OPENING PERMISSES

- Traffic signals RED permissive
  - Do not allow continuation of cycle until traffic lights RED and 15 second timer times out or TRAFFIC LIGHT BYPASS is engaged.

- On-coming traffic gates DOWN permissive
  - Enable on-coming traffic gates LOWER and sidewalk gates CLOSE

- Off-going traffic gates DOWN permissive
  - Enable off-going traffic gates LOWER

- Traffic barriers DOWN permissive
  - Enable traffic barrier LOWER

- Sidewalk gates CLOSED permissive
  - Enable sidewalk gates CLOSED

- Span locks PULLED permissive
  - Enable span locks PULLED

- Leaf(s) fully OPEN permissive
  - Do not allow channel clearance lights GREEN until all leaves are fully OPEN.

FLOWCHART LEGEND
- Continue a process, start, stop
- Enable a process device or routine, iteration
- Decision
- Action or process
- Message
- Logical OR’s
- Timer, delay
- Logical AND’s
- Connector lines, data flow
- Input, switch
- Insert flag
CLOSING PERMISSIVES

A' N/A

B' On-coming gates RAISED permissive
Do not allow continuation of cycle until on-coming traffic gates are RAISED.

C' Off-going gates RAISED permissive
Do not allow continuation of cycle until off-going traffic gates are RAISED.

D' Traffic barriers RAISED permissive
Do not allow continuation of cycle until traffic barriers are RAISED.

E' Sidewalk gates OPEN permissive
Do not allow continuation of cycle until sidewalk gates are OPEN.

F' Span locks DRIVEN permissive
Do not allow continuation of cycle until span locks are DRIVEN.

G' Leaf(s) fully SEATED permissive
Do not allow continuation of cycle until leaf(s) are FULLY SEATED.

Enable span locks DRIVE

Enable traffic signals GREEN

Enable traffic barriers raise and sidewalk gates OPEN

Enable off-going traffic gates RAISE

Enable on-coming traffic gates RAISE

Structures Manual Home
TRAFFIC SIGNALS - OPENING

START OPENING SEQUENCE → TRAFFIC SIGNALS TO RED

- Push and Release

- Energize Advance Warning Signal Contactor
- Advance Warning Signal Trouble
- Warning Drawbridge Ahead Sign

- Control Console Pushbutton

- Display Message if Any Lamp is Burned Out

- Turn Green Lights Off and Energize Yellow Lights

- ANY BURNT YELLOW LAMP?
  - Y → Message Subroutine
  - N → Message Subroutine

- Timer Adjustable 1-10 Seconds

- Energize Flashing Gate Arm Lights

- AN-15: Advance Warning Signal Trouble

- ANY BURNT RED LAMP?
  - Y → Message Subroutine
  - N → Message Subroutine

- Turn Yellow Lights Off and Energize Red Lights

- TRAFFIC LIGHTS RED?
  - Y → Message Subroutine
  - N → Message Subroutine

- Record Date and Time of Bypass
- Control Console Pushbutton
- Bypass Will Also Bypass 15 Second Timer

- Energize Gongs
- All Gate Arms Down/Closed

- Traffic Lights Red Permissive

- Or

- AN-24: Traffic Signals Bypassed

- Energize Flashing Gate Arm Lights

- SEE SHEET 6 - “TRAFFIC SIGNALS - CLOSING” FOR CONTINUATION

- Display Message if Any Lamp is Burned Out

- ANY BURNT RED LAMP?
  - Y → Message Subroutine
  - N → Message Subroutine

- Energize Gongs
- All Traffic Gates Down, Barriers Down, and Sidewalk Gates Closed

ALARMS THIS SHEET:
1. TRAFFIC SIGNALS BYPASSED (AN-24)
2. ADVANCE WARNING SIGNALS TROUBLE (AN-15)
TRAFFIC SIGNALS - CLOSING

START MESSAGE SUBROUTINE

NEAR OR FAR SIGNAL?

FAR

AN-14: FAR TRAFFIC SIGNAL TROUBLE

END MESSAGE SUBROUTINE

AN-13: NEAR TRAFFIC SIGNAL TROUBLE

FROM MESSAGE SUBROUTINE

DE-ENERGIZE FLASHING GATE ARM LIGHTS

WARNING DRAWBRIDGE AHEAD SIGN

TO MESSAGE SUBROUTINE

TRAFFIC SIGNAL TROUBLE

Y

ANY BURNT GREEN LAMP?

