BELLCOMM, INC.
955 L'ENFANT PLAZA NORTH, S.W. WASHINGTON, D.C. 20024

B70 09052

SUBJECT: Tektite II Data Management/Handling
Case 103-7

DATE: September 28, 1970

FROM: M. J. Reynolds

ABSTRACT

Tektite II is a seven-month underwater research program to determine the ability of men to live and work usefully under the sea for periods up to three weeks. Seventeen multi-aquanaut crews will participate in the program, supported by a team drawn from government agencies, universities and industry. Bellcomm is responsible for the management of the behavioral data collected by T.V. observers, by the aquanauts and from laboratory analysis of biological samples. Specific activities include:

1. receive the off-line punched data (punched after the occurence of an activity) as well as the on-line punched information on pre-perforated IBM cards.

2. process these cards yielding both weekly reports and specially configured punched data cards for particular users.

3. store the information on magnetic tape for future analysis.

(NASA-CR-113791) TEKTITE 2 DATA MANAGEMENT/HANDLING, CASE 103-7 (Bellcomm, Inc.) 18 p

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MEMORANDUM FOR FILE

INTRODUCTION

Tektite II is an underwater research program to evaluate man's ability to live and work usefully beneath the sea for durations up to three weeks. This seven-month endeavor consists of seventeen multi-aquanaut crews and is supported topside by a team drawn from government agencies, industry, as well as from universities. Bellcomm, Inc. is responsible for the management and subsequent storage of the behavioral data collected during the Tektite II long-term experiment. Its role is more fully described in the following sections.

DATA COLLECTION

As in Tektite I[1] (February 15-April 15, 1969), a support van is manned by two observers at a time who monitor the aquanauts via video screens on a twenty-four* hour basis for the duration of the mission. The observers punch pre-perforated IBM cards according to the observed behavior/activity of each crew member at a specified time.[2] In addition to these porta-punch data cards, information is collected from a time log kept by the aquanauts that is later relayed to IBM cards, and also from data cards processed after biological samples have been processed or studied.

DATA MANAGEMENT/HANDLING

The Tektite II Data Management/Handling operation at Bellcomm is divided into three parts:

1. Manual Handling
2. Weekly Sort and Formatted Output
3. Data Bank Storage

(See Appendix A for the weekly data flow at Bellcomm commencing with the arrival of the data cards from the Virgin Islands.)

*Tektite I monitored aquanauts for eighteen hours per day.

1. Manual Handling

Upon their arrival at Bellcomm, the Tektite II porta-punch cards are duplicated, interpreted, and listed in sequential order. Then, a visual scan is performed on the listing to correct any gross mispunches.

2. Weekly Sort and Formatted Output

The weekly data cards (approximately 2000 cards per week) are read chronologically onto a temporary tape. This tape is then fed into the Format Program (see Appendix B for this flow chart) developed at Bellcomm, yielding output tailored to the diversified requests of the various agencies.

Agency	Requested Visibility
On-Site Virgin Islands	Listing
NASA	Listing
University of Texas	Listing, punched cards

At present, there are seven measures* each depicting various events and activities of the Tektite II crew:

MEASURE IDENTIFICATION	TITLE
01	Aquanaut Status Record
02	Dive Record
03	Gas Usage Record
04	Meal Record
05	Retiring-Duration-Arising Record
06	Communication with Topside Record
07	Specific Events Record

(See Appendix C for the template layout[3] for each individual measure.)

*Two additional measures are soon to be incorporated.

For clarification, the output listing comprises not only the recorded data but also a detailed legend and heading explanation for an easy visual scan. (See Appendix D for a sample of the legend and data items from Measure 01.)

Optimally, data received from the Virgin Island site location can be processed within one day. Thus, within a few days, the results will be in circulation: the on-site personnel will view the fruits of their labor; the University of Texas will be able to proceed with analysis via specially configured punched data cards accompanying the listing; and the other agencies will have the opportunity to follow Tektite II progress. To date, the one-day turn-around time has been realized.

3. Data Bank Storage

Bellcomm will house the Tektite II data as it does the Tektite I data. Each week the new data is merged chronologically with the already processed Tektite II data cards. (See Appendix E for a flow chart of merge program.) These data images, residing on magnetic tapes (36 BIT-words, 556 BITS per inch, 256 word records, odd parity) are sequentially arranged according to measure identification, mission number, mission day and time.

DATA ANALYSIS

All analytical studies are being conducted by the University of Texas in Austin under the direct supervision of Dr. Robert Helmreich (Department of Psychology). However, due to the proximity of the data, analysis can also be undertaken by Bellcomm. These results will not only describe man's behavior, actions and performance within the depths of the sea; but also yield information potentially applicable to man's adaptation in outerspace. Nonetheless, at this time, analysis is the sole responsiblity of the Principle Investigator, Dr. Helmreich, at Texas.

