```
      TO EACH CLUSTER AS FOLLOWS...
     NCLS = NO. OF CLUSTERS (WORD 2 OF BANK 0).
     NWHIT = NO. OF WORDS PER HIT (WORD 3 OF BANK 0).
     NWCL = NO. OF WORDS PER CLUSTER (WORD 4 OF BANK 0).
     IPCL = IP3. WHERE IP3 IS POINTER TO BANK 3.
     IP11 = 2*IP1. WHERE IP1 IS POINTER TO BANK 1.
     IP44 = 2*IP4. WHERE IP4 IS POINTER TO BANK 4.
     IP55 = 2*IP5. WHERE IP5 IS POINTER TO BANK 5.
 BEGIN LOOP 1 - LOOP OVER CLUSTERS                     **** START LOOP 1
     DO 1000 ICL=1,NCLS
 FIND HITS FOR THIS CLUSTER.  TO GET HITS OF SECONDARY CLUSTER USE
   THE POINTERS OF PRIMARY CLUSTER.
     JCL=ICL
     IALT=IDATA(IPCL+4)
     IF(IALT.NE.0.AND.IALT.LT.ICL)JCL=IALT
     LP=HDATA(IP44+JCL)
     LPNEXT=HDATA(IP44+JCL+1)
 START LOOP 2.                                       ***** START LOOP2.
2000 CONTINUE
     IHIT=HDATA(IP55+LP)
     IP=NWHIT*(IHIT-1)
 NOW YOU CAN FIND HITS. ADD IP TO IP11 TO GET START OF COORDINATE DATA.
  (DON'T FORGET TO USE APPROPRIATE INFORMATION.E.G. AMBIGUITY FLAGS.
   FOR SECONDARY CLUSTERS. I.E. IF(JCL.LT.ICL) ).
     ....
     ....
 END LOOP 2.                                           ***** END LOOP 2.
2001 CONTINUE
     LP=LP+1
     IF(LP.LT.LPNEXT)GO TO 2000
 END LOOP 1.                                           ***** END LOOP 1.
1001 CONTINUE
     IPCL=IPCL+NWCL
1000 CONTINUE

 'MURI' BANK 6 - THE L/R AMBIGUITY OF HITS IN PRIMARY CLUSTERS
 FOR EACH HIT....
  WORD   TYPE   CONTENTS
    1    I*2    = -1. 'LEFT' AMBIGUITY SELECTED.
    .     .       +1. 'RIGHT' AMBIGUITY SELECTED.
    .     .        0. BOTH AMBIGUITIES EQUALLY ACCEPTABLE.
    .     .

 'MURI' BANK 7 - THE L/R AMBIGUITY OF HITS IN SECONDARY CLUSTERS
 FOR EACH HIT....
  WORD   TYPE   CONTENTS
    1    I*2    = -1. 'LEFT' AMBIGUITY SELECTED.
    .     .       +1. 'RIGHT' AMBIGUITY SELECTED.
    .     .        0. BOTH AMBIGUITIES EQUALLY ACCEPTABLE.
    .     .
```

```
FOR EACH INNER DETECTOR TRACK...
 WORD  TYPE  CONTENTS
   1    I*4   INNER DETECTOR TRACK NUMBER.
   2    R*4   IDENTIFIER OF PROGRAM WHICH CREATED THIS INFORMATION (A
                4-CHARACTER ALPHANUMERIC WORD).
   3    I*4   DATE OF VERSION OF MUFFLE WHICH CREATED MUR2 BANKS.
   4    I*4   HIT INFORMATION FOR THIS TRACK :
              VIZ. 10000 * INEFF   (INEFF=NO. OF INEFFICIENT LAYERS
                                    ON THIS TRACK,ACCORDING TO PHIL2
                                    DE/DX -- NOT COUNTING "DEAD" CHAMS)
                  + 100 * NHLAYR   (NHLAYR IS RELATED TO THE NO. OF
                                    LAYERS WITH ASSOCIATED MU HITS
                                    AS FOLLOWS :
                                    NHLAYR=2*NO. OF SUCH LAYERS OUTSIDE
                                          THE YOKE
                                          +1 IF LAYER INSIDE YOKE HAS
                                             ASSOCIATED HIT(S)    )
                  +       NTHIS    (NTHIS IS THE NO. OF MU HITS WHICH
                                    ARE ASSOCIATED WITH THIS TRACK)
             E.G. 10304 ==> INEFF=1 , NHLAYR=3 , NTHIS=4
             I.E. ONE LAYER DID NOT HAVE A HIT CORRESPONDING TO
                  THIS TRACK WHEN PHIL2 SAYS IT HAS NOT RANGED OUT YET;
                  NHLAYR BEING ODD ==> THERE WAS AN INNER LAYER HIT
                  ASSOCIATED , ALSO THERE WAS ONE OUTER LAYER WITH
                  ASSOCIATED HIT(S);
                  NTHIS=4 ==> THERE WERE A TOTAL OF 4 HITS ASSOCIATED
?  5    I*4   ACCEPTANCE FLAG. =0. SAFELY IN ACCEPTANCE.
?                              =1. NEAR EDGE OF ACCEPTANCE.
?                              =2. DEFINITELY OUTSIDE MUON ACCEPTANCE.
   6    I*4   QUALITY FLAG.
              = -3. TRACK HAS "ERROR CODE FROM MUREGY" . IGNORE.