N

DISPLAY MESSAGE IF ANY LAMP IS BURNED OUT

BRIDGE CLOSED

TURN RED LIGHTS OFF AND ENERGIZE GREEN LIGHTS

AND

G

P

E

D

C

B

MESSAGE SUBROUTINE

(TRAFFIC SIGNAL TROUBLE)

ALARMS THIS SHEET:

1. TRAFFIC SIGNALS TROUBLE (AN-13, AN-14)
NAVIGATION LIGHTS

ALARMS THIS SHEET:
1. NAVIGATION LIGHTS MODE (AN-17, AN-18)
2. NAVIGATION FENDER LIGHTS FAILURE (AN-19, AN-20)
3. CHANNEL CLEARANCE LIGHTS FAILURE (AN-21, AN-22)
ON-COMING TRAFFIC GATES - OPENING

- **Control Console Pushbutton**
  - Do not allow continuation of cycle until traffic gate operator trouble is cleared.
  - Do not allow continuation of cycle until handcrank is removed.
  - Do not allow continuation of cycle until operator doors are closed.
  - Do not allow continuation of cycle until limit switch failure is cleared.

- **Record Date and Time of Trouble**
  - To Message A Subroutine
  - From Message A Subroutine
  - To Message B Subroutine
  - From Message B Subroutine
  - To Message C Subroutine
  - From Message C Subroutine
  - To Message D Subroutine
  - From Message D Subroutine

- **Lower Traffic Gate**
  - Lowered limit switch made?
  - Interlock made?
  - Traffic gate down permissive?

- **TROUBLE CLEAR?**
  - Operator trouble cleared?
  - Handcrank removed?
  - Operator doors closed?

- **Limit Switch Failure Cleared?**
  - Yes
  - No

- **Energize Lower (Forward) Contactor**
  - Control console pushbutton

- **Bypass On-coming Traffic Gates Lowered Limit Switches**
  - An-25: On-coming Traffic Gates Bypassed (AN-25)

**Note:** See sheet 9 - "On-coming Traffic Gates" for message subroutines.

**Alarms This Sheet:**

1. On-coming Traffic Gates Bypassed (AN-25)
ON-COMING TRAFFIC GATES

START MESSAGE A
SUBROUTINE

END MESSAGE A
SUBROUTINE

MESSAGE A SUBROUTINE
(ON-COMING TRAFFIC GATE OPERATOR TROUBLE)

START MESSAGE B
SUBROUTINE

END MESSAGE B
SUBROUTINE

MESSAGE B SUBROUTINE
(ON-COMING TRAFFIC GATE HANDCRANK INSERTED)

START MESSAGE C
SUBROUTINE

END MESSAGE C
SUBROUTINE

MESSAGE C SUBROUTINE
(ON-COMING TRAFFIC GATE OPERATOR DOOR OPEN)

START MESSAGE D
SUBROUTINE

END MESSAGE D
SUBROUTINE

MESSAGE D SUBROUTINE
(ON-COMING TRAFFIC GATE LIMIT SWITCH FAILURE)

ALARMS THIS SHEET:
1. TRAFFIC GATE OPERATOR TROUBLE (AN-46, AN-52)
2. TRAFFIC GATE LIMIT SWITCH Failure (AN-49, AN-55)
3. TRAFFIC GATE OPERATOR DOOR OPEN (AN-51, AN-57)
4. TRAFFIC GATE HANDCRANK INSERTED (AN-50, AN-56)
ON-COMING TRAFFIC GATES - CLOSING

NOTE: SEE SHEET 9 – "ON-COMING TRAFFIC GATES" FOR MESSAGE SUBROUTINES.