M. J. Reynolds

1011-MJR-mla

M. J. Reynolds

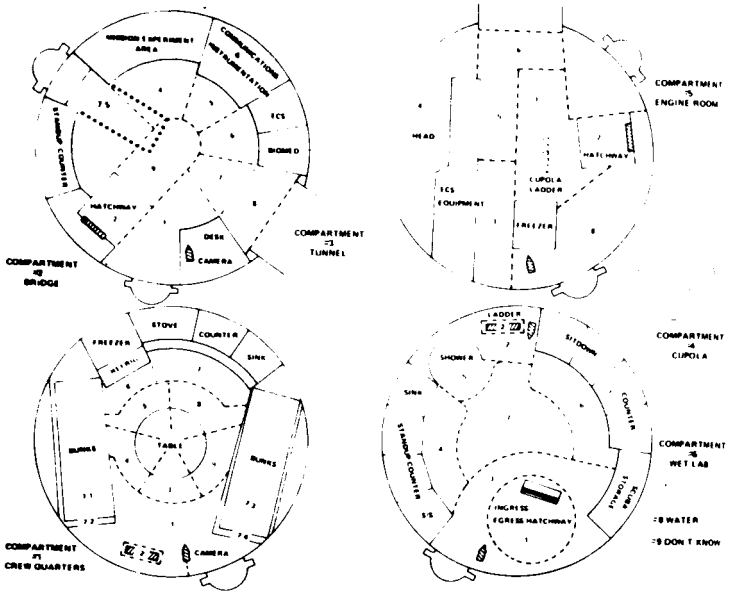
FOOTNOTES

1. Mach, Radloff and Zill, Tektite I Final Report, Appendix A.2 Behavioral Program, pp. 26-28.

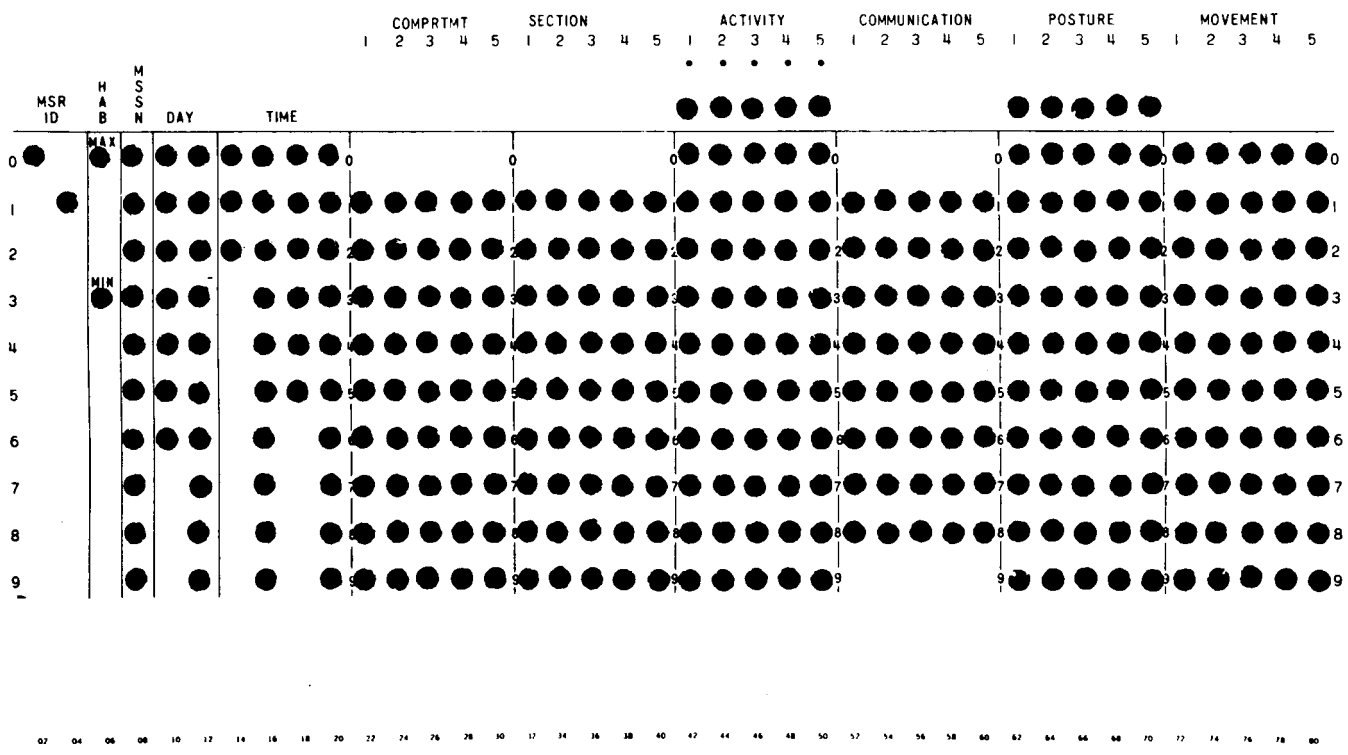
2. R. S. Mach, Tektite II Behavioral Observers Handbook, (Case 105-5), pp. 1 and 2.

3. Ibid., pp. 5, 7, 9, 11, 19, 26 and 29.

AQUANAUT STATUS RECORD



ACTIVITY CATEGORIES	COMMUNICATION CATEGORIES	POSTURE CATEGORIES	MOVEMENT CATEGORIES
11 DIRECT MARINE SCIENCE		11 STANDING-ERECT	
0 MAR SCIENCE SUPPORT		0 STANDING-SLOUCHING	0 NO MOVEMENT
1 LOCOMOTING	1 NOT COMMUNICATING NEITHER TALKING NOR LISTENING	1 STANDING-LEANING	1 LIGHT TRANSLATIONAL
2 HABITAT MAINTNC AND REPAIR	2 TALKING WITH ANOTHER AQUANAUT	2 SITTING-FORWARD	2 MODERATE TRANSLATIONAL
3 SELF MAINTENANCE	3 LISTENING TO AQUANAUT #1	3 SITTING-UPRIGHT	3 VIGOROUS TRANSLATIONAL
4 MAINTENANCE OF OTHERS	4 LISTENING TO #2	4 SITTING-SLOUCHING	4 LIGHT MANIPULATIVE
5 CO RECREATION	5 LISTENING TO #3	5 RECLINING	5 MODERATE MANIPULATIVE
6 SOLITARY RECREATION	6 LISTENING TO #4	6 SQUATTING	6 VIGOROUS MANIPULATIVE
7 RELAXING, RESTING IDLING	7 LISTENING TO #5	7 KNEELING	7 LIGHT EXPRESSIVE
8 NAPPING SLEEPING	8 TALKING OR LISTENING TO TOPSIDE	8 ALL FOURS	8 MODERATE EXPRESSIVE
9 DON'T KNOW		9 LYING DOWN	9 VIGOROUS EXPRESSIVE



APPENDIX C-1

[redacted]

LEGEND

HABITAT

MAX. – 80 FT. HABITAT
MIN. – 100 FT. HABITAT

MISSION ID

IN NUMERICAL SEQUENCE (FROM 01) FOR EACH HABITAT

MISSION DAY

FIRST DAY = 01, ETC.