              = -2. TRACK HAS POOR FIT IN INNER DETECTOR ,
                      THEREFORE , TRACK IGNORED.
              = -1. TRACK HAS SUCH LOW MOMENTUM THAT IT CURLS BACK
                      TOWARDS INTERACTION POINT , OR , ABS(TRANSVERSE ,
                      MOMENTUM) < 0.1 GEV/C .  TRACK IGNORED.
              =  0. NOT PASSING THE ACCEPTANCE CRITERIA (A) & (B) ABOVE
              =1. CLEAN MUON. I.E. A CLEAN LINE OF HITS. THE LAST
                          OF WHICH CORRESPONDS TO AN AMOUNT OF
                          PENETRATED MATERIAL NOT MORE THAN THE
                          ULTIMATE RANGE OF A MUON WITH THE MOMENTUM
                          OF THIS INNER DETECTOR TRACK. THE DRIFT
                          CHI-SQUARED PROBABILTY IS GREATER THAN 0.10.
              =2. AS =1. BUT THE DRIFT CHI-SQUARED PROBABILTY IS LESS
                          THAN 0.10.
?             =3. AS =1. BUT THE HITS ARE SHARED WITH ANOTHER TRACK.
?             =4. AS =2. BUT THE HITS ARE SHARED WITH ANOTHER TRACK.
?             =5,6,7,8. DIRTY MUON. I.E. AS =1,2,3,4 BUT MORE THAN 1
?                        ASSOCIATED HITS IN AT LEAST 1 LAYER.
              +10. I.E. ADD 10 IF THERE IS AN INEFFICIENT LAYER WITHIN
                        THE RANGE OF THETRACK AND NOT IN THE LAST LAYER
              +100. I.E. ADD 100 IF THERE IS AN INEFFICIENCY IN THE
                          LAST LAYER, ALLOWING FOR RANGE-OUT WHERE
                          APPLICABLE.
```

```
30    R*4    PI    ) WORDS 30-33 ARE THE PROBABILITY THAT THIS TRACK
31    R*4    K     ) FAKING A MUON WITH QUALITY FLAG (WORD 6) .LT. 100
32    R*4    P     ) ON THE ASSUMPTION THAT IT IS A PION, KAON, PROTON,
33    R*4    PBAR  ) AND ANTI-PROTON RESPECTIVELY.
34    R*4    PI    )
35    R*4    K     ) WORDS 34-37 ARE SIMILAR TO WORDS 30-33, BUT FOR
36    R*4    P     ) FAKING A MUON OF ANY QUALITY .GT. 0.
37    R*4    PBAR  )
38    R*4    MOMENTUM OF THIS TRACK AS MEASURED BY INNER DETECTOR.
                  I.E. EFFECTIVELY AT INTERACTION POINT.

NOTE: MANY OTHER PARAMETERS ARE CALCULATED IN THE MUON PHILOSOPHY 2
   ANALYSIS, WHICH ARE AVAILABLE IN /CWORK/ AND WHICH MAY BE ADDED TO
   THIS RESULTS BANK. FOR DETAILS, SEE 'F22ALL.JADEMUS(CMUFWORK)'.
NOTE ALSO: A DUMMY SUBROUTINE MUFFLZ IS CALLED FOR EACH 'GOOD' MUON
   TRACK. EVEN MORE INFORMATION IS AVAILABLE THERE. THE USER MAY
   MODIFY IT FOR HIS OWN USE.
```

```
-----------------------------------------------------------------------------------
COMMON DESCRIPTIONS. --------------------------------------------------------------
-----------------------------------------------------------------------------------


      COMMON /CALIBR/ LARRY(100),MUCAL(4185)


                 NVERSN
      DIMENSION DESCRP(15),HOVALL(6)
                                                                  19 WORDS
      EQUIVALENCE ( NVERSN,MUCAL(1) ),( DESCRP(1),MUCAL(2) ),
     $            ( HOVALL(1),MUCAL(17) )
---------------------------------------------------------------19 WORDS SO FAR
                                                                 370 WORDS
      HMFFIX(740)
      DIMENSION HMFFIX(740)
      EQUIVALENCE ( HMFFIX(1),MUCAL(20) )
      DIMENSION HFACE(82),HSECT(82),HLAYER(82),HNORM(82),HLONG(82),
     $          HTRANS(82),HAC(82),HAL(82),HUNIT(82)
      EQUIVALENCE (HMFFIX(1),NFRAMS),(HMFFIX(3),HFACE(1)),
     $            (HMFFIX(85),HSECT(1)),(HMFFIX(167),HLAYER(1)),
     $            (HMFFIX(249),HNORM(1)),(HMFFIX(331),HLONG(1)),
     $            (HMFFIX(413),HTRANS(1)),(HMFFIX(495),HAC(1)),
     $            (HMFFIX(577),HAL(1)),(HMFFIX(659),HUNIT(1))
--------------------------------------------------------------389 WORDS SO FAR

