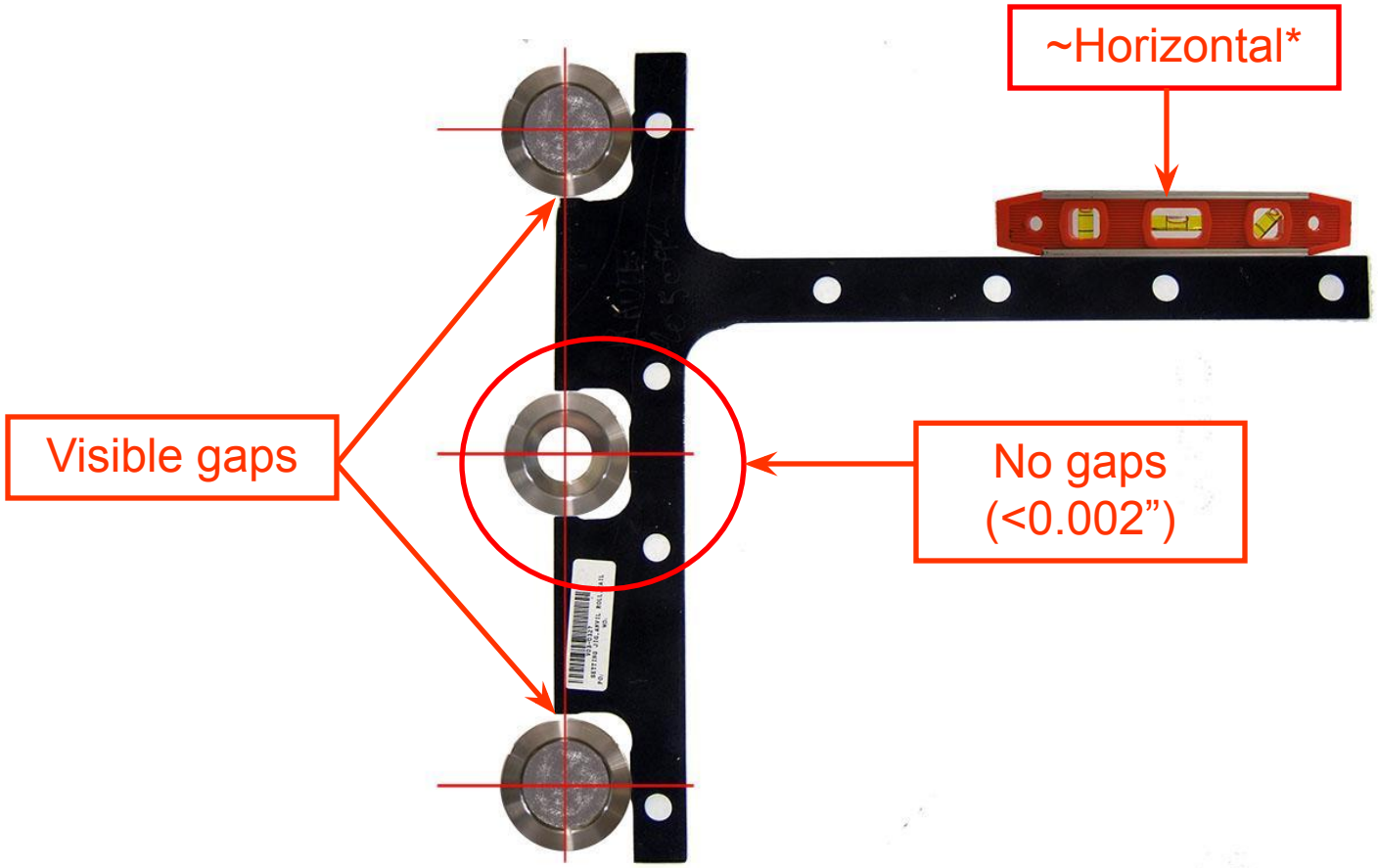
3 - Head DOWN



HYDRAULICS ON!