ALARMS THIS SHEET:
1. ON-COMING TRAFFIC GATES BYPASSED (AN-25)
OFF-GOING TRAFFIC GATES - OPENING

NOTE: SEE SHEET 12 – "OFF-GOING TRAFFIC GATES" FOR MESSAGE SUBROUTINES.
OFF-GOING TRAFFIC GATES

MESSAGE A SUBROUTINE
(OFF-GOING TRAFFIC GATE OPERATOR TROUBLE)

MESSAGE B SUBROUTINE
(OFF-GOING TRAFFIC GATE HANDCRANK INSERTED)

MESSAGE C SUBROUTINE
(OFF-GOING TRAFFIC GATE OPERATOR DOOR OPEN)

MESSAGE D SUBROUTINE
(OFF-GOING TRAFFIC GATE LIMIT SWITCH FAILURE)

ALARMS THIS SHEET:
1. TRAFFIC GATE OPERATOR TROUBLE (AN-58, AN-64)
2. TRAFFIC GATE LIMIT SWITCH FAILURE (AN-61, AN-67)
3. TRAFFIC GATE OPERATOR DOOR OPEN (AN-63, AN-69)
4. TRAFFIC GATE HANDCRANK INSERTED (AN-62, AN-68)
OFF-GOING TRAFFIC GATES - CLOSING

NOTE: SEE SHEET 12 – “OFF-GOING TRAFFIC GATES” FOR MESSAGE SUBROUTINES.

ALARMS THIS SHEET:
1. OFF-GOING TRAFFIC GATES BYPASSED (AN-26)
NOTE: SEE SHEET 15 “SIDEWALK GATES – 1 OF 2” AND SHEET 16 “SIDEWALK GATES – 2 OF 2” FOR MESSAGE SUBROUTINES.
SIDEWALK GATES - 1 OF 2

MESSAGE A SUBROUTINE
(SIDEWALK GATE OPERATOR TROUBLE)

MESSAGE B SUBROUTINE
(SIDEWALK GATE HANDCRANK INSERTED)

ALARMS THIS SHEET:
1. SIDEWALK GATE OPERATOR TROUBLE (AN-71, AN-77, AN-83, AN-89)
2. SIDEWALK GATE HANDCRANK INSERTED (AN-75, AN-81, AN-87, AN-93)
SIDEWALK GATES - 2 OF 2

ALARMS THIS SHEET:
1. SIDEWALK GATE OPERATOR DOOR OPEN (AN-76, AN-82, AN-88, AN-94)
2. SIDEWALK GATE LIMIT SWITCH FAILURE (AN-74, AN-80, AN-86, AN-92)
NOTE: SEE SHEET 15 "SIDEWALK GATES – 1 OF 2" AND SHEET 16 "SIDEWALK GATES – 2 OF 2" FOR MESSAGE SUBROUTINES.
TRAFFIC BARRIERS - OPENING

NOTE: SEE SHEET 19 “TRAFFIC BARRIERS – 1 OF 2” AND SHEET 20 “TRAFFIC BARRIERS – 2 OF 2” FOR MESSAGE SUBROUTINES.
TRAFFIC BARRIERS - 1 OF 2

MESSAGE A SUBROUTINE (TRAFFIC BARRIER OPERATOR TROUBLE)

MESSAGE B SUBROUTINE (TRAFFIC BARRIER HANDCRANK INSERTED)

ALARMS THIS SHEET:
1. TRAFFIC BARRIER OPERATOR TROUBLE (AN-96, AN-102, AN-114)
2. TRAFFIC BARRIER HANDCRANK INSERTED (AN-100, AN-106, AN-112, AN-118)
TRAFFIC BARRIERS - 2 OF 2

MESSAGE C SUBROUTINE
(TRAFFIC BARRIER OPERATOR DOOR OPEN)

START MESSAGE C SUBROUTINE

NEAR OR FAR
TRAFFIC BARRIER?

NEAR

AN-107: NOC TRAFFIC BARRIER OPERATOR DOOR OPEN

OC

AN-113: FOG TRAFFIC BARRIER OPERATOR DOOR OPEN

OG

MESSAGE D SUBROUTINE
(TRAFFIC BARRIER LIMIT SWITCH FAILURE)

START MESSAGE D SUBROUTINE

NEAR OR FAR
TRAFFIC BARRIER?