      HMCFIX(636)                                                318 WORDS
      DIMENSION HMCFIX(636)
      EQUIVALENCE ( HMCFIX(1),MUCAL(390) )
      DIMENSION HFR(634)
      EQUIVALENCE (HMCFIX(1),NCHAMS),(HMCFIX(3),HFR(1))
--------------------------------------------------------------707 WORDS SO FAR

      HMFSUR(492)                                                246 WORDS
      DIMENSION HMFSUR(492)
      EQUIVALENCE ( HMFSUR(1),MUCAL(708) )
      DIMENSION HDIST(82),HANG(82),HCLLO(82),HCLHI(82),HCTLO(82),
     $          HCTHI(82)
      EQUIVALENCE (HMFSUR(1),HDIST(1)),(HMFSUR(83),HANG(1)),
     $            (HMFSUR(165),HCLLO(1)),(HMFSUR(247),HCLHI(1)),
     $            (HMFSUR(329),HCTLO(1)),(HMFSUR(411),HCTHI(1))
--------------------------------------------------------------953 WORDS SO FAR

      HMCSUR(1268)                                               634 WORDS
      DIMENSION HMCSUR(1268)
      EQUIVALENCE ( HMCSUR(1),MUCAL(954) )
      DIMENSION HD1(634),HCTW(634)
      EQUIVALENCE (HMCSUR(1),HCTW(1)),(HMCSUR(635),HD1(1))
-------------------------------------------------------------1587 WORDS SO FAR
```

```
IFRAME              FRAME NUMBER.
ICHAM               CHAMBER NUMBER.
NFRAMS              NUMBER OF FRAMES.
NCHAMS              NUMBER OF CHAMBERS.

FIXED DATA FOR EACH FRAME....

HFACE(IFRAME)       1-6 FOR -X.+X.-Y.+Y.-Z.+Z RESPECTIVELY.
                    =C IF FRAME NOT PRESENT.
HSECT(IFRAME)       SECTION NUMBER OF SECTION TO WHICH FRAME BELONGSH
HLAYER(IFRAME)      1-5 NUMBERING FROM THE INTERACTION POINT OUTWARDSH
                     =1. INSIDE RETURN YOKE
                     =2-5 FOR LAYERS ON CONCRETE.
HNORM(IFRAME)       =1.NORMAL OF PLANE PARALLEL TO X-AXIS
                    =2.NORMAL OF PLANE PARALLEL TO Y-AXIS
                    =3.NORMAL OF PLANE PARALLEL TO Z-AXIS
HLONG(IFRAME)       =1.WIRE NOMINALLY PARALLEL TO X-AXIS
                    =2.WIRE NOMINALLY PARALLEL TO Y-AXIS
                    =3.WIRE NOMINALLY PARALLEL TO Z-AXIS
HTRANS(IFRAME)      =1.DRIFT FIELD PARALLEL TO X-AXIS
                    =2.DRIFT FIELD PARALLEL TO Y-AXIS
                    =3.DRIFT FIELD PARALLEL TO Z-AXIS
HAC(IFRAME)         CHAMBER NUMBER OF FIRST CHAMBER IN FRAME.
HAL(IFRAME)         CHAMBER NUMBER OF LAST CHAMBER IN FRAME.
HUNIT(IFRAME)       UNIT TO WHICH THIS FRAME BELONGS.

SURVEY DATA FOR EACH FRAME....

HDIST(IFRAME)       THE COORDINATE OF THE CENTRAL PLANE WHERE THE AXIS
                     SPECIFIED BY HNORM(IFRAME) CUTS THE PLANE.(UNITS MM
HANG(IFRAME)        THE ANGLE BETWEEN THE WIRE AND THE AXIS SPECIFIED BY
                     HLONG(IFRAME)  (UNITS 1/10 MR)
HCLLO(IFRAME)       LOWER LOGITUDINAL COORDINATE LIMIT
HCLHI(IFRAME)       UPPER LOGITUDINAL COORDINATE LIMIT
HCTLO(IFRAME)       LOWER TRANSVERSE COORDINATE LIMIT
HCTHI(IFRAME)       UPPER TRANSVERSE COORDINATE LIMIT
                     THE ABOVE 4 VARIABLES APPLY TO TOTAL SENSITIVE AREA
                       OF PLANE.THEY ARE IN MM

FIXED DATA FOR EACH WIRE....

HFR(ICHAM)          FRAME NUMBER FOR THIS CHAMBER.

SURVEY DATA FOR EACH WIRE....

HDI(ICHAM)          AMOUNT TO BE ADDED TO HDIST(IFRAME) TO GET TO
                     COORDINATE OF THE CHAMBER.    (UNITS MM)
HCTW(ICHAM)          TRANVERSE COORDINATE OF EACH IRE.  (UNITS MM)

ELECTRONIC DATA FOR CHAMBERS...

HDTP(ICHAM)         DRIFT TIME PEDESTAL (TRANS. CLOCK UNITS. CA. 60 NS.)
HLTP(ICHAM)         LONGITUDINAL TIME PEDESTAL (IN LONG. CLOCK UNITS.
                      CA. 0.5 NS. OR 50 MM.)
HLSF(J.ICHAM)       LONG. SCALE FACTOR FOR J'TH HIT
                      (UNITS (1/100MM)/LONG. CLOCK UNIT)
HVDRFT(ICHAM)       DRIFT VELOCITY (MICRONS PER CLOCK UNIT (50 NS)).

                    THE ABOVE DATA ARE USED TO CONVERT SIGNALS TO COOR-
```