VERTICAL ROLL ALIGNMENT - 1

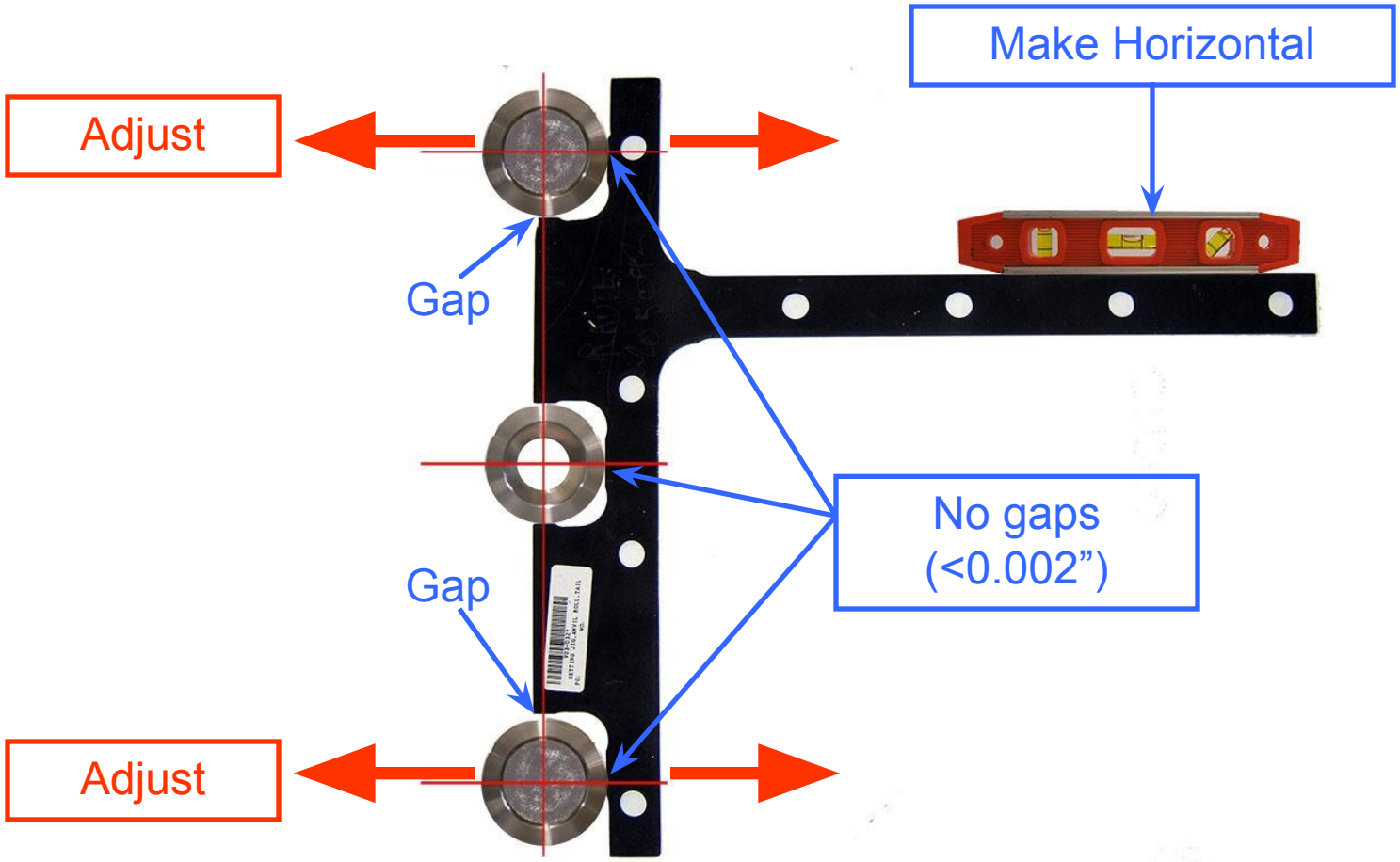
4 - Set T-bar & Level



* USE ONLY MACHINIST GRADE LEVEL

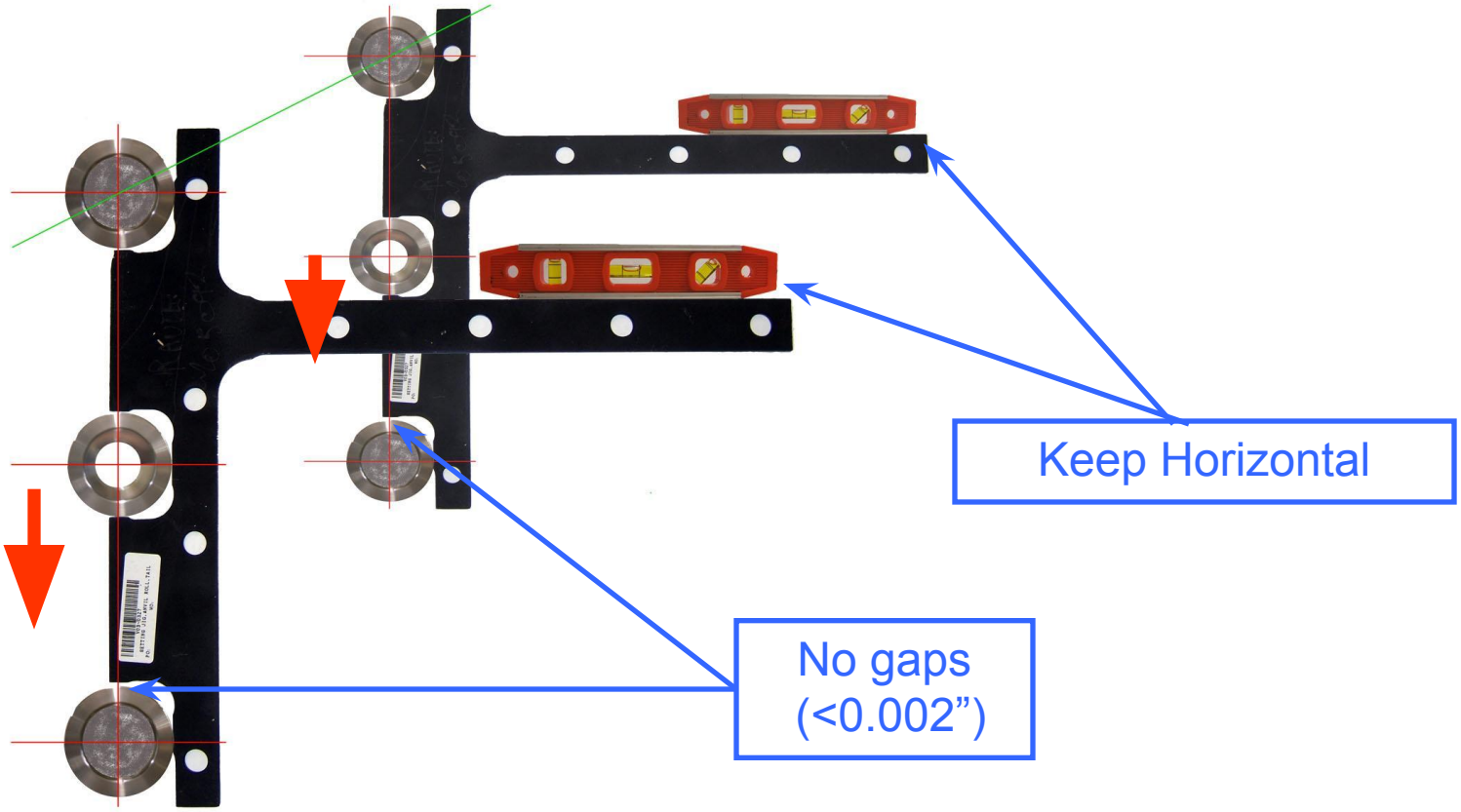
VERTICAL ROLL ALIGNMENT - 2

5 - Adjust rolls



HORIZONTAL ROLL ALIGNMENT - 1

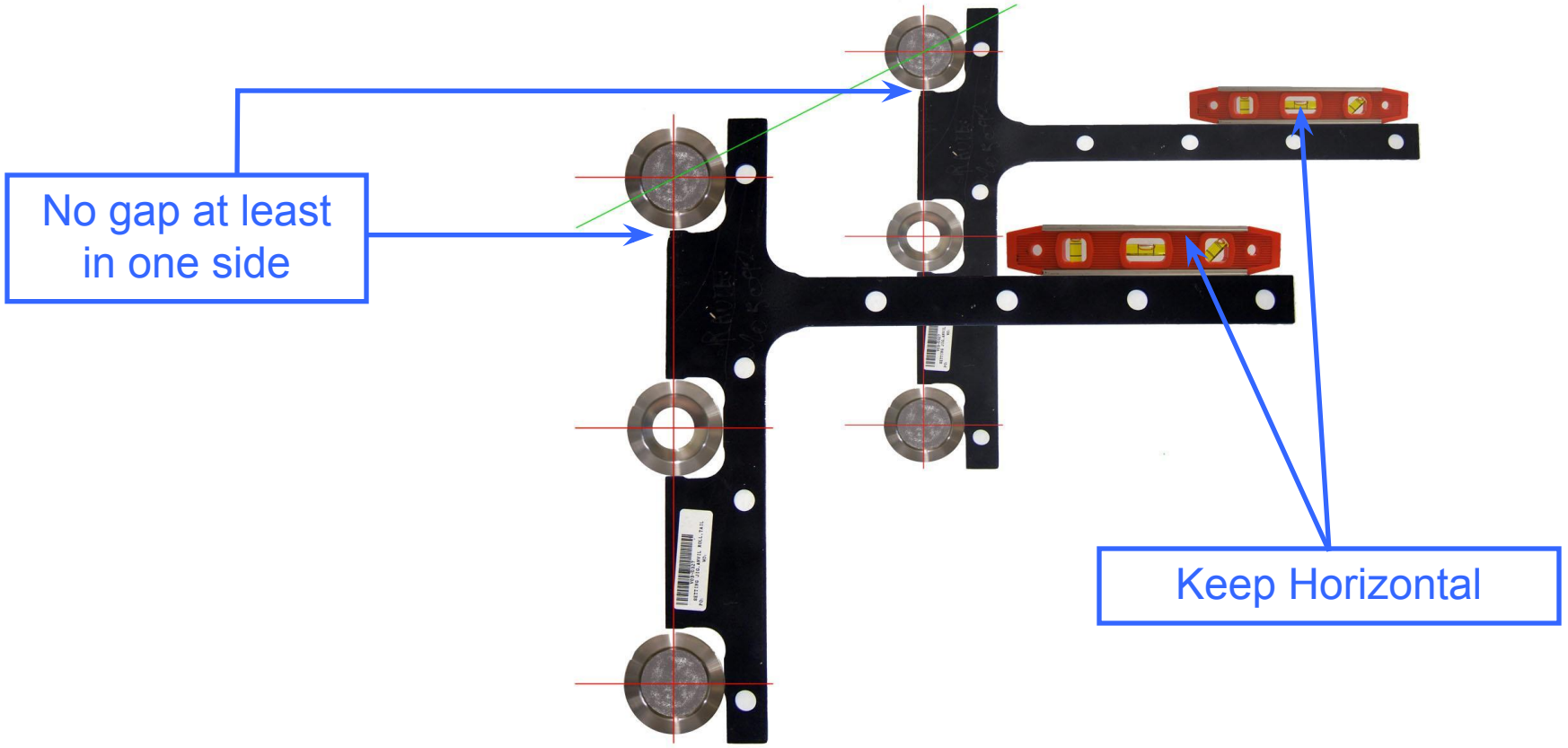
6 - Lower Knife



HYDRAULICS ON!

HORIZONTAL ROLL ALIGNMENT - 2

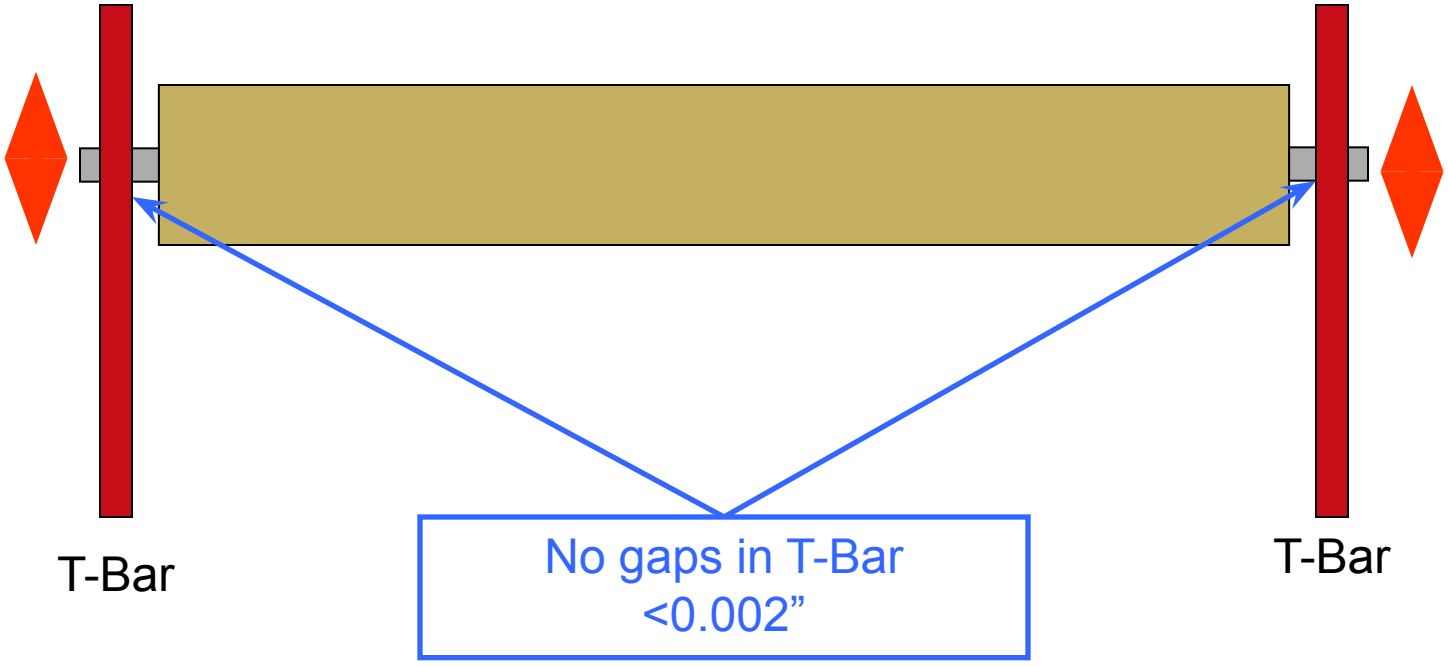
7 - Lower Top Roll



HYDRAULICS ON!

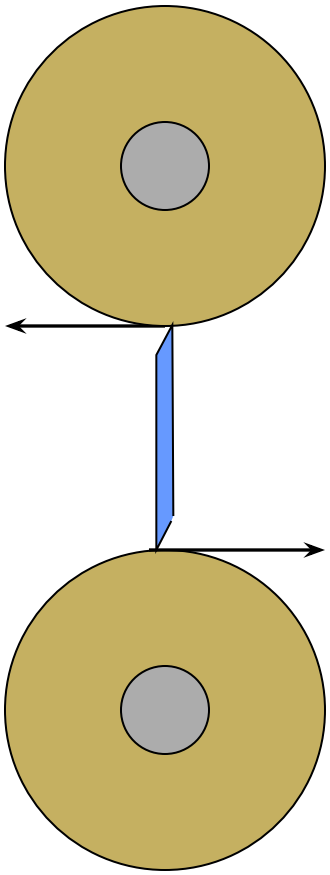
HORIZONTAL ROLL ALIGNMENT - 3

8 - Adjust Top roll



HYDRAULICS ON!