NEAR

AN-105: NOC TRAFFIC BARRIER LIMIT SWITCH FAILURE

OC

AN-117: FOG TRAFFIC BARRIER LIMIT SWITCH FAILURE

OG

ALARMS THIS SHEET:
1. TRAFFIC BARRIER OPERATOR DOOR OPEN (AN-101, AN-107, AN-113, AN-119)
2. TRAFFIC BARRIER LIMIT SWITCH FAILURE (AN-99, AN-105, AN-111, AN-117)
NOTE: SEE SHEET 19 “TRAFFIC BARRIERS – 1 OF 2” AND SHEET 20 “TRAFFIC BARRIERS – 2 OF 2” FOR MESSAGE SUBROUTINES.
SPAN LOCKS - OPENING

NOTE: SEE SHEET 23 "SPAN LOCKS" FOR MESSAGE SUBROUTINES.

ALARMS THIS SHEET:
1. SPAN LOCKS BYPASSED (AN-29)
START MESSAGE A SUBROUTINE

MESSAGE A SUBROUTINE
(SPAN LOCK OPERATOR TROUBLE)

MESSAGE B SUBROUTINE
(SPAN LOCK HANDCRANK INSERTED)

MESSAGE C SUBROUTINE
(SPAN LOCK OVERPRESSURE)

MESSAGE D SUBROUTINE
(SPAN LOCK LIMIT SWITCH FAILURE)

START MESSAGE B SUBROUTINE

START MESSAGE C SUBROUTINE

START MESSAGE D SUBROUTINE

END MESSAGE A SUBROUTINE

END MESSAGE B SUBROUTINE

END MESSAGE C SUBROUTINE

END MESSAGE D SUBROUTINE

ALARMS THIS SHEET:
1. SPAN LOCK OPERATOR TROUBLE (AN-121, AN-126, AN-131, AN-136)
2. SPAN LOCK HANDCRANK INSERTED OR OVERPRESSURE (AN-125, AN-130, AN-135, AN-140)
3. SPAN LOCK LIMIT SWITCH FAILURE (AN-124, AN-129, AN-134, AN-139)
SPANS LOCKS - CLOSING

**NOTE:** SEE SHEET 23 "SPAN LOCKS" FOR MESSAGE SUBROUTINES.
NOTE: SEE SHEETS 27 THRU 35 "LEAFS – 1 OF 9" THRU "LEAFS - 9 OF 9" FOR MESSAGE SUBROUTINES.
START MESSAGE A SUBROUTINE

NEAR OR FAR LEAF?

FAR

Opposite or adjacent leaf?

O

MOTOR A BRAKE?

Y

AN-211: NO LEAF MOTOR A BRAKE MANUALLY RELEASED

N

AN-214: NO LEAF MOTOR B BRAKE MANUALLY RELEASED

MOTOR B BRAKE?

Y

AN-217: NO LEAF MACHINERY BRAKE A MANUALLY RELEASED

N

AN-220: NO LEAF MACHINERY BRAKE B MANUALLY RELEASED

MACHINERY BRAKE A?

Y

AN-175: NA LEAF MOTOR A BRAKE MANUALLY RELEASED

N

AN-178: NA LEAF MOTOR B BRAKE MANUALLY RELEASED

MACHINERY BRAKE B?

Y

AN-181: NA LEAF MACHINERY BRAKE A MANUALLY RELEASED

N

AN-184: NA LEAF MACHINERY BRAKE B MANUALLY RELEASED

MOTOR A BRAKE?

Y

AN-193: FA LEAF MOTOR A BRAKE MANUALLY RELEASED

N

AN-196: FA LEAF MOTOR B BRAKE MANUALLY RELEASED

MACHINERY BRAKE A?

Y

AN-199: FA LEAF MACHINERY BRAKE A MANUALLY RELEASED

N

AN-202: FA LEAF MACHINERY BRAKE B MANUALLY RELEASED

MOTOR B BRAKE?

Y

AN-229: FO LEAF MOTOR A BRAKE MANUALLY RELEASED

N

AN-232: FO LEAF MOTOR B BRAKE MANUALLY RELEASED

MACHINERY BRAKE B?