DIVE START TIME

TIME RE: [24 HR CLOCK] TO NEAREST MINUTE FIRST AQUANAUT ENTERS WATER

RIG CATEGORIES

1. OPEN CIRCUIT
2. CLOSED CIRCUIT
3. HOOKAH
4. FREE

EGR [ESS] ORDER

AT START OF TEAM DIVE IS AQUANAUT FIRST, 2ND, 3RD, ETC. OUT OF HABITAT

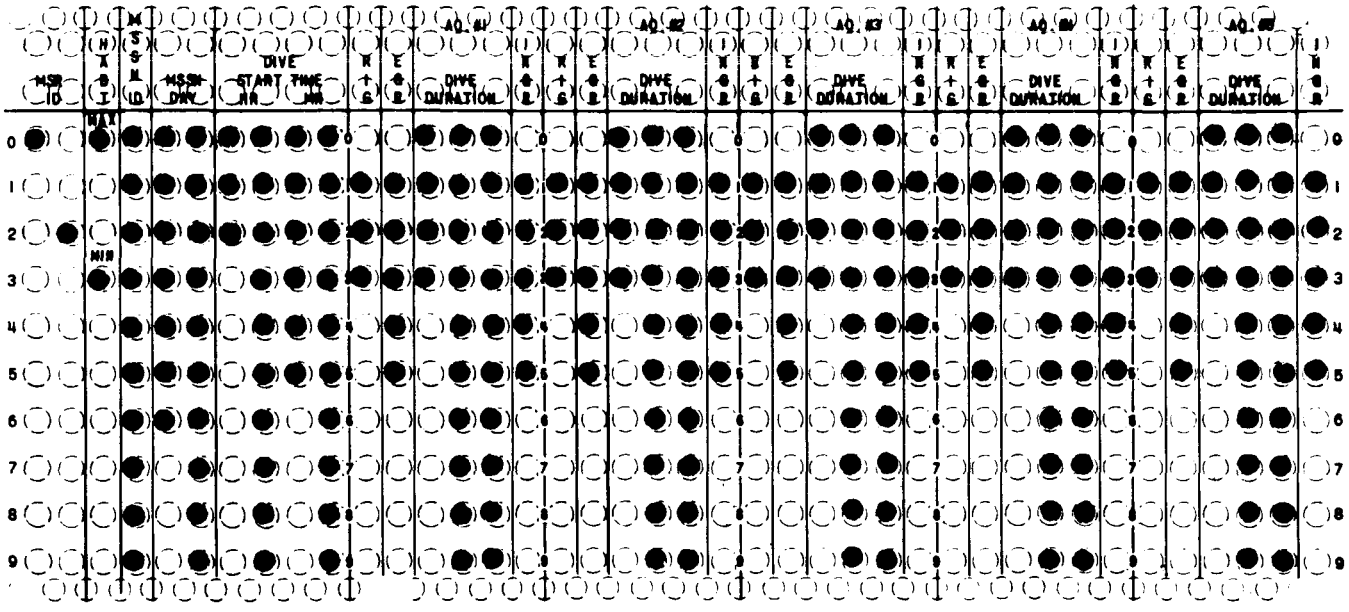
DIVE DURATION

TOTAL NO. OF MINUTES IN WATER BETWEEN END OF PREPARATION FOR AND BEGINNING OF SECURING FROM DIVE

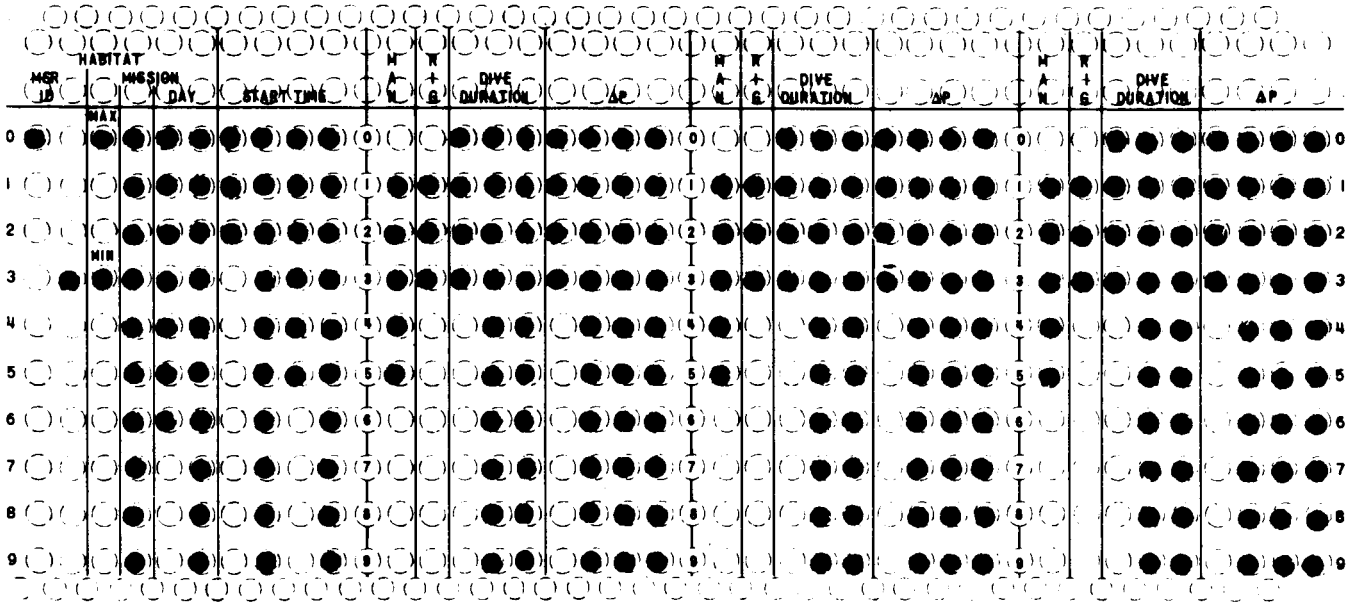
INGR [ESS] ORDER

AT END OF DIVE ORDER OF AQUANAUT'S RETURN IE. IS HE FIRST, 2ND ETC BACK INTO HABITAT.

DIVE IDENTIFICATION



GAS USAGE



START TIME

GENERAL START TIME LISTED IN PAPER LOG

MAN

PUNCH HIS ID #

RIG CATEGORIES

1. OPEN CIRCUIT
2. CLOSED CIRCUIT
3. HOOKAH

DIVE DURATION

DIFFERENCE IN MINUTES, BETWEEN DIVE START AND STOP TIMES AS LISTED IN THE PAPER LOG

ΔP

DIFFERENCE, IN POUNDS PER SQUARE INCH GAUGED BETWEEN PRE AND POST DIVE GAUGE READINGS

MEAL

START TIME

THE TIME TO THE NEAREST MINUTE WHEN THE MAJORITY OF MEN COMPRISING THE MEAL GROUP BEGIN EATING

COOK

PREPARES THE FOOD FOR THE MEAL OF ....

WAITER

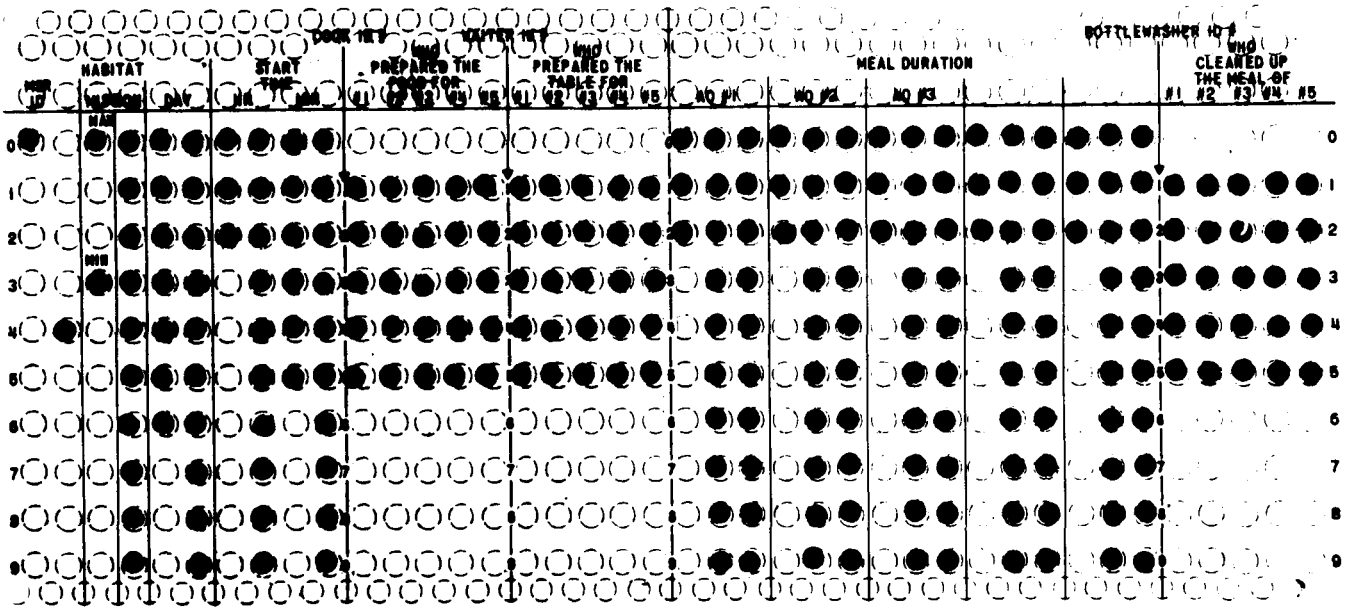
SETS THE TABLE AND BRINGS THE FOOD TO THE TABLE FOR ....