ROLL SPEED SETUP - GOALS

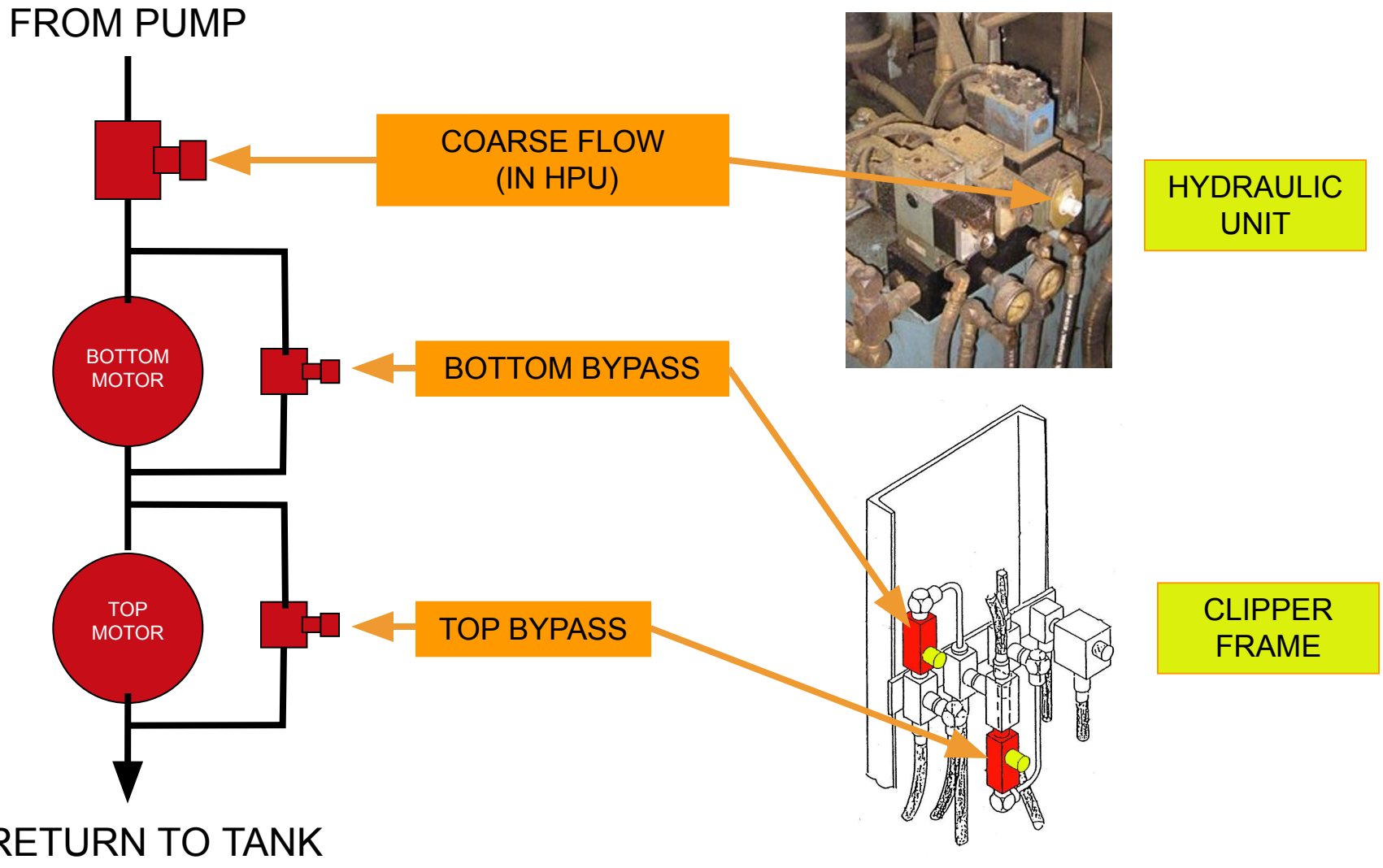


ROLL SPEEDS MUST BE EQUAL TO KNIFE SPEED

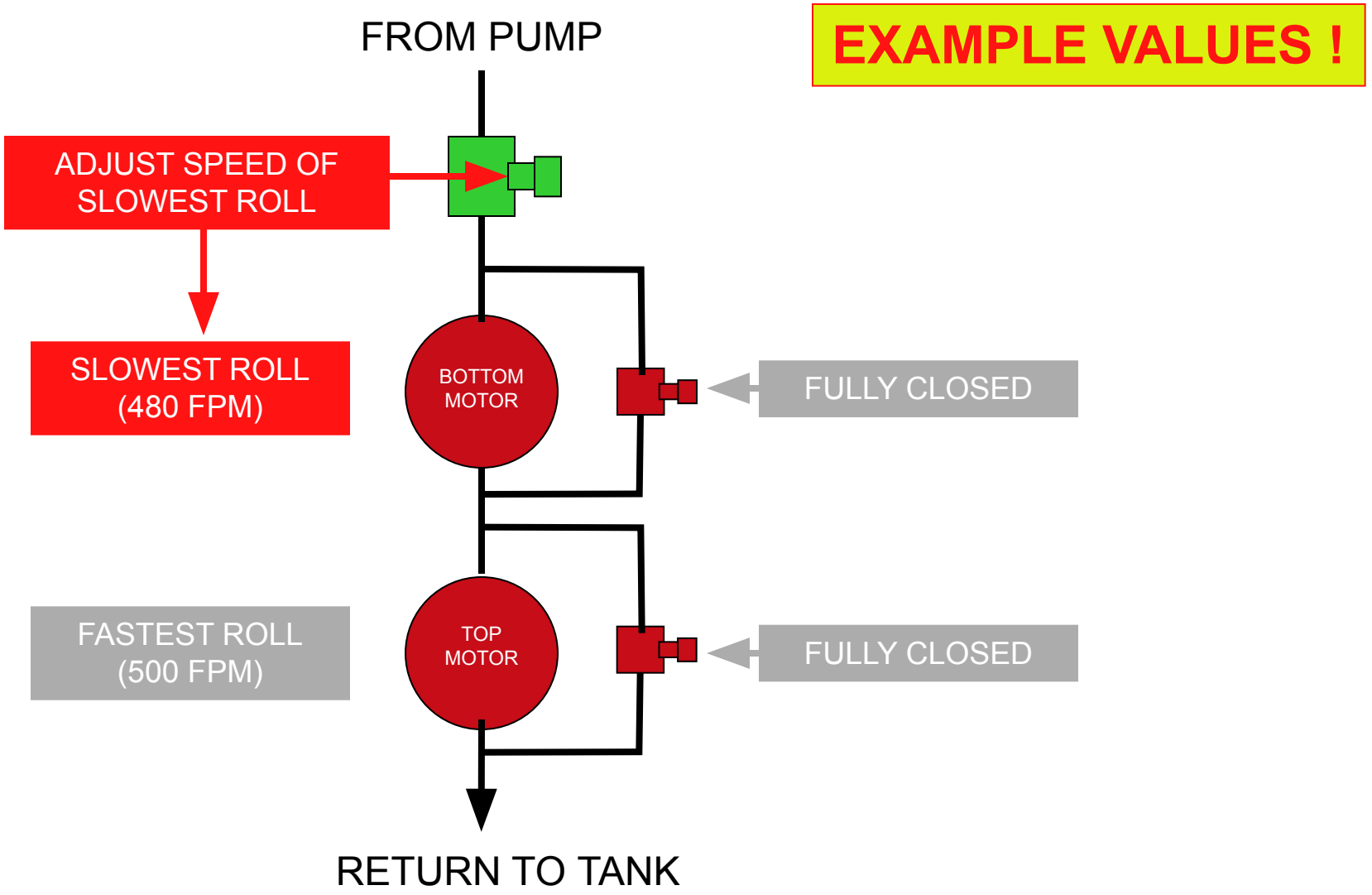
TYPICAL KNIFE SPEED VALUES

430 TO 480 FPM

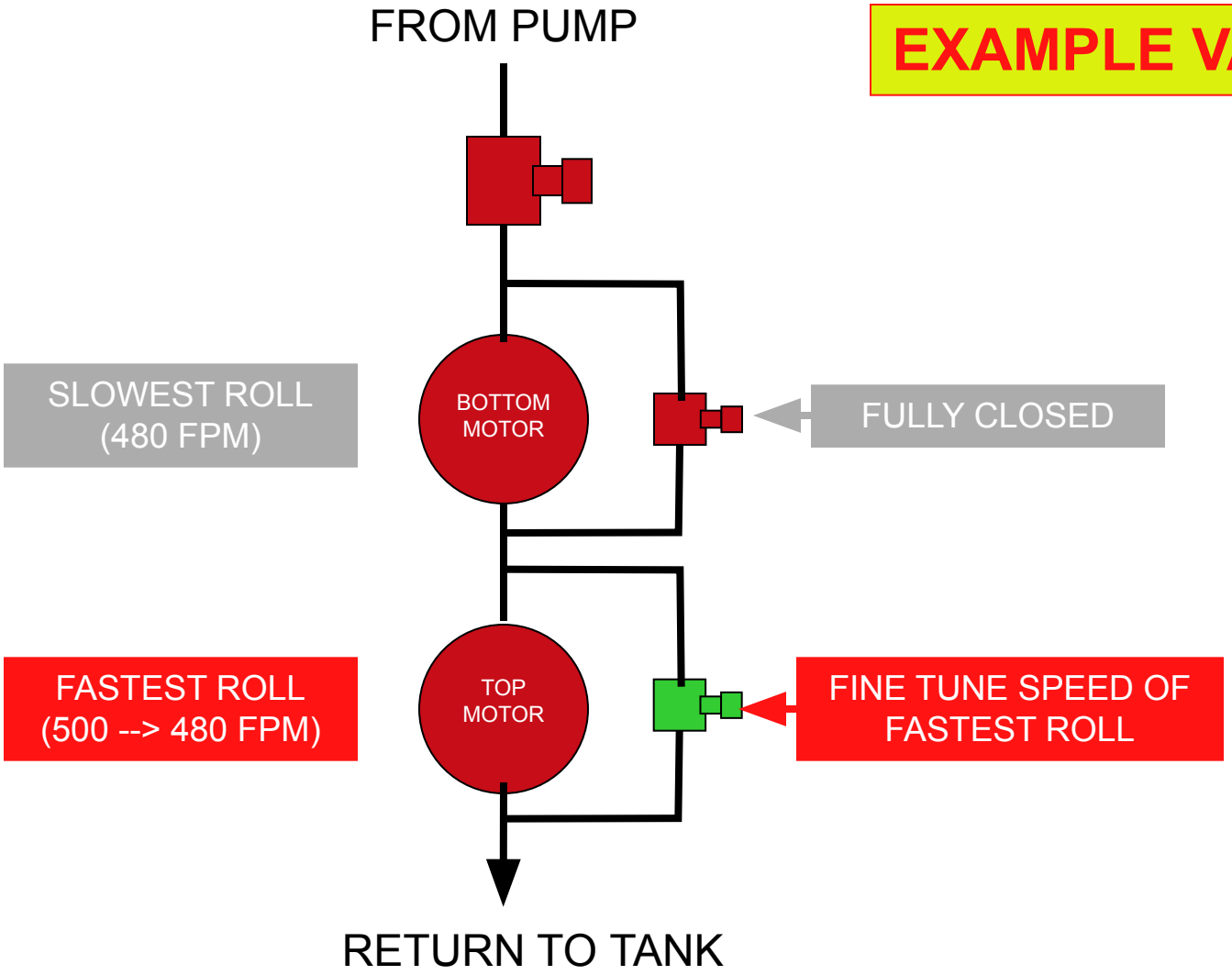
ROLL SPEED SETUP - 1



ROLL SPEED SETUP - 2

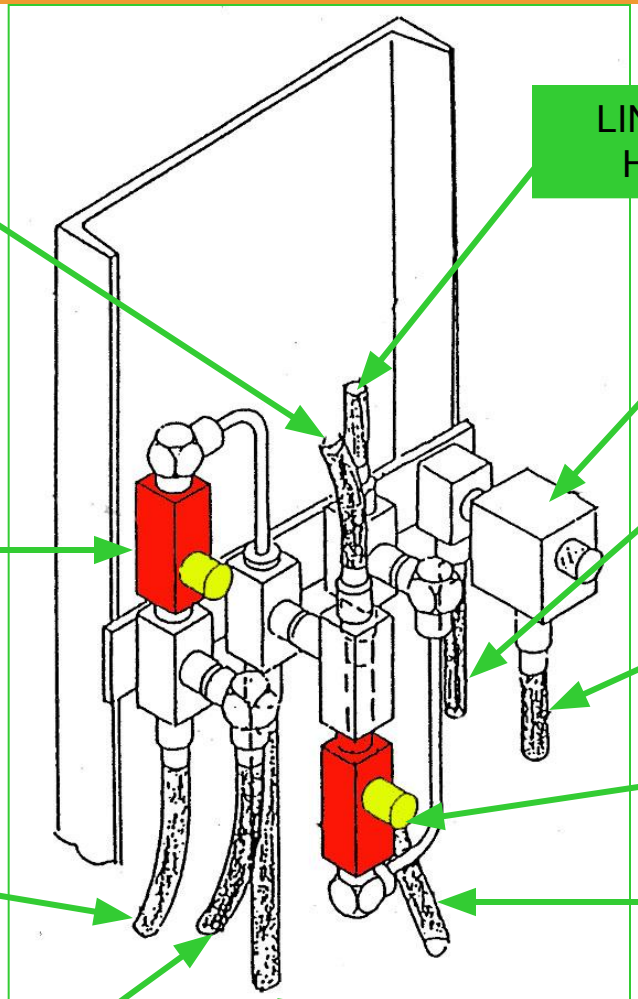


ROLL SPEED SETUP - 3



RAUTE

ROLL SPEED SETUP - 4



LINE TO TOP HYD. MOTOR

LINE FROM TOP HYD. MOTOR

CASE DRAIN RELIEF VALVE

HYD. MOTOR CASE DRAIN