MACRO CMUANP.

MU ANALYSIS PARAMETERS FILLED BY BLOCK DATA AFTER MUINI.

```
      COMMON/CMUANP/IMUANP(30)
      DIMENSION AMUANP(30),HMUANP(60)
      EQUIVALENCE (IMUANP(1),AMUANP(1),HMUANP(1))
```

COMMON /CMUPRN/.

```
      COMMON /CMUPRN/MUPRIN
```

MUPRIN=0 TO SUPPRESS ALL PRINTING OF MU MESSAGES.
.GE.1 TO GET MU ERROR MESSAGES.
.GE.2 TO GET MU INFORMATION MESSAGES.
.GE.10 TO GET FULL MU CALIBRATION PRINTOUT (ABOUT 10 PAGES).

END OF COMMON DESCRIPTIONS.

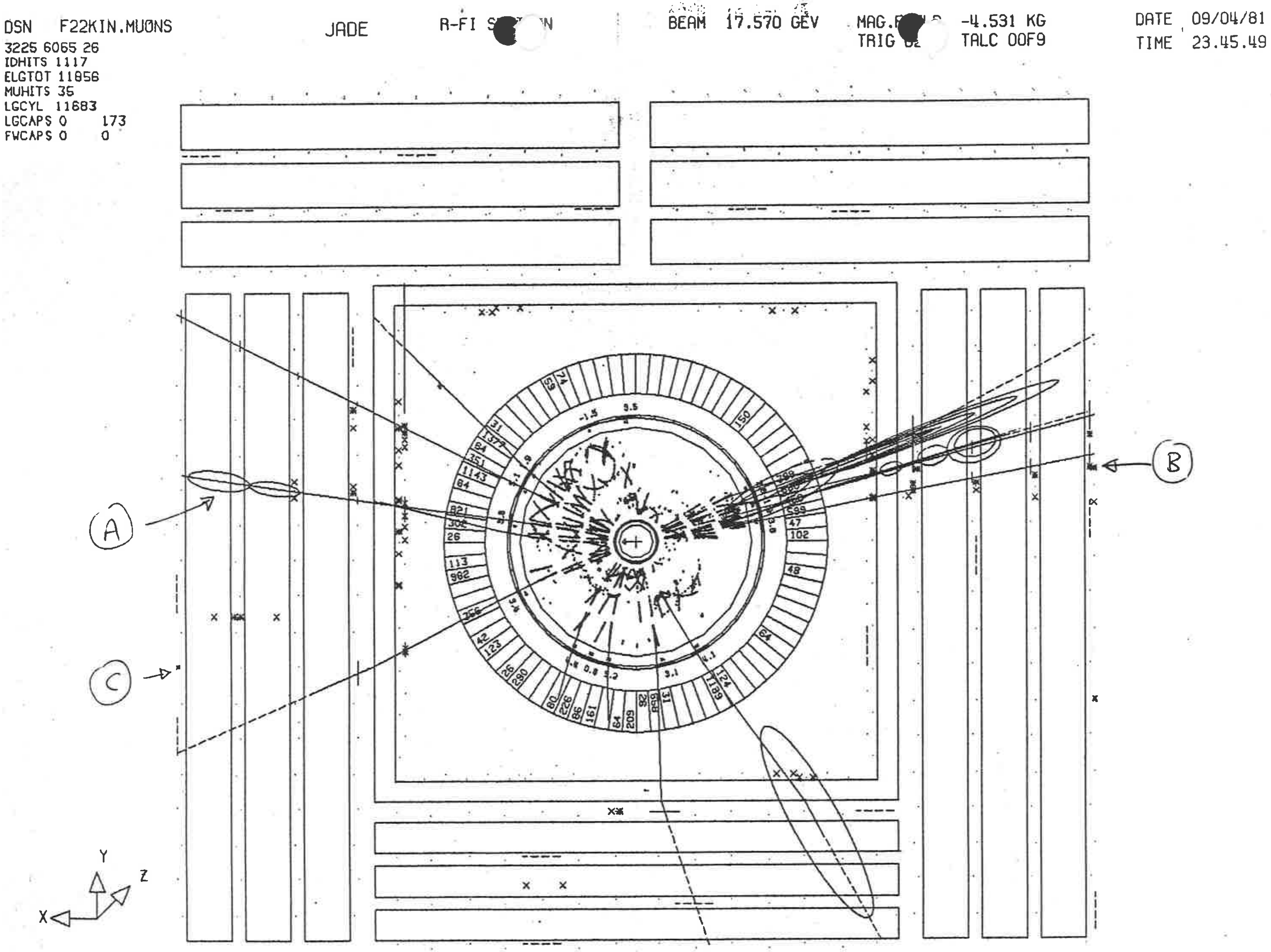
DSN F22KIN.MUONS
3225 6065 26
IDHITS 1117
ELGTOT 11856
MUHITS 35
LGCYL 11683
LGCAPS 0 173
FWCAPS 0 0
JADE
BEAM 17.570 GEV
-4.531 KG
TALC 00F9
DATE 09/04/81
TIME 23.45.49
A
B
C
X
Y
Z