BOTTLEWASHER

CLEARS THE TABLE AND WASHES THE DISHES OF ....

DURATION

LENGTH OF TIME, IN MINUTES, BETWEEN THE MAN STARTING TO EAT HIS MEAL AND LEAVING THE TABLE FOR GOOD AFTER THE MEAL



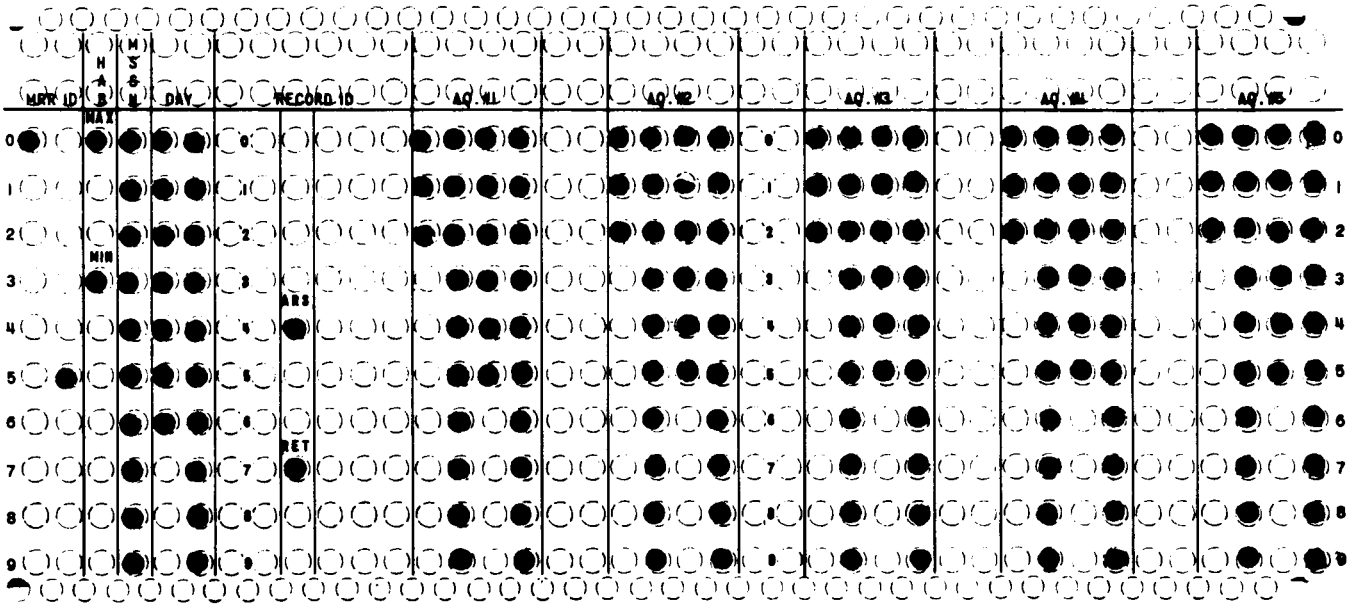
ARISING—RETIRING

INSTRUCTIONS:

THIS TEMPLATE ALLOWS PUNCHING OF TIME OF ARISING OR TIME OF RETIRING PUNCH #4 IN RECORD ID COLUMN WHEN PUNCHING ARISING AND #7 WHEN PUNCHING RETIRING. USE 24 HR CLOCK TIME TO THE NEAREST MINUTE.

CONVENTION—

ALTHOUGH SOME OR EVEN ALL OF THE CREW MEMBERS MAY RETIRE AFTER MIDNIGHT THE MISSION DAY ID SHOULD ALWAYS BE PUNCHED AS THE DAY ON WHICH INDIVIDUALS WOULD NORMALLY RETIRE I.E. AS ON THE DAY BEFORE MIDNIGHT...THE PREVIOUS DAY.



DEFINITIONS: ARISING _ WHEN AN AQUANAUT GETS OUT OF BED TO BEGIN THE DAY
RETIRING – WHEN THE AQUANAUT GETS INTO HIS BUNK FOR THE NIGHT