BOTTOM ROLL NEEDLE VALVE

CASE DRAIN RETURN LINE

TOP ROLL NEEDLE VALVE

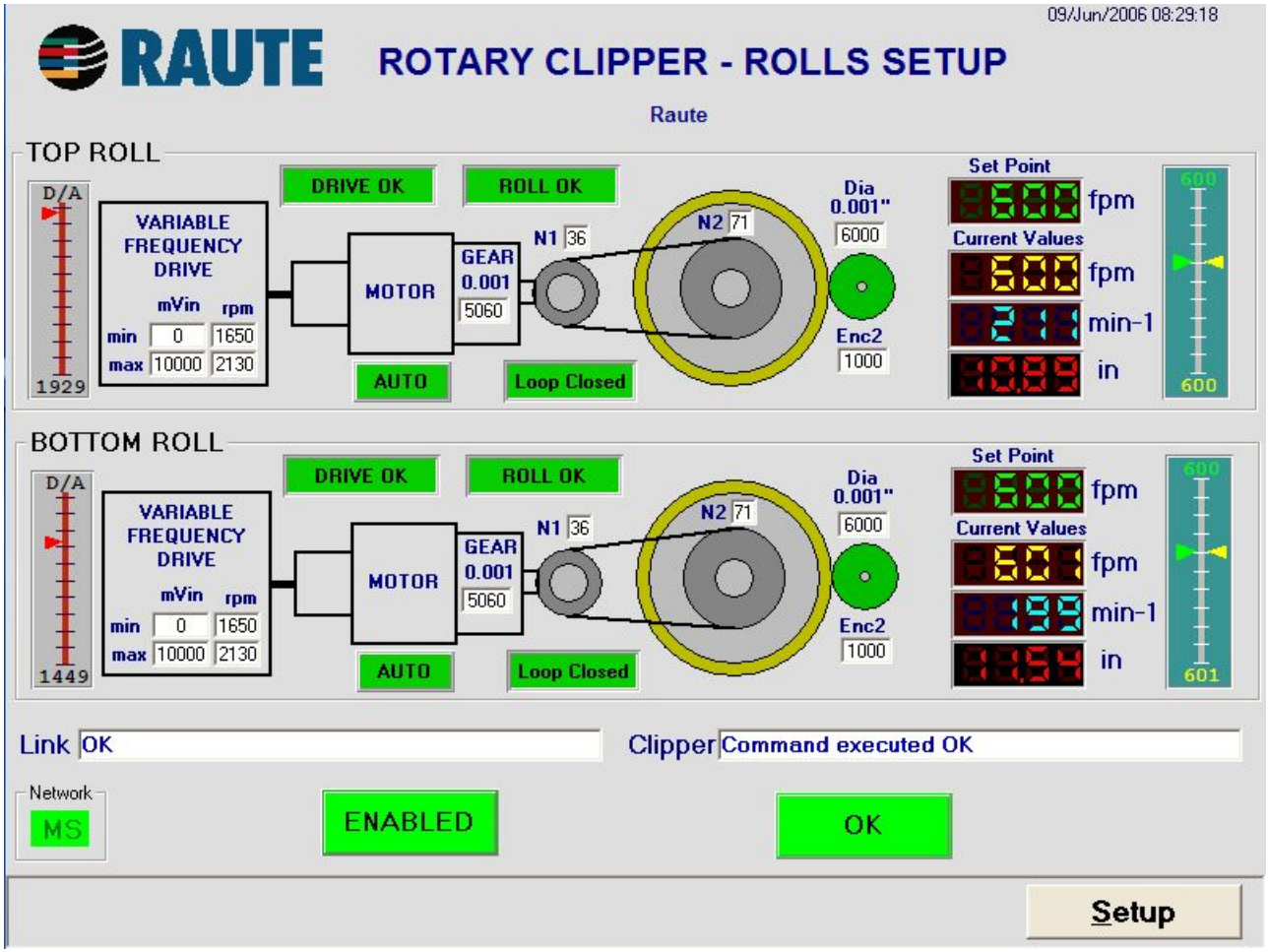
PRESS. LINE FROM PUMP

RETURE LINE TO TANK

LINE TO BOTTOM HYD. MOTOR

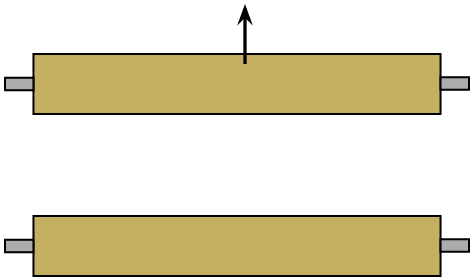
LINE FROM BOTTOM HYD. MOTOR

ROLL SPEED SETUP - 5



KNIFE HANDLING SETUP

1 - Head UP and Secure



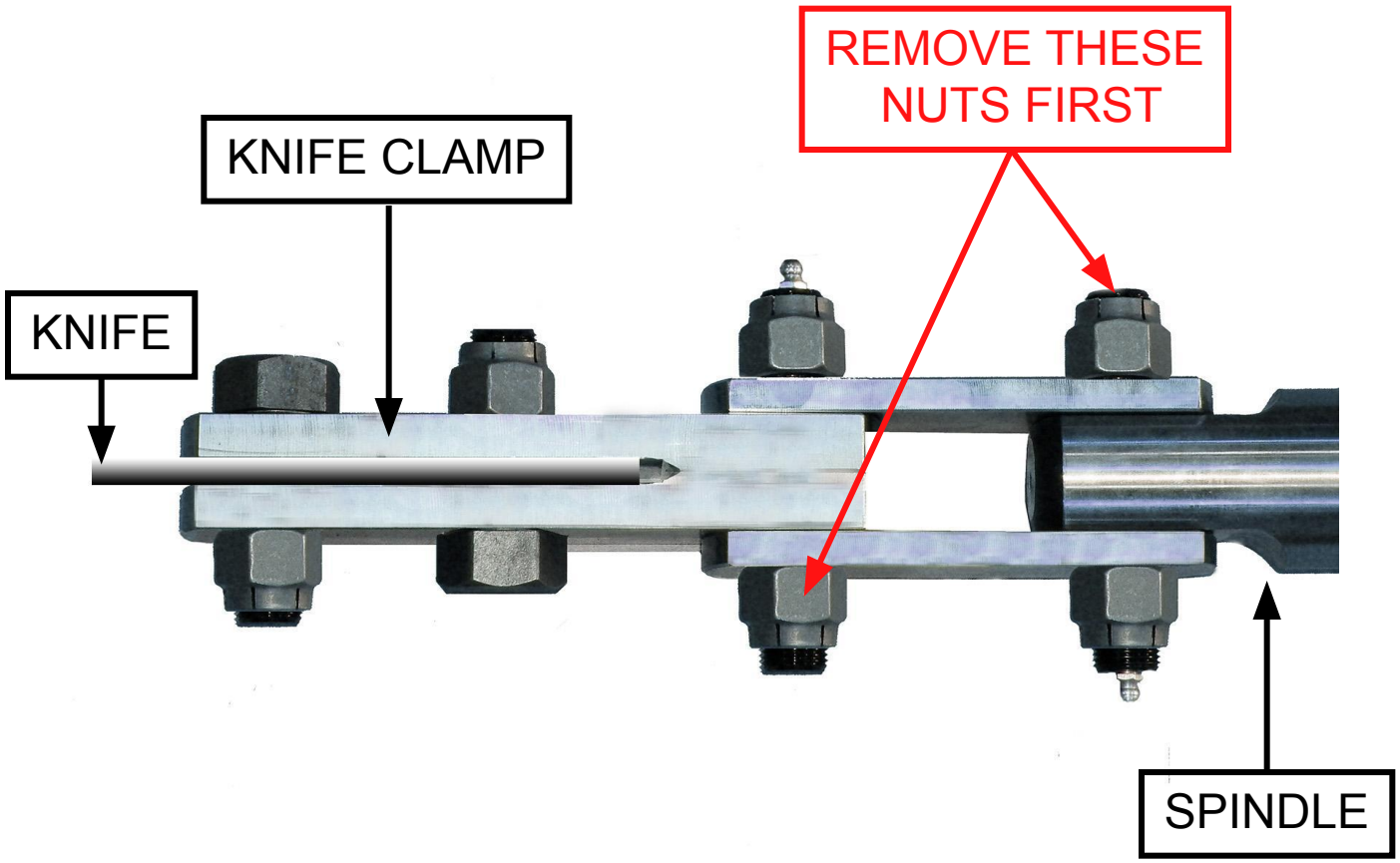
2 - Hydraulics OFF

3 - Shut-off valve OFF

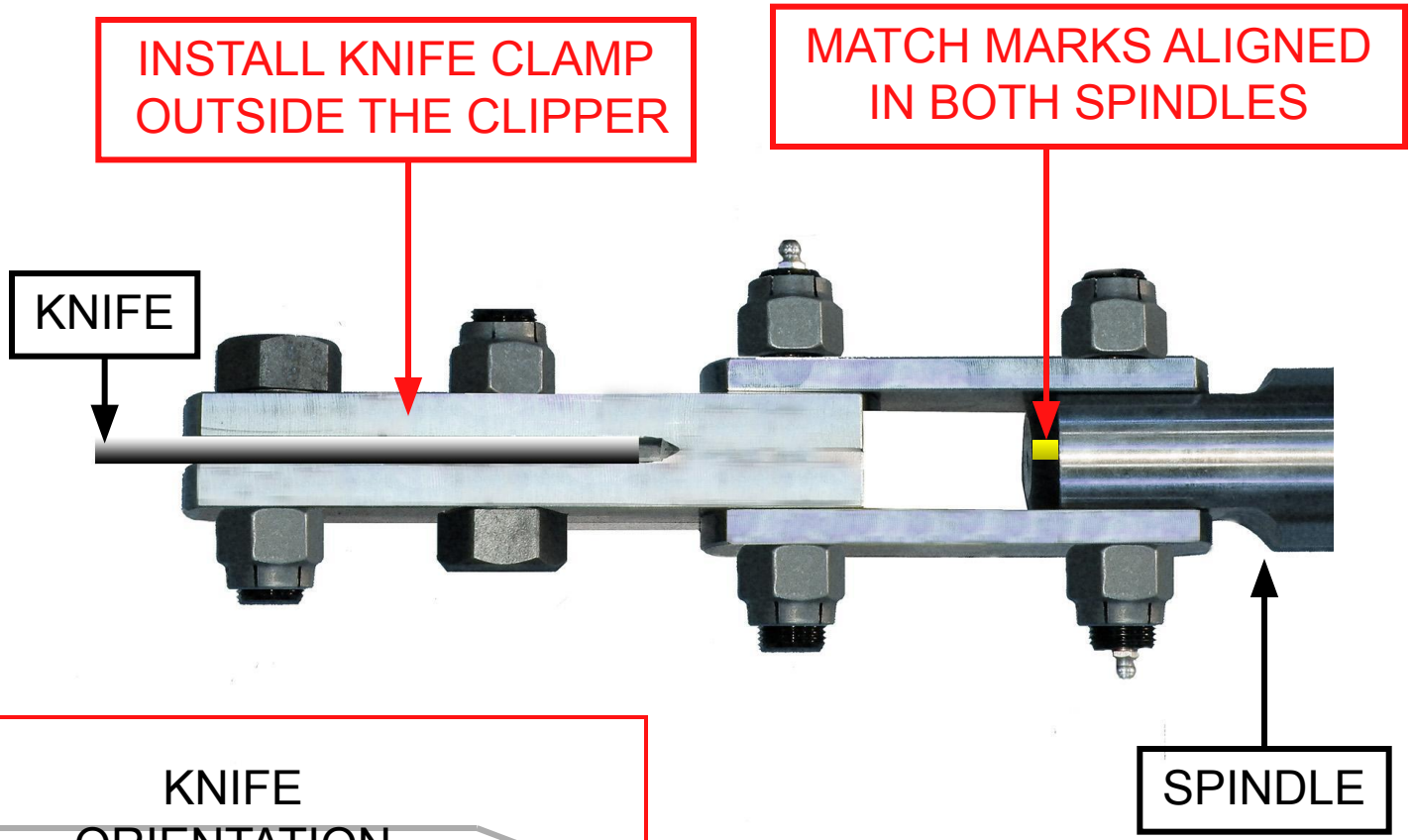
ONLY WITH NEW RAUTE CONTROLLER