Y

AN-235: FO LEAF MACHINERY BRAKE A MANUALLY RELEASED

N

AN-238: FO LEAF MACHINERY BRAKE B MANUALLY RELEASED

END MESSAGE A SUBROUTINE

MESSAGE A SUBROUTINE (BRAKE MANUALLY RELEASED)

ALARMS THIS SHEET:

1. MOTOR A BRAKE MANUALLY RELEASED (AN-175, AN-193, AN-211, AN-229)
2. MOTOR B BRAKE MANUALLY RELEASED (AN-178, AN-196, AN-214, AN-232)
3. MACHINERY BRAKE A MANUALLY RELEASED (AN-181, AN-199, AN-217, AN-235)
4. MACHINERY BRAKE B MANUALLY RELEASED (AN-184, AN-202, AN-220, AN-238)
LEAFS - 2 OF 9

MESSAGE B SUBROUTINE (EMERGENCY DRIVE ENGAGED)

START MESSAGE B SUBROUTINE

END MESSAGE B SUBROUTINE

START MESSAGE C SUBROUTINE

END MESSAGE C SUBROUTINE

MESSAGE C SUBROUTINE (DRIVE FAULT)

ALARMS THIS SHEET:
1. EMERGENCY DRIVE ENGAGED (AN-173, AN-191, AN-209, AN-227)
2. LEAF DRIVE A FAULT (AN-171, AN-189, AN-207, AN-225)
3. LEAF DRIVE B FAULT (AN-172, AN-190, AN-208, AN-226)
LEAFS - 3 OF 9

START MESSAGE D SUBROUTINE

NEAR OR FAR LEAF?

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LEAFS - 4 OF 9

START MESSAGE E SUBROUTINE

NEAR OR FAR LEAF?

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START MESSAGE E SUBROUTINE

NEAR OR FAR LEAF?

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START MESSAGE E SUBROUTINE

NEAR OR FAR LEAF?

NEAR

O

MESSAGE E SUBROUTINE (BRAKE TROUBLE)

AN-174: NO LEAF MOTOR A BRAKE TROUBLE

AN-177: NO LEAF MOTOR B BRAKE TROUBLE

AN-180: NO LEAF MACHINERY BRAKE A TROUBLE

AN-183: NO LEAF MACHINERY BRAKE B TROUBLE

AN-192: NO LEAF MOTOR A BRAKE TROUBLE

AN-195: NO LEAF MOTOR B BRAKE TROUBLE

AN-198: NO LEAF MACHINERY BRAKE A TROUBLE

AN-201: NO LEAF MACHINERY BRAKE B TROUBLE

AN-210: NO LEAF MOTOR A BRAKE TROUBLE

AN-213: NO LEAF MOTOR B BRAKE TROUBLE

AN-216: NO LEAF MACHINERY BRAKE A TROUBLE

AN-219: NO LEAF MACHINERY BRAKE B TROUBLE

AN-228: NO LEAF MOTOR A BRAKE TROUBLE

AN-231: NO LEAF MOTOR B BRAKE TROUBLE

AN-234: NO LEAF MACHINERY BRAKE A TROUBLE

AN-237: NO LEAF MACHINERY BRAKE B TROUBLE

AN-234: NO LEAF MACHINERY BRAKE A TROUBLE

AN-237: NO LEAF MACHINERY BRAKE B TROUBLE

AN-231: NO LEAF MOTOR B BRAKE TROUBLE

AN-201: NO LEAF MACHINERY BRAKE B TROUBLE

AN-180: NO LEAF MACHINERY BRAKE A TROUBLE

AN-183: NO LEAF MACHINERY BRAKE B TROUBLE

AN-192: NO LEAF MOTOR A BRAKE TROUBLE

AN-195: NO LEAF MOTOR B BRAKE TROUBLE

AN-198: NO LEAF MACHINERY BRAKE A TROUBLE

AN-201: NO LEAF MACHINERY BRAKE B TROUBLE

END MESSAGE E SUBROUTINE

ALARMS THIS SHEET:
1. MOTOR A BRAKE TROUBLE
   (AN-174, AN-192, AN-210, AN-228)
2. MOTOR B BRAKE TROUBLE
   (AN-177, AN-195, AN-213, AN-231)
3. MACHINERY BRAKE A TROUBLE
   (AN-180, AN-198, AN-216, AN-234)
4. MACHINERY BRAKE B TROUBLE
   (AN-183, AN-201, AN-219, AN-237)
MESSAGE F SUBROUTINE (MOTOR OVERSPEED)

ALARMS THIS SHEET:
1. MOTOR A OVERSPEED (AN-242, AN-244, AN-246, AN-248)
2. MOTOR B OVERSPEED (AN-243, AN-245, AN-247, AN-249)
ALARMS THIS SHEET:
1. MOTOR A HIGH TEMPERATURE (AN-186, AN-204, AN-222, AN-240)
2. MOTOR B HIGH TEMPERATURE (AN-187, AN-205, AN-223, AN-241)
MESSAGES

H SUBROUTINE (LOCKS NOT PULLED)

SUBROUTINE

AN-165: LOCKS NOT PULLED

START MESSAGE H SUBROUTINE

END MESSAGE H SUBROUTINE

START MESSAGE I SUBROUTINE

NEAR OR FAR LEAF?