FIGURE 2

J. Olsson

THIS MEMBER CONTAINS INFORMATION ON THE MUON ANALYSIS AND MONTE CARLO
PROGRAMS.

F22ALL.MUANAL.S(~~INFO~~) (@MUINFOM)

~~DRAFT JADE COMPUTER NOTE 22.~~ 9a 9/3/79

MONTE CARLO. STATUS AT 9/1/79.

WRITTEN LARGELY BY DEREK STORK, UPDATED SOMEWHAT BY JOHN ALLISON, WHO NOW HOLDS DEREK STORK'S FILES. NOW FULLY INCORPORATED INTO THE JADE MONTE CARLO ON 'F11BAR.JADE.SOURCE' AND '.LOAD', AND MAINTAINED BY WULFFIN BARTEL AND ECKHARD ELSEN.

THERE ARE SOME MUON MONTE CARLO PRINTING ROUTINES ON 'F22ALL.MUMC.S' AND '.L' WHICH CAN BE CALLED FOR DIAGNOSTIC PURPOSES AND FOR OBTAINING FULL INFORMATION ABOUT THE TRACKS IN THE MUON FILTER AS GENERATED. SEE, E.G., 'F11BAR.JADE.SOURCE(ITEST8)' WHERE THE APPROPRIATE STATEMENTS ARE COMMENTED OUT, OR 'F22ALL.MUMC.S(MUGEN)' WHERE THEY ARE OPERATIONAL. THE CORRESPONDING JCL IS IN 'F22ALL.MUMC.S(#MUGEN)'.

MUON ANALYSIS. STATUS AT 9/1/79.

UNDER INTENSIVE DEVELOPMENT BY JOHN ALLISON AND HARRY PROSPER.

THE ANALYSIS CHAIN CONSISTS OF 4 SUBROUTINES (WHICH CALL NUMEROUS OTHER SUBROUTINES).

1)MUANAC. THIS CONVERTS SIGNALS TO COORDINATES AND CREATES 'MUR1' BANKS 0 AND 1 (SEE BELOW). IT CALLS 1 OF 2 SIGNAL TO COORDINATE CONVERSION ROUTINES...
    MUTINY, WHICH USES A CONDENSED SET OF CALIBRATION DATA PREPARED
        BY MUCONT (FOR MONTE CARLO OUTPUT - SEE READMC), WHICH CALLS
        A VERSION OF MUCOWN.
    MUCOOR, WHICH USES THE FULL MUON CALIBRATION DATA PREPARED BY
        MUCON (FOR MONTE CARLO OUTPUT - SEE READMC).

2)MUANAL. THIS LOOKS FOR 'LINEAR CLUSTERS', I.E. TRACKS, IN THE MUON FILTER. IT FOLLOWS 'PHILOSOPHY 1', I.E. GATHERS AS MUCH INFORMATION AS POSSIBLE BY LOOKING IN THE MUON FILTER ALONE. IT USES 'MUR1' BANKS 0 AND 1. IT UPDATES 'MUR1' BANK 0. IT CREATES 'MUR1' BANKS 2,3,4 AND 5 (SEE BELOW).

3)MUANAJ. THIS ATTEMPTS TO JOIN MUON CLUSTERS TO INNER DETECTOR AND LEAD-GLASS CLUSTERS. IT USES THE 'MUR1' BANKS AND UPDATES 'MUR1' BANKS 0 AND 1 (SEE BELOW).

4)MUANAF. THIS ACCEPTS 'PHILOSOPHY 2', I.E. FOLLOWS EACH INNER DETECTOR TRACK OUT THROUGH THE MUON FILTER. CREATES 'MUR2'.

AN EXAMPLE OF A CALLING SEQUENCE IS AS FOLLOWS....

CONVERT MUON SIGNALS TO COORDINATES.
    CALL MUANAC(IDATA(IPMU+1),IDATA(IPMU))

FIND MUON LINES - PHILOSOPHY 1 MUON PATTERN RECOGNITION.
    CALL MUANAL

ATTEMPT TO JOIN MUON CLUSTERS ~~AND~~ TO INNER DETECTOR TRACKS. ~~AND~~ TO LEAD GLASS CLUSTERS.
    CALL MUANAJ

FOLLOW EACH INNER DETECTOR TRACK OUT (PHILOSOPHY 2).
    CALL MUANAF

Outdated!