DISCHARGE VALVE CLOSED AND LOCKED OUT

KNIFE REMOVAL

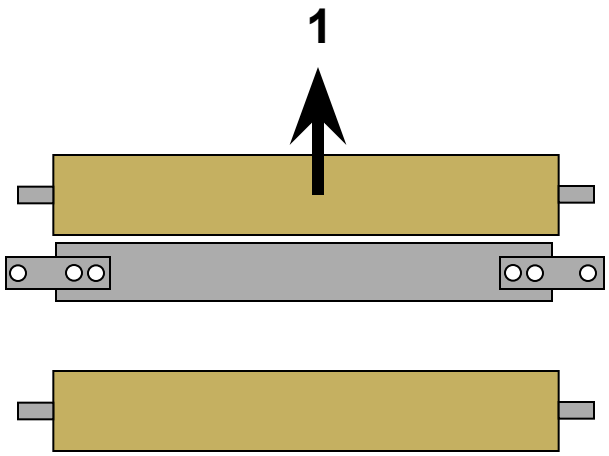


KNIFE INSTALLATION - 1

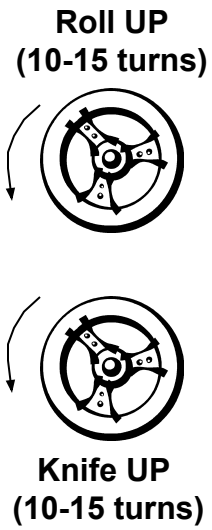


KNIFE INSTALLATION - 2

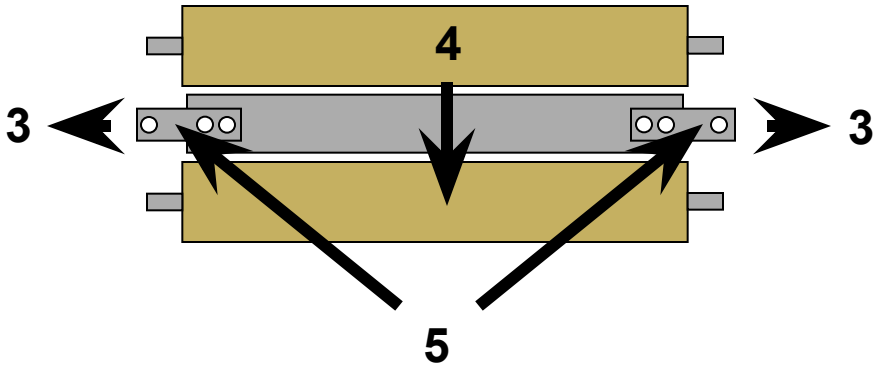
1 - Head UP



2 - Raise top roll and knife

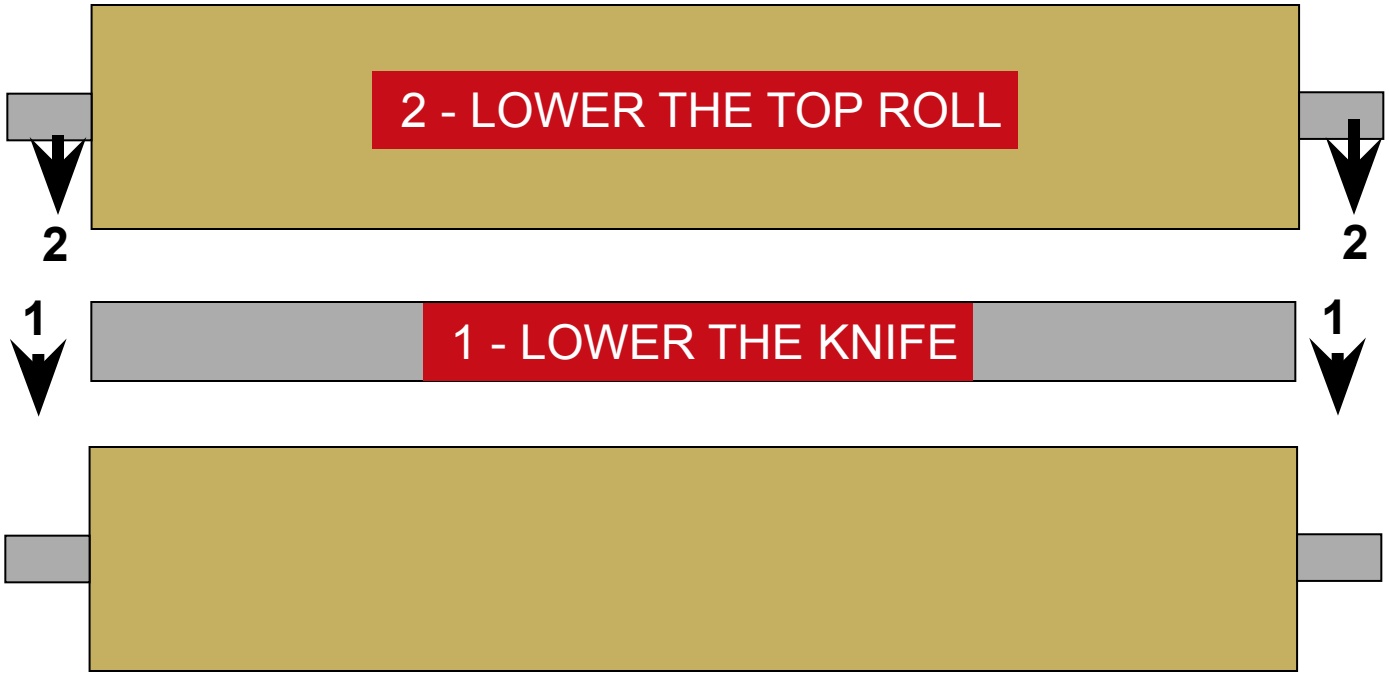


3 - Knife Tension ON
4 - Lower Head
5 - Check toggles



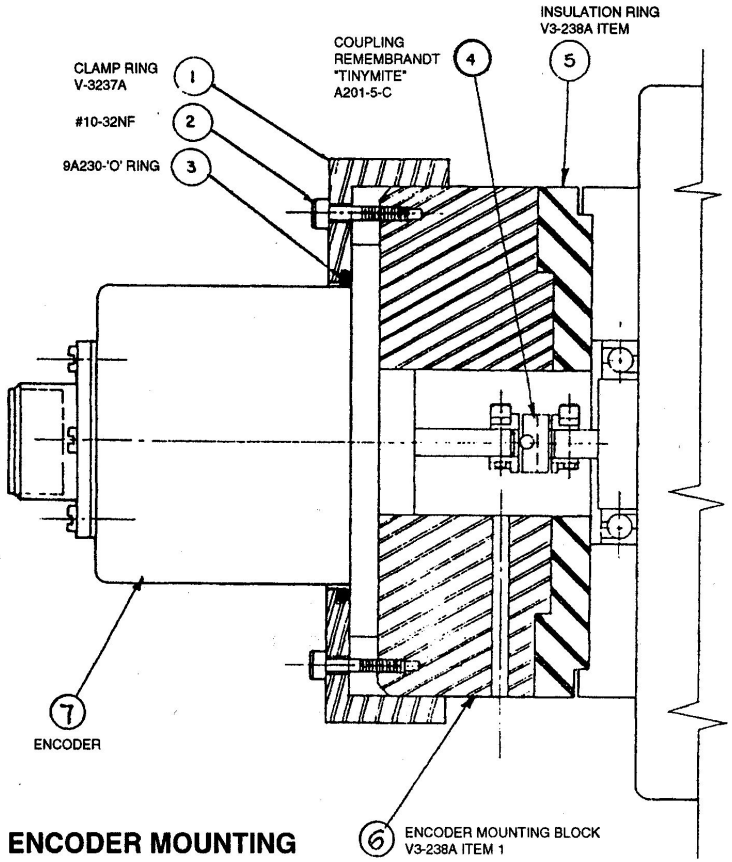
HYDRAULICS ON!

KNIFE SETUP



HYDRAULICS ON!