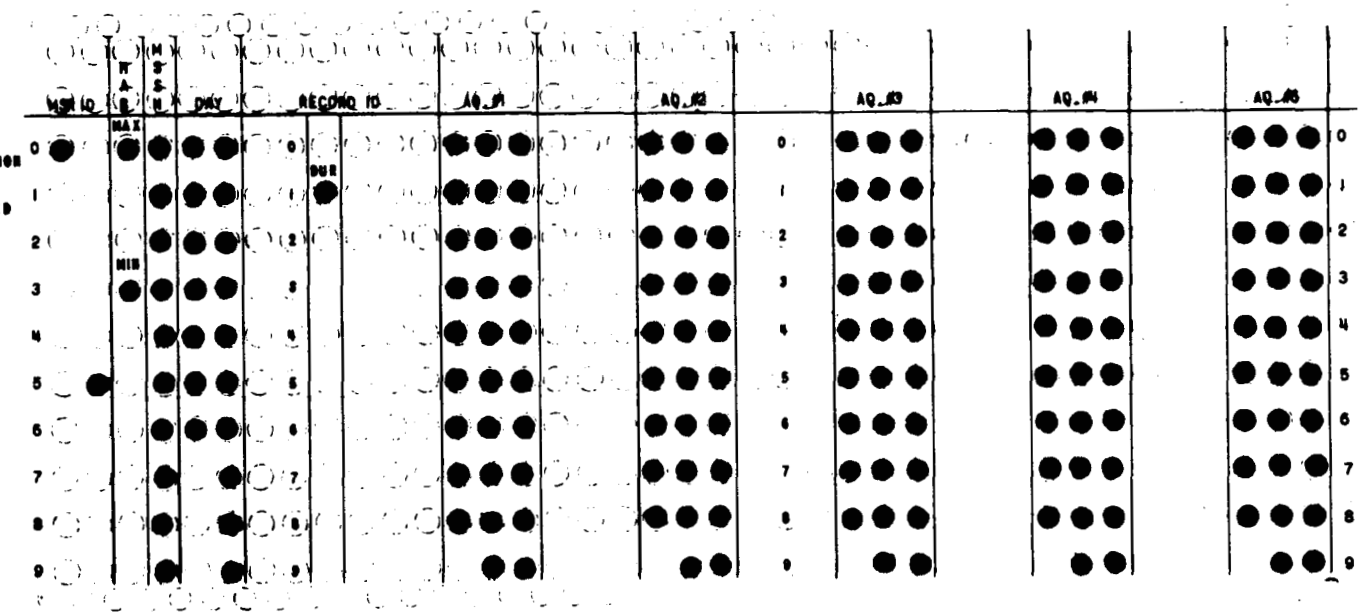
TK II RYM

OVERNIGHT SLEEP DURATION

INSTRUCTIONS:

WHEN PUNCHING THE MISSION DAY ALWAYS PUNCH THE DAY ON WHICH THE SLEEP PERIOD IN QUESTION ENDED

THE DURATION IS THE TOTAL NUMBER OF MINUTES FOLLOWING THE TIME OF RETIRING THE NIGHT BEFORE UNTIL THE TIME OF ARISING ON THE MORNING OF THE RECORD



COMMUNICATIONS WITH TOPSIDE

START TIME

TO NEAREST MINUTE A COMMUNICATION BETWEEN HABITAT AND TOPSIDE PERSONNEL

INIT [IATOR]

DID THE HABITAT OR DID TOPSIDE INITIATE THE COMMUNICATION

DEVICE CATEGORIES

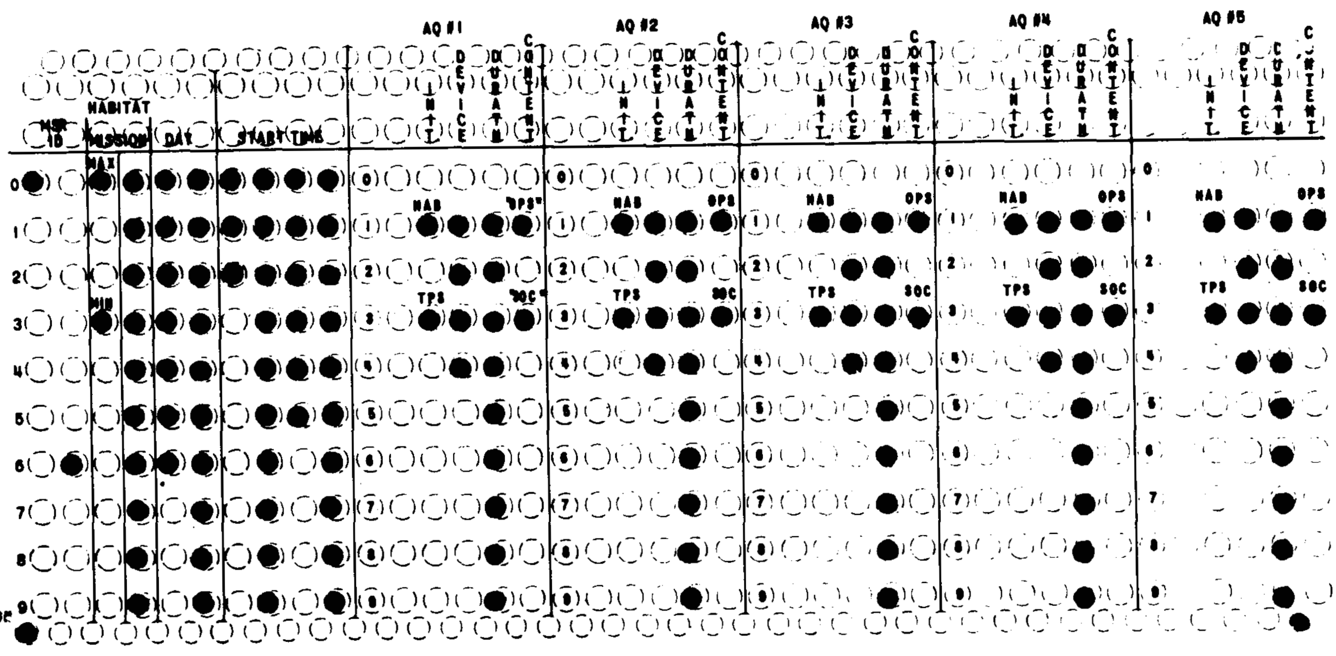
1. OPEN MICROPHONE (PUBLIC)
2. INTERCOM (SEMI-PRIV.)
3. BOGEN (PRIVATE)
4. VIDEO PHONE

DURATION OF COMMUN. CATEGORIES

1. 20-40 SEC
2. 40 SEC - 1 MIN
3. 1-2 MIN
4. 2-3
5. 3-5
6. 5-7
7. 7-10
8. 10-15
9. 15 OR >

CONTENT

WAS THE MAJORITY OF TIME SPENT IN THE COMMUNICATION DEVOTED TO OPERATIONAL OR SOCIAL TOPICS



EVENT IDENTIFICATION
G general category
S specific "

MH maintenance of habitat
1 housekeeping
2 habit. maint.
3 " repair
4 baralime change

MSO maint self/others
1 head usage
2 showering
3 laundry
4 handling food stores

UF use of facilities
1 tv outside
2 tv tapes/entrtnmt
3 tv " maintnc
4 radio
5 general leisure package hardware
6 personal leisure items
7 pressure pot
8 winch

FREQ no. times per day aquanaut does above

TOTAL DURATION
G gen. cat.