3

Designed to be same as for inner detector

```
'MUR1' BANK 2 - MUON CLUSTER ASSIGNMENT BANK.
FOR EACH HIT A 2-BYTE WORD PACKED AS FOLLOWS...
 NAME                F   E    D    C    B    A
 LAYOUT   M.S. I---I-I-----I-I-----I-I LEAST SIGNIFICANT END.
 NO. OF BITS      3  1    5    1    5    1
 NAME  BITS           CONTENTS
  A       15 (L.S.)   =0 IF LONGITUDINAL MEASUREMENT DOUBTFUL,.
                      =1 IF LONGITUDINAL MEASUREMENT IS OK.
  B   10-14           PRIMARY CLUSTER ASSIGNMENT (=0 IF UNASSIGNED).
  C        9          =0 LEFT AMBIGUITY  ) (PRIMARY CLUSTER).
                      =1 RIGHT AMBIGUITY )
  D      4-8          SECONDARY CLUSTER ASSIGNMENT (=0 IF UNASSIGNED).
  E        3          =0 LEFT AMBIGUITY  ) (SECONDARY CLUSTER).
                      =1 RIGHT AMBIGUITY )
  F      0-2 (M.S.)   FREE.

'MUR1' BANK 3 - MUON CLUSTER INFORMATION.   (NOTE. CLUSTER NUMBER IN
   WORD 27.)
FOR EACH CLUSTER...
 WORD   TYPE   CONTENTS
   1    I*4    DATE OF PRODUCTION (E.G. 790110 FOR 10/1/79).
   2    I*4    IDENTIFIER OF PROGRAM WHICH CREATED CLUSTER (A 4 CHAR-
                 ACTER ALPHANUMERIC WORD).
   3    I*4    NO. OF HITS IN CLUSTER.
   4    I*4    CLUSTER NUMBER OF ALTERNATIVE CLUSTER (=0 IF NONE).
   5    I*4    =0, ONLY ONE LAYER IN CLUSTER (IF SO WORDS 9-14=0).
   6    R*4    XC )
   7    R*4    YC ) COORDS. OF 'CENTRE OF GRAVITY' (MM).
   8    R*4    ZC )
   9    R*4    DX )
  10    R*4    DY ) DIRECTION COSINES OF FITTED LINE.
  11    R*4    DZ )
  12    R*4    D1, DISTANCE TO 'FIRST' POINT (MM).
  13    R*4    D2, DISTANCE TO 'LAST' POINT (MM).
                 NOTE. ALGORITHM TO GET CORDINATES OF FIRST HIT IS...
                    X1=XC+D1*DX
                    Y1=YC+D1*DY
                    Z1=ZC+D1*DZ
                 AND SIMILARLY FOR LAST HIT.
  14    R*4    RMS DEVIATION FOR 'GOOD' CLUSTER - SEE ALSO WORDS 25,26.
               =0. IF MULINA (AMBIGUITY RESOLVING ROUTINE) NOT CALLED.
               =-1. IF IT FAILS ACCEPTANCE CRITERIA,
               =-2. IF IT HAS MORE THAN 2 ACCEPTABLE AMBIGIUTY
                           PERMUTATIONS.
               =-9999. IF MULINA HAS TAKEN NO ACTION, E.G. IF ONLY 1
                  LAYER, OR TOO MANY AMBIGUITIES, OR ONLY 2 LAYERS AND
                  TOO MANY AMBIGUITIES.
               NOTE THAT IF THIS WORD.LE.0 THEN WORDS 6-11 CONTAIN THE
                 THE RESULTS OF FITTING PRIOR TO CALL TO MULINA, I.E.
                 L AND R HITS OF UNRESOLVED HITS USED WITH EQUAL WEIGHT
                 (ALTHOUGH WITH LOWER WEIGHT THAN RESOLVED HITS).
  15    R*4    INTEGRAL DL (=DISTANCE, MM).                    )(FROM
  16    R*4    INTEGRAL DENSITY*DL (= MATERIAL TRAVERSED,      )(INTER-
                 GM CM**-2).                                   )(ACTION
  17    R*4    INTEGRAL (-DE/DX)*DL (ENERGY LOSS, MINIMUM      )(POINT TO
                 IONISING PARTICLE, GEV).                      )(LAST
  18    R*4    INTEGRAL DL/(ABSORPTION LENGTH) ('NUMBER' OF    )(POINT IN
                 ABSORPTION LENGTHS) ASSUMING A PION.          )(CLUSTER.
  19    R*4    MU 'GOODNESS' PARAMETER (VERY CRUDE AT THIS STAGE).
  20    R*4    HADRON 'LEAK' PROBABILTY, EXP(-(NO. OF ABSN. LENGTHS)).
  21    I*4    ASSOCIATED INNER DETECTOR TRACK NO., IF ANY.
  22    I*4    ASSOCIATED LEAD GLASS CLUSTER NO., IF ANY.
  23    R*4    DISTANCE BETWEEN PROJECTIONS OF THE MU-TRACK AND THE
                 INNER DETECTOR TRACK, IF ANY, AT THE POSITION OF THE
                 FLUX RETURN YOKE.
```