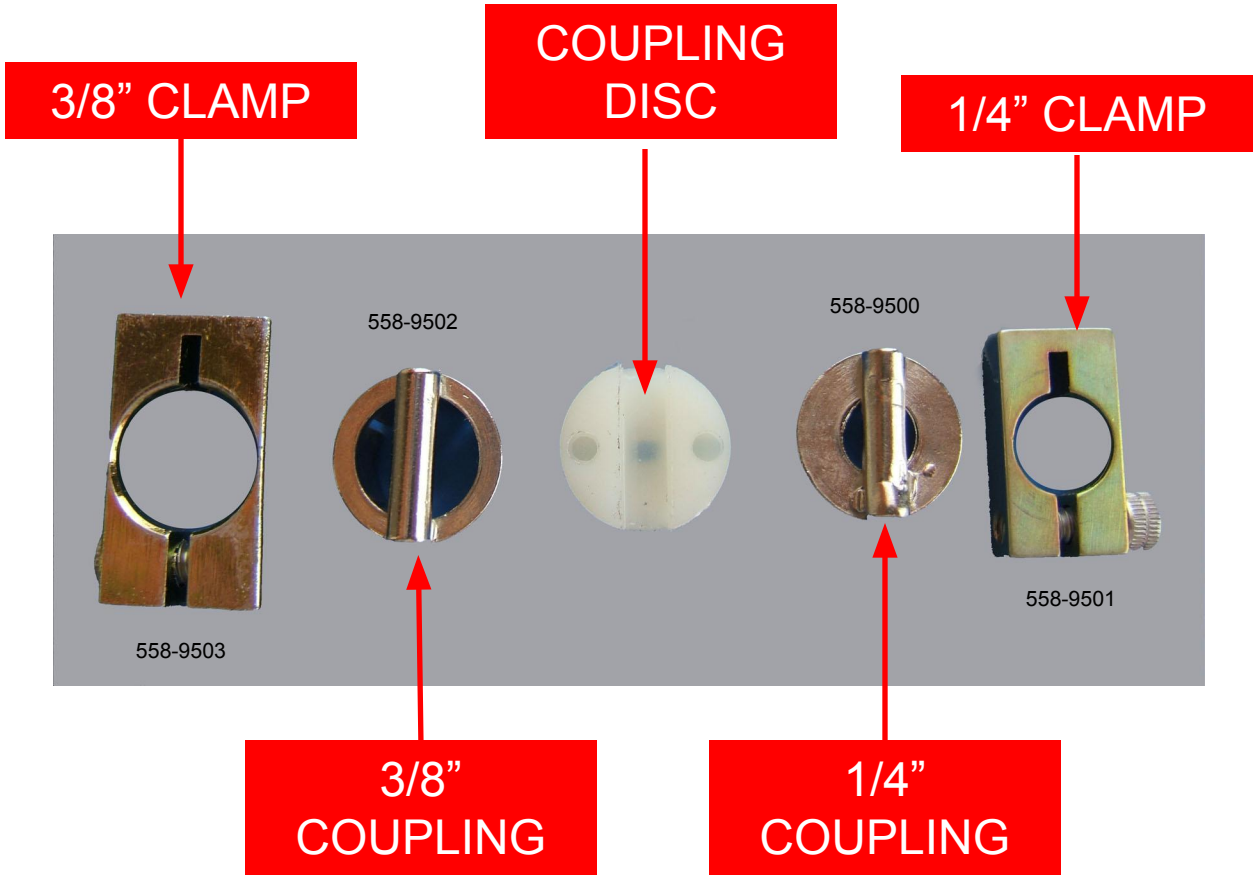
KNIFE ENCODER



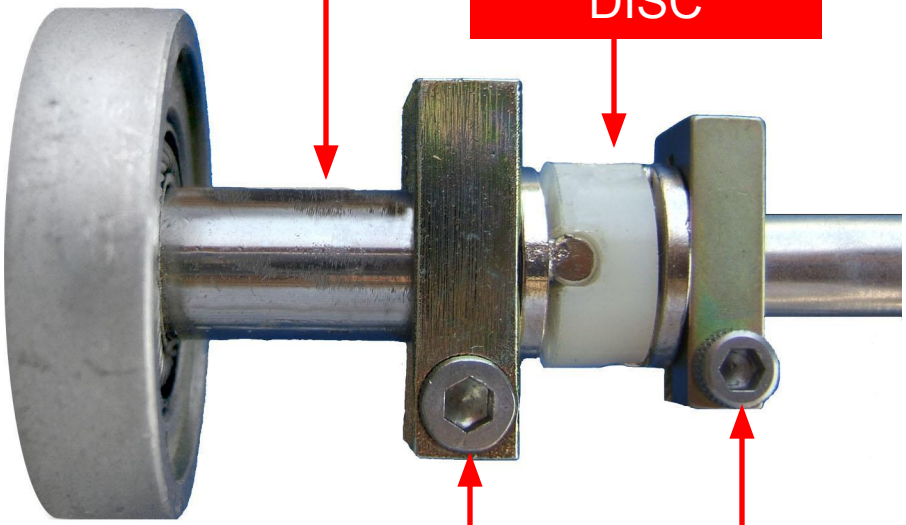
MOUNTING DETAIL

RAUTE

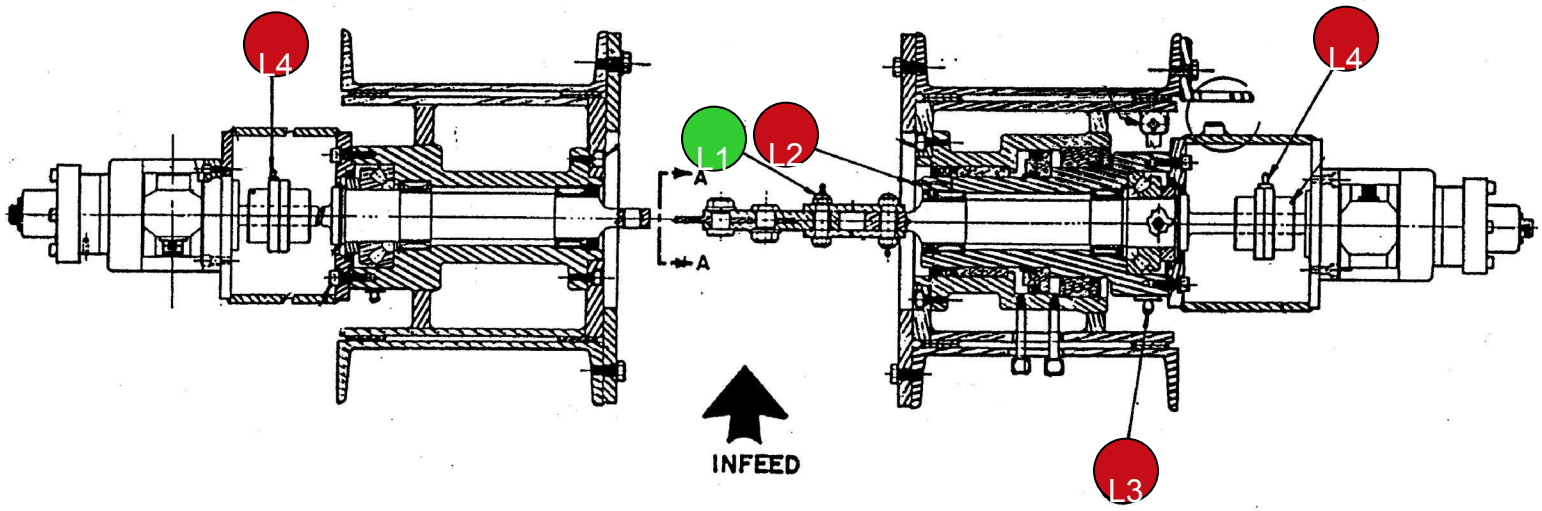
TINY-MITE COUPLING



ENCODER COUPLING ASSEMBLY



LUBRICATION



USE ONLY GREASE TELLUS _____ OR EQUIVALENT!

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Section 6

TROUBLESHOOTING

GENERAL	Normal failures Threshold failures
QUICK GUIDE	Symptom Cause Solution
CONTROLLER BASED	Diagnostics tests Graphics

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GENERAL

NORMAL FAILURES

- Originated by a single element (e.g.: broken spindle)
- Easy to diagnose
- Direct fixing by repair/substitution of parts

THRESHOLD FAILURES

- Multiple origins (e.g: Bias clip)
- Effects only seen after a certain “threshold” is passed
- Difficult to diagnose
- Multiple actions required to fix the problem

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QUICK GUIDE - EXAMPLE

Response time		
SYMPTOM	**PROBABLE CAUSE**	**ACTION**
Response time above 42 ms on both sides	Low hydraulic pressure	Adhust pump to 1800 psi of higher
	Low clipping speed	Adjust rolls and knife speed to 450 fpm or higher
Response time above 42 ms only on one side	Local accumulator discharged	Recharge or replace accumulator
	Thrust bearing with excessive drag	replace bearing
	Faulty servo-valve	Replace servo-valve
	Faulty motor	replace motor
Response time difference between sides greater than 2 ms	Mechanical failure in the slowest spindle (motor, bearing, coupling)	repair
	Faulty servo-valve	Replace servo-valve

THRESHOLD ISSUES - EXAMPLE

BIAS CLIP

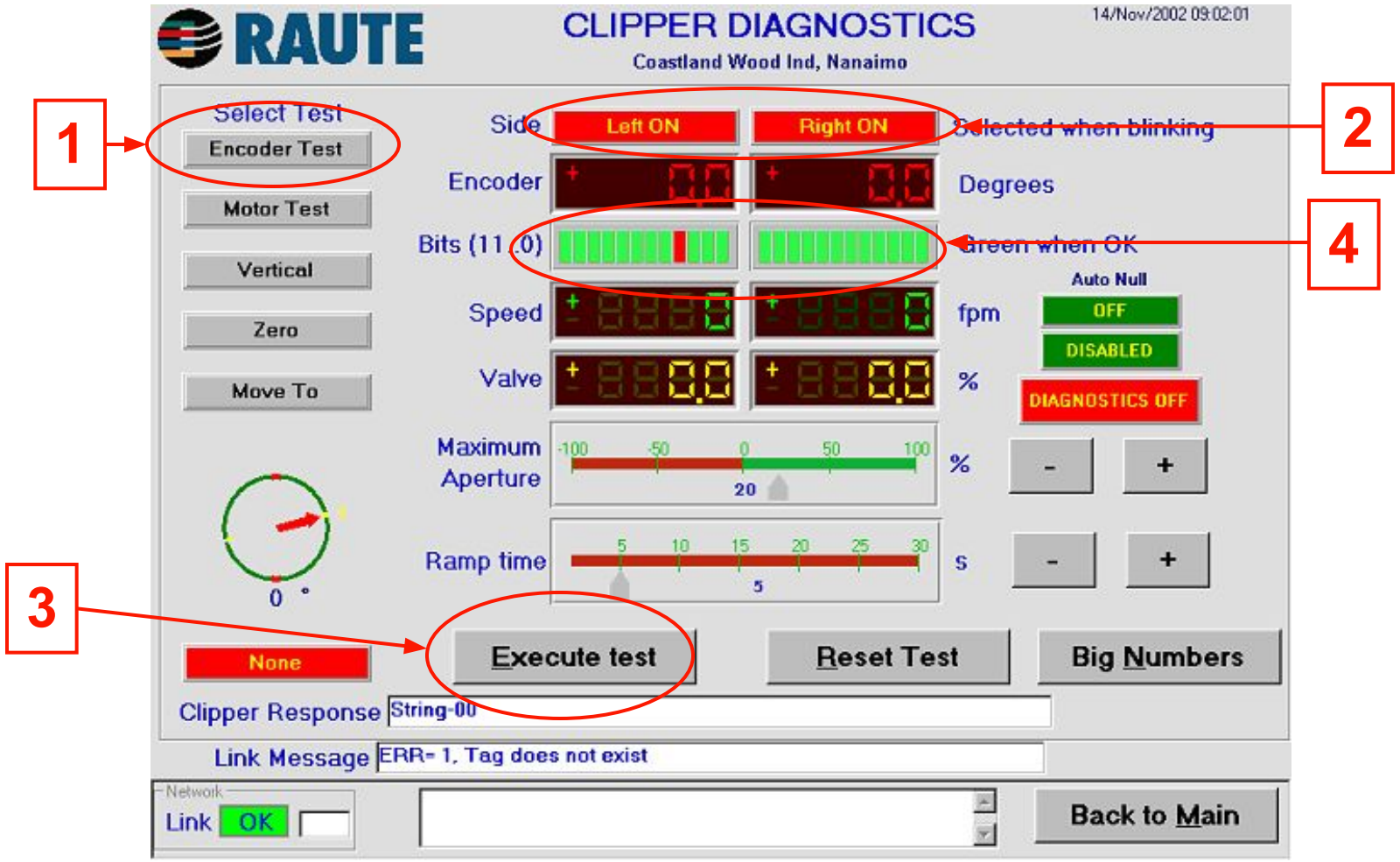
- **Symptoms**: Veneer sheets are not perfect rectangles but parallelograms.
- Possible causes

A. Spindles with different response times (1 ms ~ 0.1 in @ 500 FPM)
B. Outer in-feed belts with different speeds in both sides. Worn belt is a typical cause.
C. Hold down belts with different gap in each side. Incorrect hold down alignment.

- **Solution**: Multiple actions may be required.