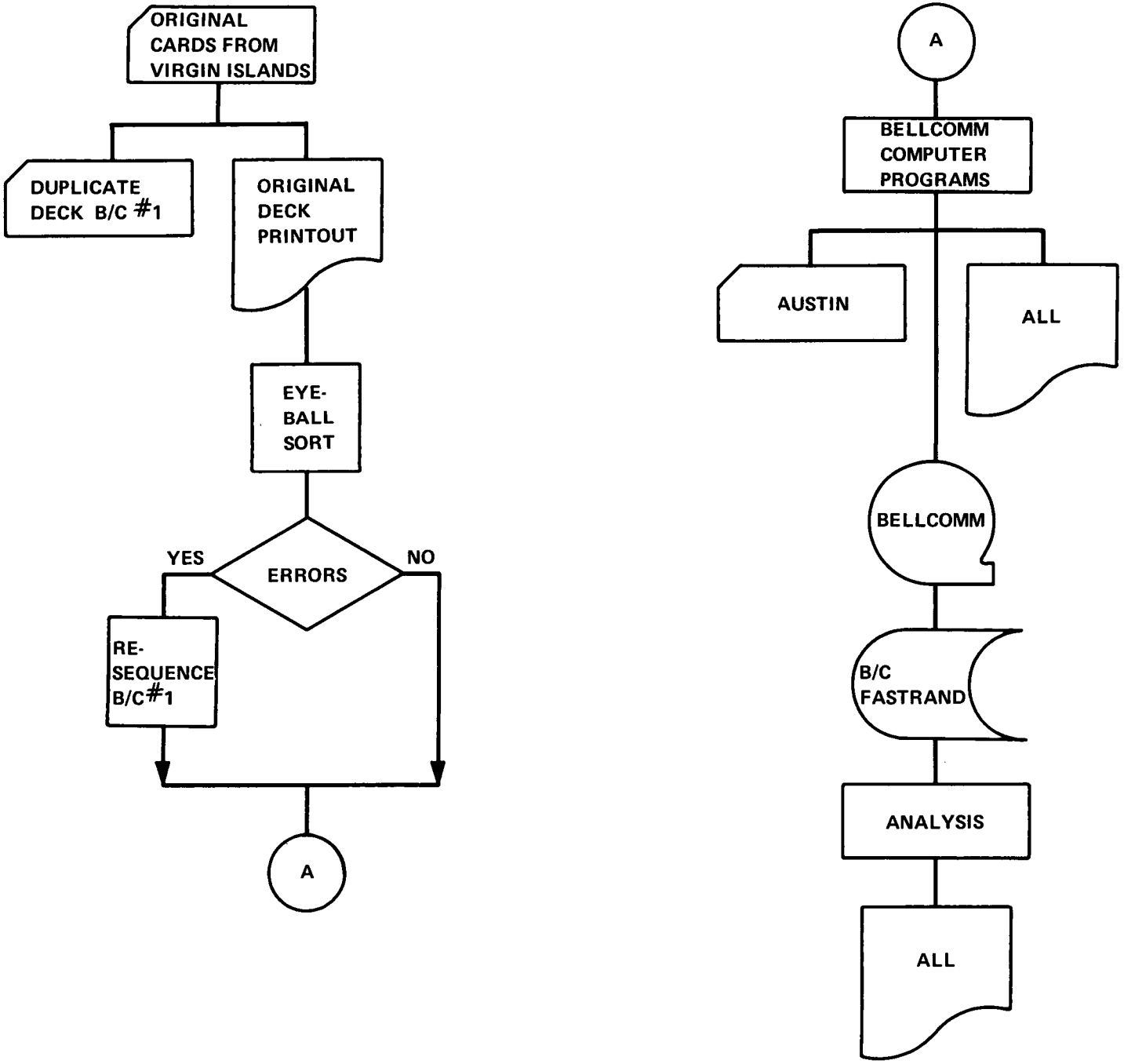
0 less than 3min
1 3 - 10
2 10 - 20
3 20 - 30
4 30 - 45
5 45 - 60
6 60 - 90
7 90 - 120
8 120 - 150
9 greater than 150

SPC. specific total min. if available

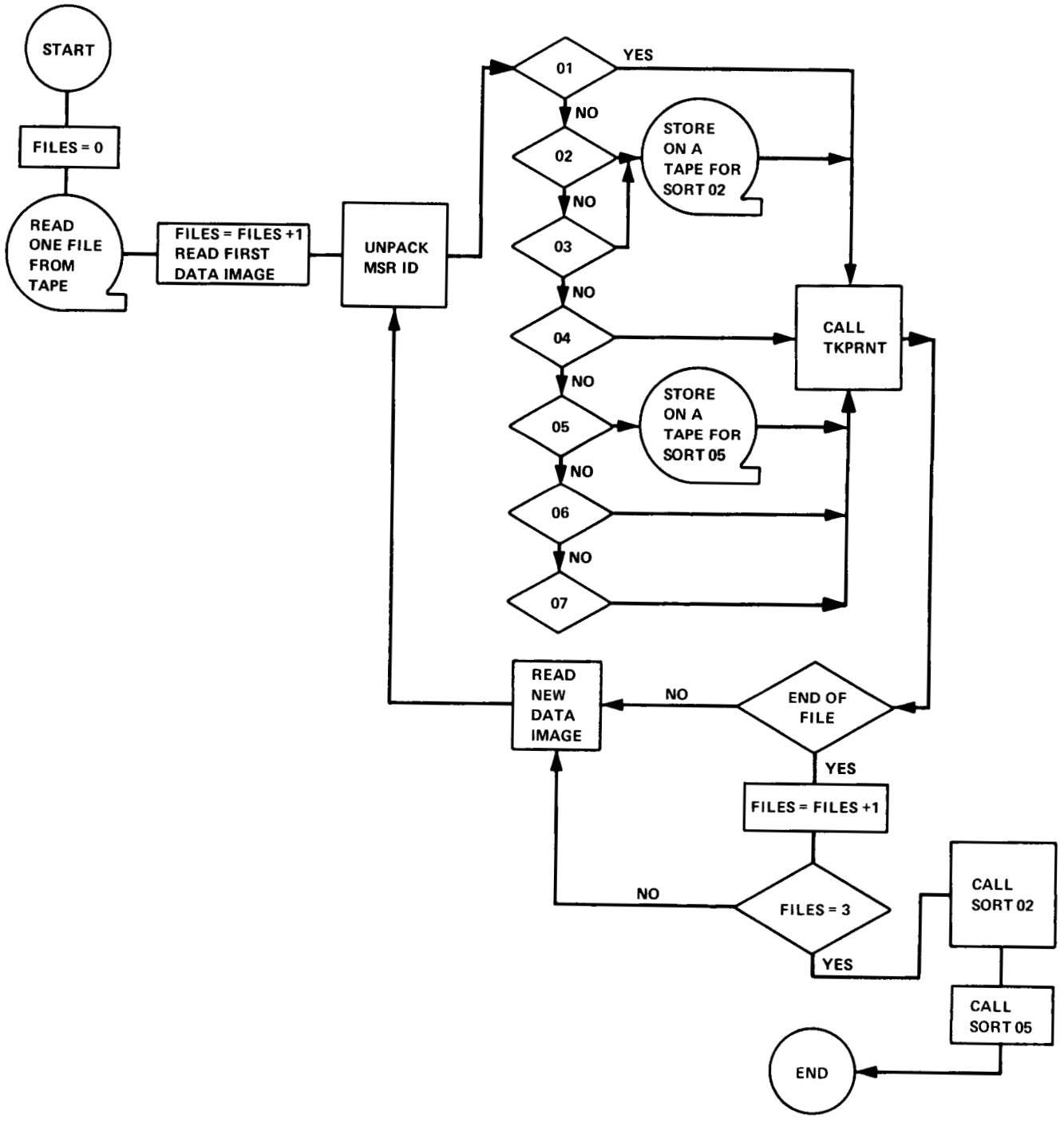
SPECIFIC EVENT RECORD

MSR ID	H A B	M S N	DAY	EVENT ID G	EVENT ID S		A Q 1 freq	duration G S P C	A Q 2 freq	duration G S P C	A Q 3 freq	duration G S P C	A Q 4 freq	duration G S P C	A Q 5 freq	duration G S P C	
	hou					0											0
				mh		1											1
						2											2
	min					3											3
				msq		4											4
						5											5
						6											6
				uf		7											7
						8											8
						9											9