'MUR2' BANK 1 - MUON INFORMATION FOR EACH INNER DETECTOR TRACK. (IN THE FOLLOWING DESCRIPTION, 'MULTIPLE SCATTERING CIRCLE' MEANS AN ELLIPSE IN THE PLANE OF A MUON CHAMBER WITH MAJOR AXIS PARALLEL TO THE WIRE. THE SEMI-MAJOR/MINOR AXIS HAS A LENGTH DMAJOR/DMINOR. (5)

```
DMAJOR=F*SQRT(DSRMS**2+DLRES**2),
DMINOR=F*SQRT(DSRMS**2+DRES**2),
```

WHERE DSRMS IS THE RMS MULTIPLE SCATTERING DEFLECTION EXPECTED AT THE CHAMBER,
DLRES IS THE LONGITUDINAL (I.E. PARALLEL TO WIRE) RESOLUTION EXPRESSED AS A STANDARD DEVIATION,
DRES IS THE DRIFT DISTANCE RESOLUTION, ALSO A STANDARD DEVN.
F IS A FACTOR, SAY 3., TO COLLECT HITS WITHIN 3 STANDARD DEVIATIONS. F IS ADJUSTABLE.

FOR EACH INNER DETECTOR TRACK...

ALSO extra word 4 - NUMBER OF ASSOCIATED MUON CHAMBER HITS.

WORD	TYPE	CONTENTS
1	I*4	TRACK NUMBER.
2	R*4	IDENTIFIER OF PROGRAM WHICH CREATED THIS INFORMATION (A 4-CHARACTER ALPHANUMERIC WORD).
~~3~~	~~I*4~~	~~DATE OF PRODUCTION, E.G. 790307 FOR 7TH MARCH 1979.~~
~~4~~ 6	I*4	QUALITY FLAG =0, NO HITS AND NO HITS EXPECTED FOR A MUON.
		=1, CLEAN MUON, I.E. A CLEAN LINE OF HITS, THE LAST OF WHICH CORRESPONDS TO AN AMOUNT OF PENETRATED MATERIAL NOT MORE THAN THE ULTIMATE RANGE OF A MUON WITH THE MOMENTUM OF THIS INNER DETECTOR TRACK AND THERE ARE NO CHAMBERS BEYOND THE LAST HIT WHICH FIRE.
		=2, AS =1, BUT THE HITS USED ARE SHARED WITH ANOTHER TRACK, I.E. THERE IS AN AMBIGUITY.
		=3, DIRTY MUON, I.E. AS =1, BUT MORE THAN 1 HITS WITHIN MULTIPLE SCATTERING CIRCLE IN AT LEAST ONE MUON CHAMBER LAYER.
		+10, I.E. ADD 10 IF THE HITS STOP SHORT OF WHAT WOULD BE EXPECTED FOR A MUON, I.E. THERE EXIST CHAMBERS BEYOND THE LAST WHICH WOULD FIRE.
		+100, I.E. ADD 100 IF THE HITS EXTEND TOO FAR, I.E. THE LAST HIT CORRESPONDS TO AN AMOUNT OF MATERIAL PENETRATED WHICH IS SIGNIFICANTLY GREATER THAN THE EXPECTED RANGE.
~~5~~ 7	I*4	TRACK NUMBER OF TRACK WITH SHARED HITS, IF ANY. (=-1 IF MORE THAN 1 OTHER TRACKS SHARE HITS. IN THIS CASE SEE 'MUR2' BANK 2.)
~~6~~ 8	I*4	CLUSTER NUMBER OF ASSOCIATED MUON CLUSTER RECORDED IN MUON RESULTS BANKS 'MUR1'. (=-1 IF MORE THAN 1 CLUSTER IS ASSOCIATED. IN THIS CASE SEE 'MUR2' BANK 2 AND 'MUR1' BANK 3.)
~~7~~ 9	I*4	NO. OF HITS EXTRA TO ASSOCIATED CLUSTER.)(=0 FOR
~~8~~ 10	I*4	NO. OF HITS IN ASSOCIATED CLUSTER BUT)(COMPLETE)(CORRESPONDENCE. NOT FOUND HERE.
~~9~~ 11	R*4	CHI-SQUARED PROBABILITY OF BEING MUON. THIS HAS MEANING ONLY IF FLAG (WORD 4) IS .LT. 10. THE CHI-SQUARED IS THE SUM (D/SD)**2 FOR EACH DIRECTION FOR EACH HIT, WHERE D IS THE DISTANCE OF THE HIT FROM THE EXTRAPOLATION OF THE INNER DETECTOR TRACK, IN THE DRIFT DIRECTION OR WIRE DIRECTION, SD IS THE CORRESPONDING STANDARD DEVIATION, WHICH IS THE RMS MULTIPLE SCATTERING DISPLACEMENT AND THE CHAMBER RESOLUTION ADDED IN QUADRATURE.