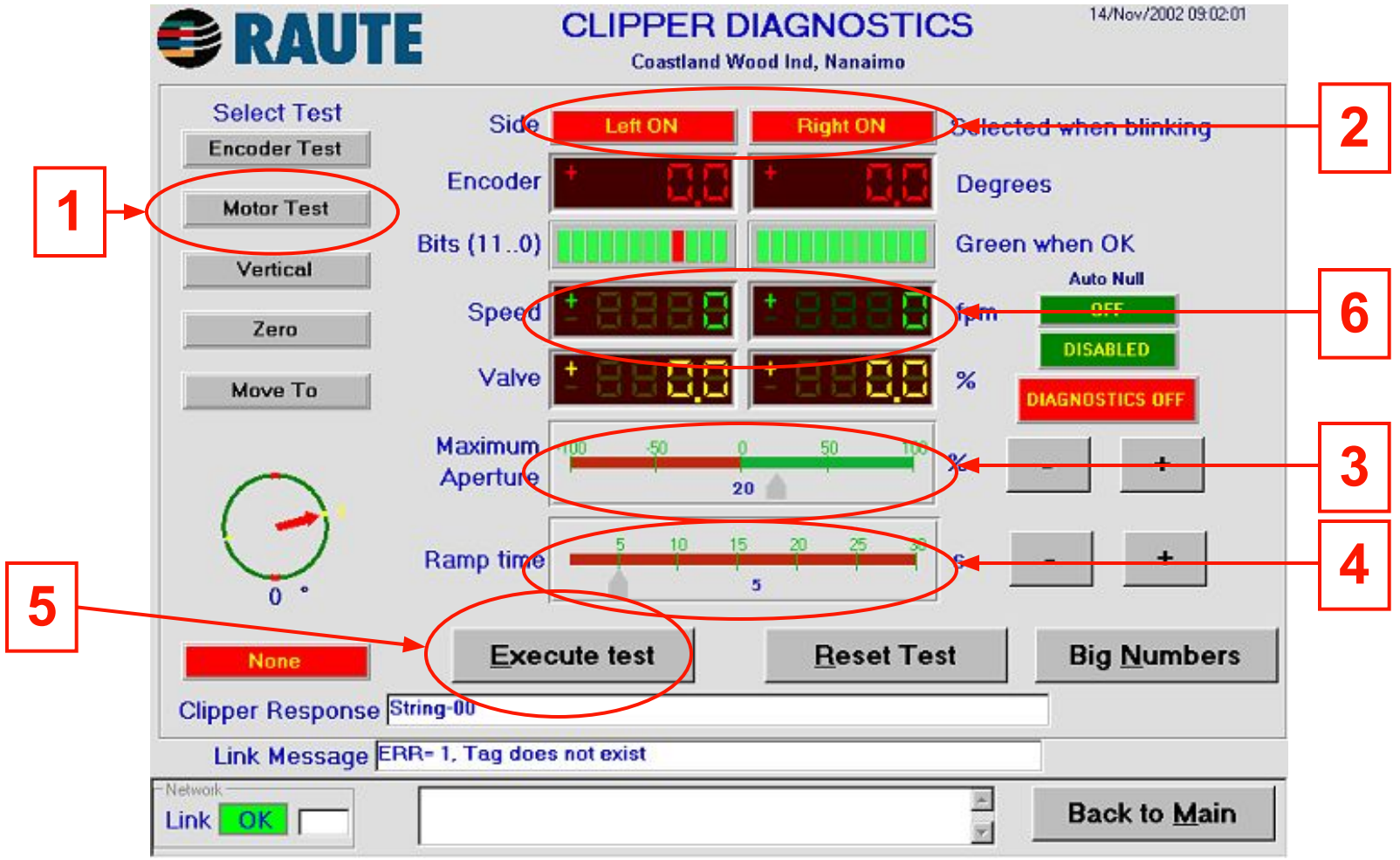
Section 6

DIAGNOSTICS - ENCODER



Section 6

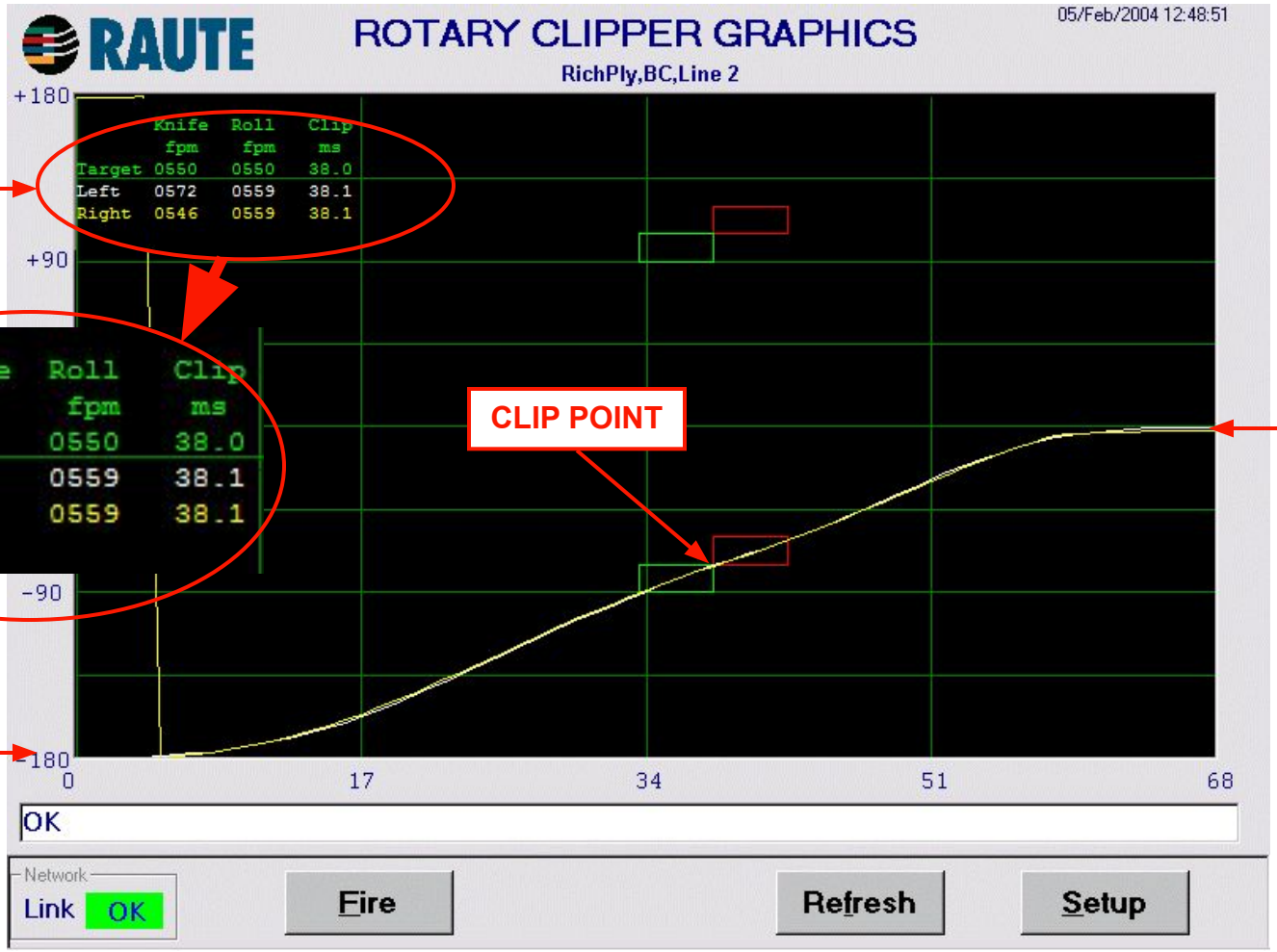
DIAGNOSTICS - MOTORS



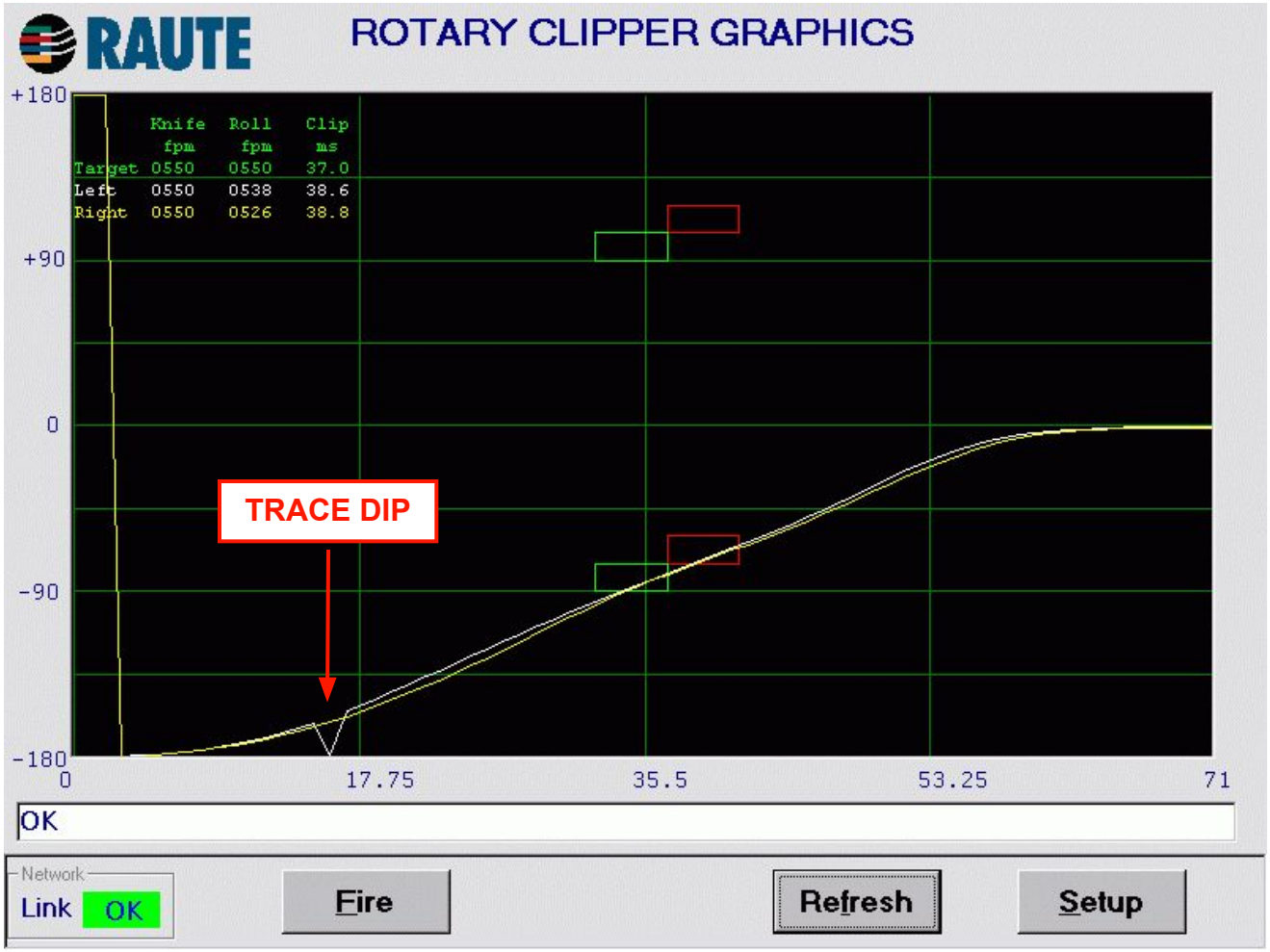
N M E 2

RAUTE

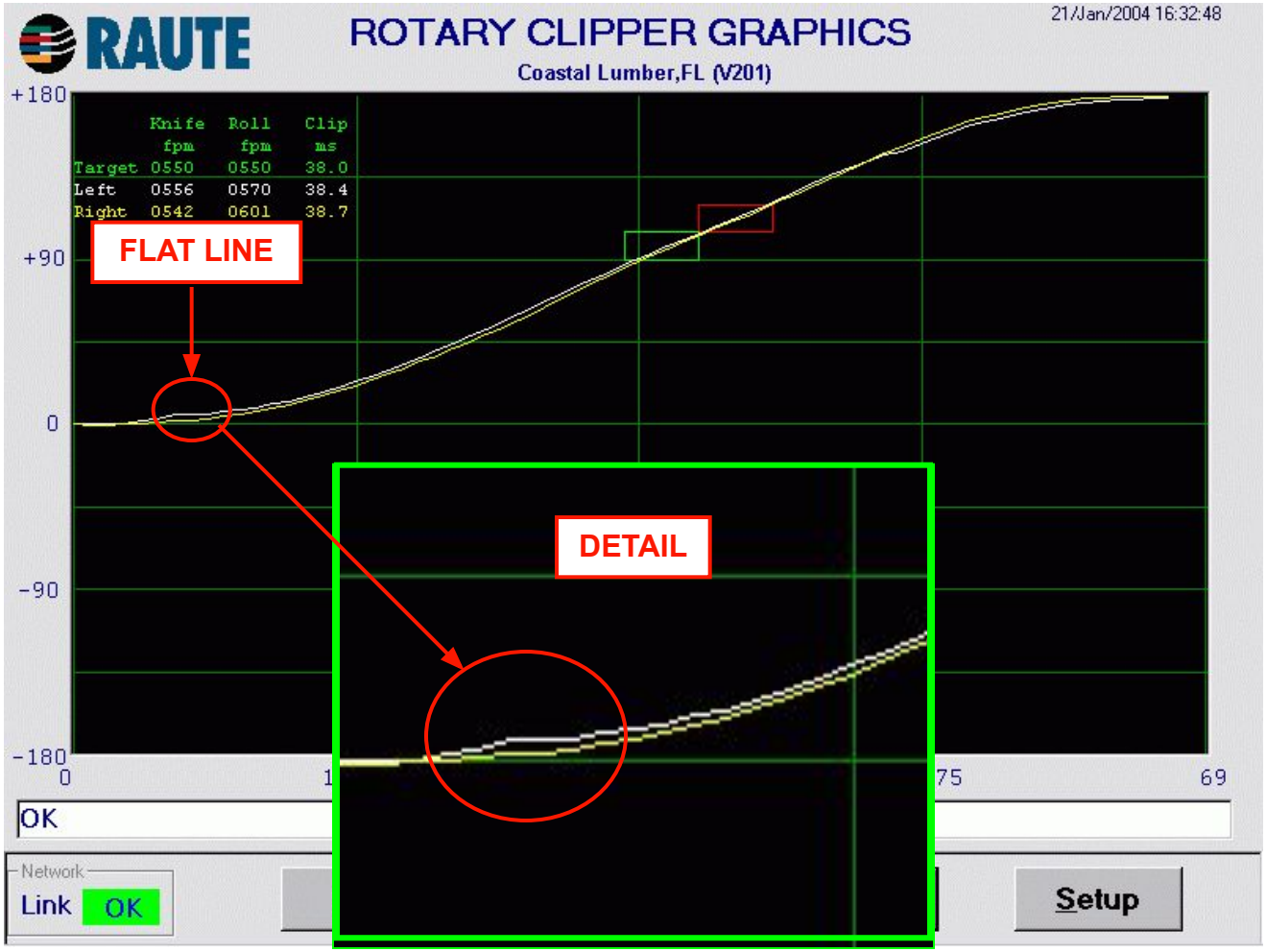
GRAPHIC OF A NORMAL CLIP



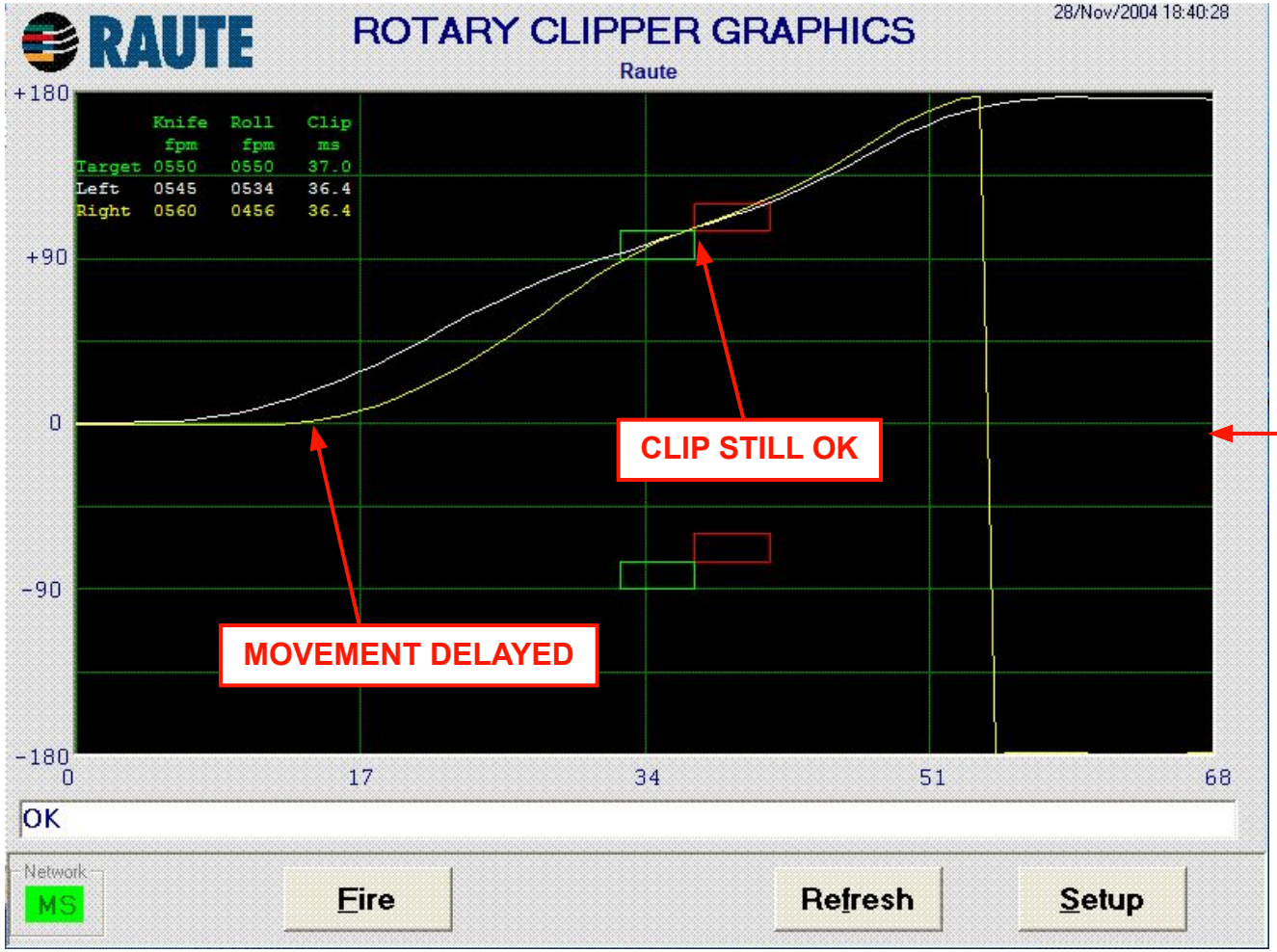