AN-151: FA LEAF FULL OPEN LIMIT SWITCH FAILURE

AN-146: NA LEAF FULL OPEN LIMIT SWITCH FAILURE

FAR

AN-157: NO LEAF FULL OPEN LIMIT SWITCH FAILURE

START MESSAGE I SUBROUTINE

END MESSAGE I SUBROUTINE

START MESSAGE J SUBROUTINE

NEAR OR FAR LEAF?

AN-150: FA LEAF NEAR OPEN LIMIT SWITCH FAILURE

AN-144: NA LEAF NEAR OPEN LIMIT SWITCH FAILURE

FAR

AN-156: NO LEAF NEAR OPEN LIMIT SWITCH FAILURE

START MESSAGE J SUBROUTINE

END MESSAGE J SUBROUTINE

MESSAGE I SUBROUTINE (FULL OPEN LIMIT SWITCH FAILURE)

MESSAGE J SUBROUTINE (NEAR OPEN LIMIT SWITCH FAILURE)

ALARMS THIS SHEET:
1. LOCKS NOT PULLED (AN-165)
2. FULL OPEN LIMIT SWITCH FAILURE (AN-145, AN-151, AN-157, AN-163)
3. NEAR OPEN LIMIT SWITCH FAILURE (AN-144, AN-150, AN-156, AN-162)
MESSAGE K SUBROUTINE
(FULL CLOSED LIMIT SWITCH FAILURE)

START MESSAGE K SUBROUTINE

NEAR OR FAR LEAF?

NEAR

OPPOSITE OR ADJACENT LEAF?

FAR

AN-148: FA LEAF FULL CLOSED LIMIT SWITCH FAILURE

AN-160: FO LEAF FULL CLOSED LIMIT SWITCH FAILURE

AN-154: NO LEAF FULL CLOSED LIMIT SWITCH FAILURE

AN-142: NA LEAF FULL CLOSED LIMIT SWITCH FAILURE

MESSAGE L SUBROUTINE
(NEAR CLOSED LIMIT SWITCH FAILURE)

START MESSAGE L SUBROUTINE

NEAR OR FAR LEAF?

NEAR

OPPOSITE OR ADJACENT LEAF?

FAR

AN-149: FA LEAF NEAR CLOSED LIMIT SWITCH FAILURE

AN-161: FO LEAF NEAR CLOSED LIMIT SWITCH FAILURE

AN-155: NO LEAF NEAR CLOSED LIMIT SWITCH FAILURE

AN-143: NA LEAF NEAR CLOSED LIMIT SWITCH FAILURE

ALARMS THIS SHEET:
1. FULL CLOSED LIMIT SWITCH FAILURE (AN-142, AN-148, AN-154, AN-160)
2. NEAR CLOSED LIMIT SWITCH FAILURE (AN-143, AN-149, AN-155, AN-161)
MESSAGE M SUBROUTINE
(FULL SEATED LIMIT SWITCH FAILURE)

MESSAGE N SUBROUTINE
(POSITION TRANSDUCER FAILURE)

ALARMS THIS SHEET:
1. FULL SEATED LIMIT SWITCH FAILURE (AN-141, AN-147, AN-153, AN-159)
2. POSITION TRANSDUCER FAILURE (AN-146, AN-152, AN-158, AN-164)
NOTE: SEE SHEETS 27 THRU 35 "LEAFS - 1 OF 9" THRU "LEAFS - 9 OF 9" FOR MESSAGE SUBROUTINES.
NOTE: SEE SHEETS 27 THRU 35 "LEAFS – 1 OF 9" THRU "LEAFS – 9 OF 9" FOR MESSAGE SUBROUTINES.
LEAFS - SEATED

ALARMS THIS SHEET:
1. LEAF(S) FULLY SEATED BYPASSED (AN-30)