=-2 NO CHAMBERS ALONG PROJECTED INNER DETECTOR TRACK, I.E. OUT OF ACCEPTANCE

extra word 5 ACCEPTANCE FLAG

= -1, IF CLOSE TO EDGE OF 'SAFE' REGION

= 0, in 'safe' fiducial region

Vl 22201

Computer
JADE NOTE 22.
MU INFORMATION.

JOHN ALLISON
4/7/79.

THIS INFORMATION IS KEPT ON 'F22ALL.JADEMUS(@MUINFOM)'. IT WAS LAST UPDATED AT 21.15 CN 02/07/79. IT CONTAINS EXTENSIVE INFORMATION CN THE MUCN ANALYSIS AND MONTE CARLO FROGRAMS. IT WAS ISSUEC IN JADE COMPUTER NOTE 22 IN JULY 1979.

? LINES PREFIXED WITH ? INDICATE INTENTION ONLY. FEATURES MARKED IN
? THIS WAY ARE NOT YET IMPLEMENTED. HCPEFULLY THEY WILL EE
? IMPLEMENTED AT SOME TIME AND AN UPDATED NOTE WILL BE ISSUED.

The libraries
'F22ALL.JADEMUS' (source)
and 'F22ALL.JADEMUL' (load)
are now standard JADE libraries. To process muon data and produce muon results banks, concatenate this library on LKED.SYSLIB <u>before</u> 'F22LHO.JADEGL'. Observe the calling sequence on page 2.

JA.

outdated!

II)MUANA - THE MUON ANALYSIS DRIVING ROUTINE.

```
      CALL MUANA(IJOIN)
```

WHERE IJOIN.NE.0 TO GET MUON ROUTINES TO ATTEMPT TO JOIN MUON HITS AND TRACKS TO INNER DETECTOR AND LEAD GLASS TRACKS AND CLUSTERS, I.E. YOU WOULD USUALLY CALL MUANA(1) SAY. (IJOIN=0 SUPRESSES SUCH ATTEMPTS AND THUS CAN BE USED ON MU DATA ALONE WHEN NO OTHER BANKS EXIST.)

MUANA CALLS 4 OTHER DRIVING ROUTINES, WHICH CALL NUMEROUS OTHER ROUTINES.....

1)MUANAC. THIS CONVERTS SIGNALS TO COORDINATES AND CREATES 'MUR1' BANKS 0 AND 1 (SEE BELOW). IT CALLS 1 OF 2 SIGNAL TO COORDINATE CONVERSION ROUTINES...
- MUTINY, WHICH USES A CONDENSED SET OF CALIBRATION DATA PREPARED BY MUCONT (FOR MONTE CARLO OUTPUT - SEE READMC), WHICH CALLS A VERSION OF MUDCWN.
- MUCOOR, WHICH USES THE FULL MUON CALIBRATION DATA PREPARED BY MUCON (FOR MONTE CARLO OUTPUT - SEE READMC).

2)MUANAL. THIS LOOKS FOR 'LINEAR CLUSTERS', I.E. TRACKS, IN THE MUON FILTER. IT FOLLOWS 'PHILOSOPHY 1', I.E. GATHERS AS MUCH INFORMATION AS POSSIBLE BY LOOKING IN THE MUON FILTER ALONE. IT USES 'MUR1' BANKS 0 AND 1. IT UPDATES 'MUR1' BANK 0. IT CREATES 'MUR1' BANKS 2,3,4 AND 5 (SEE BELOW).

3)MUANAJ. THIS ATTEMPTS TO JOIN MUON CLUSTERS TO INNER DETECTOR AND LEAD-GLASS CLUSTERS. IT USES THE 'MUR1' BANKS AND UPDATES 'MUR1' BANKS 0 AND 3 (SEE BELOW).

4)MUANAF. THIS ADOPTS 'PHILOSOPHY 2', I.E. FOLLOWS EACH INNER DETECTOR TRACK OUT THROUGH THE MUON FILTER. CREATES 'MUR2'.

AN EXAMPLE OF A CALLING SEQUENCE IS AS FOLLOWS....

CONVERT MUON SIGNALS TO COORDINATES.
```
      CALL MUANAC
```

FOLLOW EACH INNER DETECTOR TRACK OUT (PHILOSOPHY 2). AT THE MOMENT MUANAF AND MUANAL ARE COMPLETELY INDEPENDENT.
```
      CALL MUANAF
```

FIND MUON LINES - PHILOSOPHY 1 MUON PATTERN RECOGNITION.
```
      CALL MUANAL
```

ATTEMPT TO JOIN MUON CLUSTERS WITH INNER DETECTOR TRACKS AND WITH LEAD GLASS CLUSTERS. ALSO CORRELATE RESULTS OF PHILOSPHY 1 AND 2.
```
      CALL MUANAJ
```

III)MUFINI - THE MUON 'FINISHING OFF' ROUTINE.

CALL MUFINI AFTER PROCESSING ALL DATA.

END OF DESCRIPTION OF MUON ANALYSIS. --