LEFT ENCODER FAILURE



LEFT ENCODER BACKLASH



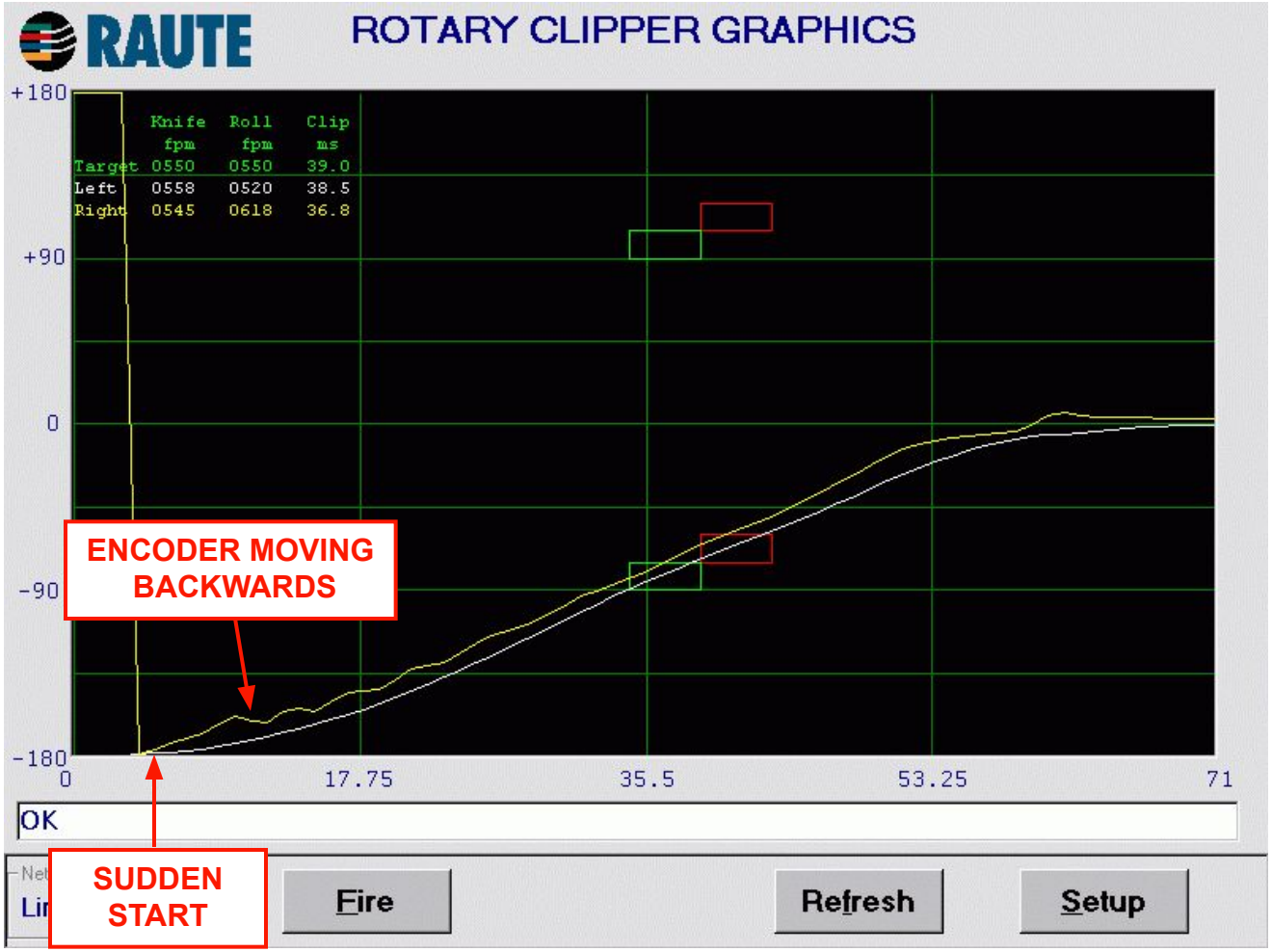
RIGHT MOTOR LAGGING



N M E 2

RAUTE

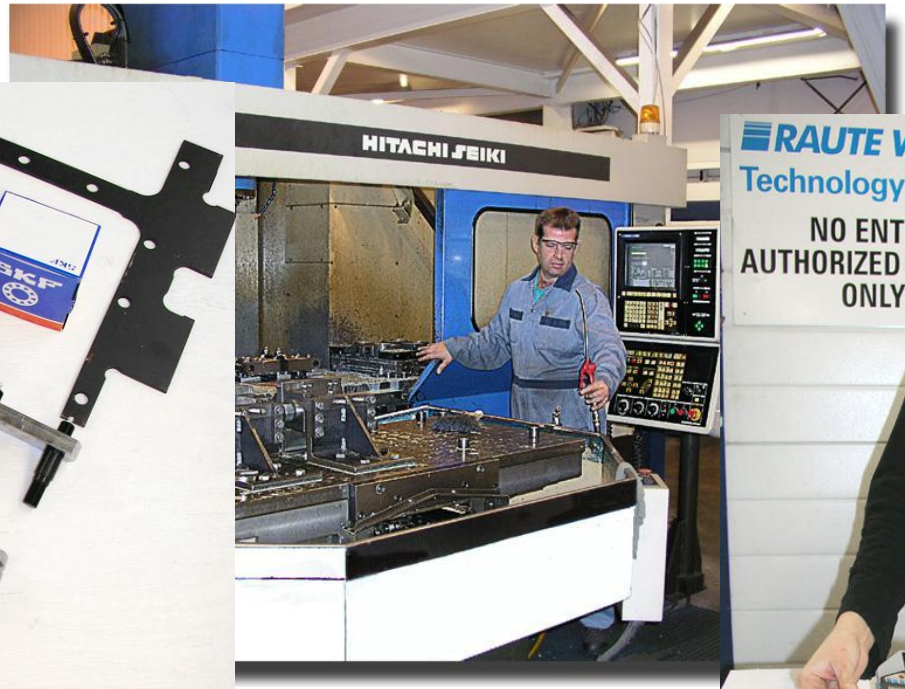
RIGHT COUPLING PROBLEM



Section 7

APPENDIX

PARTS



QUALITY RAUTE PARTS

PARTS & SERVICE

PARTS & SERVICE PHONE NUMBERS