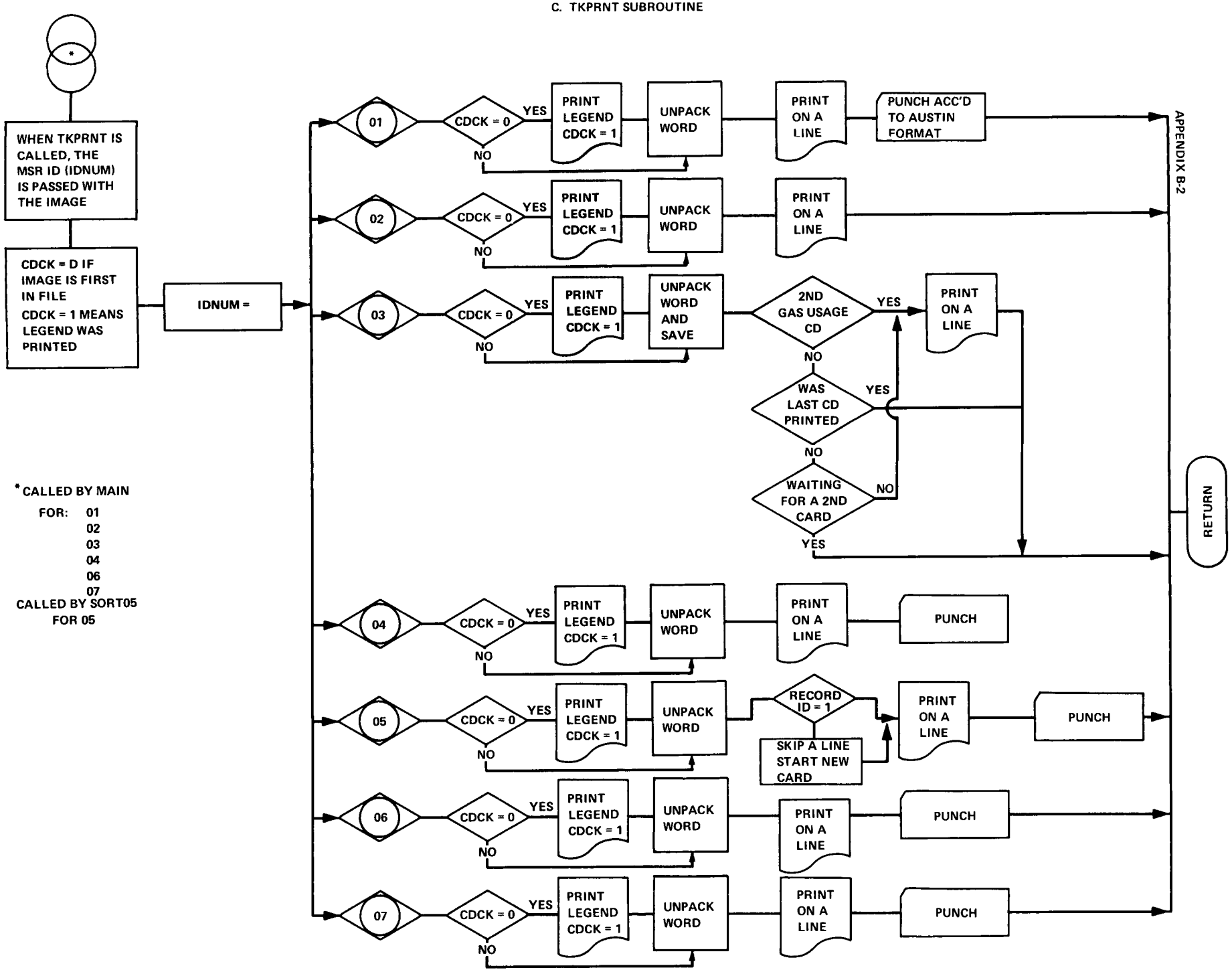
DATA FLOW


ORIGINAL CARDS FROM VIRGIN ISLANDS
DUPLICATE DECK B/C #1
ORIGINAL DECK PRINTOUT
EYE-BALL SORT
ERRORS
YES
NO
RE-SEQUENCE B/C#1
A
A
BELLCOMM COMPUTER PROGRAMS
AUSTIN
ALL
BELLCOMM
B/C FASTRAND
ANALYSIS
ALL

A FORMAT PROGRAM



C. TKPRNT SUBROUTINE



*CALLED BY MAIN
FOR: 01
02
03
04
06
07
CALLED BY SORT05
FOR 05

BELLCOMM DATA MANAGEMENT

TEKTITE II

MEASURE 01

AQUANAUT STATUS RECORD

LEGEND:

HABITAT (HAB)

0 = MAXITAT

3 = MINITAT

MISSION IDENTIFICATION NUMBER (MSSN)

MISSION DAY - DAY OF SPECIFIED MISSION

MAXITAT

1 = APRIL 4 - APRIL 16
2 = APRIL 22 - MAY 7
3 = MAY 7 - MAY 27
4 = MAY 27 - JUNE 17
5 = JULY 6 - JULY 21
6 = JULY 23 - AUGUST 12
7 = AUGUST 12 - SEPTEMBER 1
8 = SEPTEMBER 1 - SEPTEMBER 22
9 = SEPTEMBER 26 - OCTOBER 11
0=10= OCTOBER 15 - OCT 31

MINITAT

1 = JUNE 18 - JULY 4
2 = JULY 8 - JULY 24
3 = JULY 26 - AUGUST 11
4 = AUGUST 15 - AUGUST 31
5 = SEPTEMBER 4 - SEPTEMBER 20
6 = SEPTEMBER 22 - OCTOBER 8
7 = OCTOBER 12 - OCTOBER 31

TIME - TIME ON 24 HOUR CLOCK WHEN STATUS WAS RECORDED

FOR EACH OF THE AQUANAUTS

COMPARTMENT(C)

1 = CREW QUARTERS
2 = BRIDGE
3 = TUNNEL
4 = CUPOLA
5 = ENGINE ROOM
6 = WET LAB
7 = BUNK
8 = WATER
9 = UNKNOWN

SECTION(S)

FOR THE SPECIFIC SECTION IN THE RESPECTIVE COMPARTMENT-- SEE THE TEKTITE LAYOUT

ACTIVITY(A)

1 = DIRECT MARINE SCIENCE
2 = MARINE SCIENCE SUPPORT
3 = LOCOMOTING
4 = HABITAT MAINT/REPAIR
5 = SELF MAINTENANCE
6 = MAINTENANCE OF OTHERS
7 = CO-RECREATION
8 = SOLITARY RECREATION
9 = RELAXING,RESTING,IDLING
10 = NAPPING,SLEEPING
11 = DO NOT KNOW

COMMUNICATION(T)

1 = NOT COMMUNICATING
2 = TALK W. ANOTHER AQU
3 = LISTENING TO AQU#1
4 = LISTENING TO AQU#2
5 = LISTENING TO AQU#3
6 = LISTENING TO AQU#4
7 = LISTENING TO AQU#5
8 = TALK/LISTENING TO TOPSIDE

POSTURE(P)

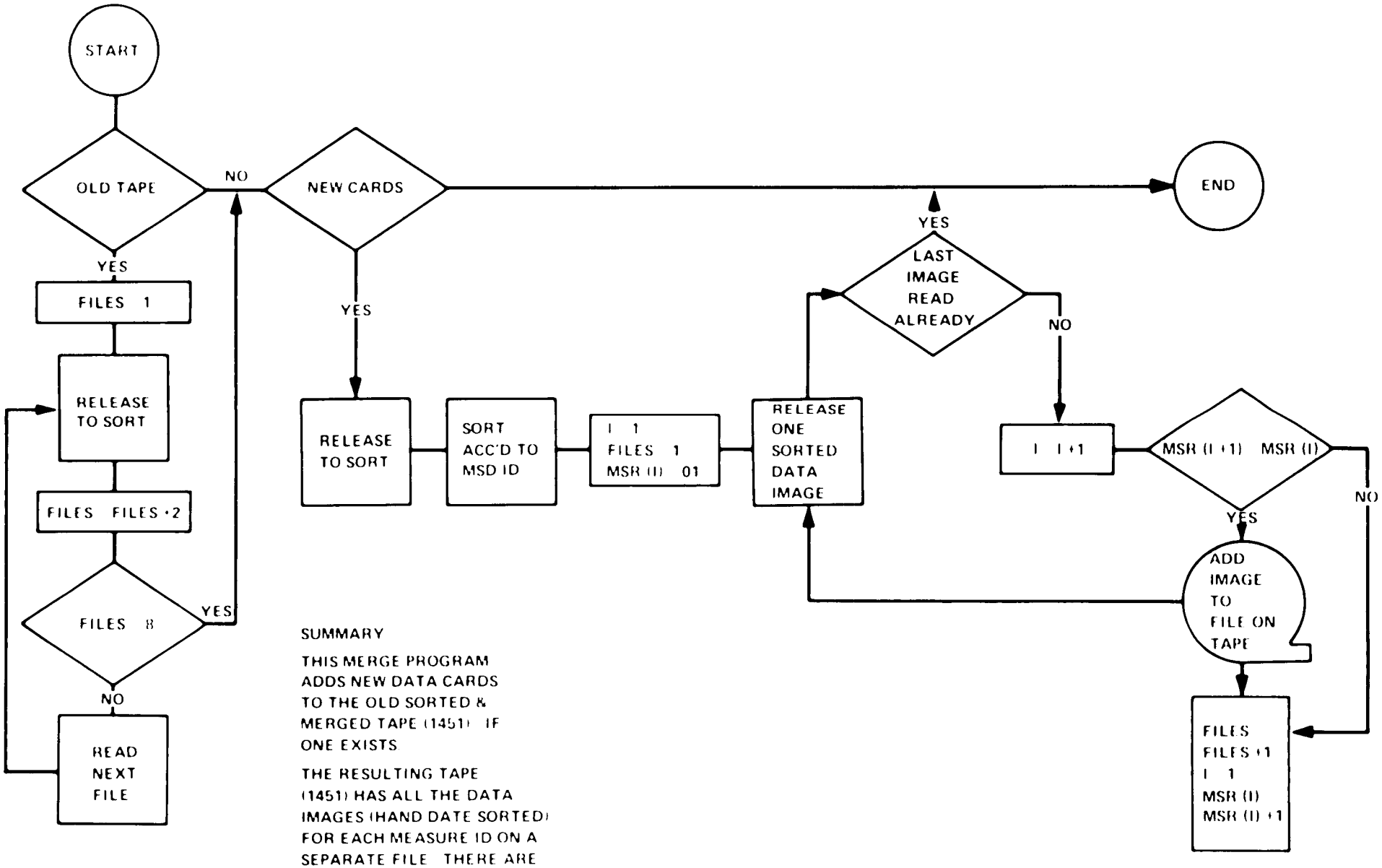
1 = STAND ERECT
2 = STAND-SLOUCH
3 = STAND-LEANING
4 = SIT FORWARD
5 = SIT UPRIGHT
6 = SIT SLOUCHING
7 = RECLINING
8 = SQUATTING
9 = KNEELING
10 = ALL FOURS
11 = LYING DOWN

MOVEMENT (M)

1 = NO MOVEMENT
2 = LIGHT TRANSLATIONAL
3 = MODERATE TRANSLATIONAL
4 = VIGOROUS TRANSLATIONAL
5 = LIGHT MANIPULATIVE
6 = MODERATE MANIPULATIVE
7 = VIGOROUS MANIPULATIVE
8 = LIGHT EXPRESSIVE
9 = MODERATE EXPRESSIVE
10 = VIGOROUS EXPRESSIVE

HAB	MSSN	DAY	TIME	AQUANAUT #1 C	S	A	T	P	M	AQUANAUT #2 C	S	A	T	P	M	AQUANAUT #3 C	S	A	T	P	M	AQUANAUT #4 C	S	A	T	P	M	AQUANAUT #5 C	S	A	T	P	M
0	8	08	0000	7	2	5	[illegible]	6	1	7	1	9	1	11	1	7	4	5	1	5	1	2	4	1	1	2	1	2	5	4	1	5	1
0	8	08	0006	2	3	4	2	2	1	2	3	4	2	2	1	7	4	9	1	7	1	2	3	4	2	2	1	2	3	4	2	2	1
0	8	08	0012	6	6	2	[illegible]	2	5	6	6	2	1	2	5	7	4	1	1	7	1	6	6	2	1	2	5	2	4	8	1	5	1

MERGE PROGRAM



SUMMARY

THIS MERGE PROGRAM ADDS NEW DATA CARDS TO THE OLD SORTED & MERGED TAPE (1451) IF ONE EXISTS

THE RESULTING TAPE (1451) HAS ALL THE DATA IMAGES (HAND DATE SORTED) FOR EACH MEASURE ID ON A SEPARATE FILE THERE ARE 7 FILES PER TAPE