

2. GENERAL CONSIDERATIONS

2.1. Structure of library program.

Library program is the subprogram for the general form (SUBROUTINE), written in the language FORTRAN. It consists of following major portions:

1) information. It is located in the beginning program. It consists of one or several lines, which have in the first position symbol "C". From the point of view of language FORTRAN this part subprogram it contains commentaries. Information part program it concludes with the first line, which does not have in the first the position of symbol "C". With the start of module in the libraries complex it is processed by utilities PRADIS for obtaining additional information about designation and interface of that switch oned module.

2) the description of entrance point into the program (operator SUBROUTINE).

e) the meaningful part of program.

4) the operator of the recovery of control into the main program.

2.2. Information part of library module.

And n f about r m and Q and about n n and I the part of program contains two important elements - passport of program and reference the information on this module, which will be accessible to user in the regime "OF ON LINE" (directly with the work by complex on the display screen or in the form printout).

THE PASSPORT OF PROGRAM is necessary for that, in order to fulfilling the system of complex PRADIS could correctly build the call of this module. Actually, this formal description of the form of the operator SUBROUTINE, which begins the meaningful part of program. Examples of the passports:

C MODEL TEST1:EXT=3, PAR=2, WRK=1- the passport of the model of element TEST1

C OUTPUT TEST2:SYS=3, OUT=2, PAR=3- the passport of the program of the calculation

output variable TEST2

C IMAGE TEST3: EXT=2- the passport of the program
graphic means TEST3.

The content of passport, composition and designation of its elements depend from the functional designation of the switch oned module. Therefore it is more detailed information about the passports will be given below, with the consideration of the concrete types of those included in the libraries of the complex modules.

REFERENCE INFORMATION is intended for the start in built-in HELP of system. Utility of the start of module in library,

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examining the information part of program, it places reference information into the system catalog it connects it by the name of the switch oned module. From this point on, the information it does become accessible upon command ARM (for example, ARM? and ARM? TEST1). Lines, which contain reference information as everything the lines of the information part of program, begin with symbol "C" and, furthermore, they contain the keyword HELP. Example to the reference information on the module TEST:

```
C
C HELP ideally elastic one cell TEST.
C HELP THE NAME:   Ideal- the elastic one-dimensional inertia-free
C HELP the element, which is used for describing the connection of two
C HELP of bodies.
C
C HELP THE FIELD OF APPLICATION: Mechanics.
C
C HELP OF DEGREE OF FREEDOM:
C HELP 1- is progressive of the point A of element.
C HELP is 2nd progressive of the point B of element.
C
C HELP THE PARAMETERS:
C HELP 1- stiffness coefficient.
C
```

In the given example into the system catalog of the system 10 lines of reference information fall. In this case the first line it falls into the reduced reference book, issued upon command ARM?. It is expedient the first line of reference information ALWAYS to use for the brief description of the designation of that included on in library program. Remaining lines of the reference information they fall into the extended reference book, information from which it does reveal along the demand ARM? <[imja] of [modulja]>. It is recommended with the creation of reference information on the concrete module to adhere to order and content of the subsections, which they are accepted for corresponding type base modules.

In more detail about the content of the information part library module, to the structure of its passport, the description of the point the entrance into the module and to the structure of meaningful part they are brought in the corresponding divisions of this document with the description of the modules different types.

2.3. Connection of library program with the the computational by nucleus.

Program, included in the libraries of complex PRADIS, is achieved connection with the computational nucleus of complex with the aid of the mechanism of the formal/actual parameters and through the the general the region of data.

There is two moderately-priced for those included in the libraries complex COMMON - region. This unnamed COMMON - region and named COMMON - region NOTAT. Furthermore,


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| of 8 | STEPMD of | Of r*8 of | the maximum value of the following step of |
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| of 10 | NAME of | Of c*8 of | in this variable on leaving from the program of
| of | of | of | of user with the value CODE, outstanding of |
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| of 11 | NSTEP of | I * 4 | the number of the current step of the integration
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[illegible]

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| of | of | of | of integration for the first time of |
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| of 21 | MINSTP of | I * 2 | the sign of the fact that the current step of |
| of | of | of | of integration is minimal |
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The program of user can change the following
the elements of the COMMON- block:

STEPMD - maximum recommended with the model of the element
the step of integration (this COMMON - variable
it is used only by models of elements)

CODE the -code of recovery from the program of the user

NAME - name of the program of user, which established the code
recovery.

STEPMD are used by models of elements, "inside"
which can occur these or other events, it is sufficiently strong
influencing the analyzed process. Representative models of such type
- different supports, the dependence of force on the time or the displacement
, etc in this case, if the computational nucleus of complex not
it has information about that which must occur any

event, then too steep pitch can be selected integration. This, in turn, can lead to the fact that event will generally remain "unnoticed" (let us say, the step integration it can exceed the duration of the action power impulse). Another trouble - large losses of the steps integration because of the nonconformity to the precision parameters or the divergence of the solution of the system of nonlinear equations (for example, inside the step of integration the support was subjected significant of deformation, while at the previous step of integration it it did not work).

In these cases the model of element must "report" to the computational nucleus of complex about the assumed space time before the offensive of one or other event or another. If this event it begins on the time, then is time interval before its offensive can be determined accurately (difference between moment of the time occurrence of an event and by the current time). If event begins not on the time (as in the supports), but the model of element with that or something different with the portion of confidence it can predict the time of occurrence of an event, this is better nevertheless to make. For example, the model of supports as rule, they predict moment of the time, when support begins to operate, on the basis of those flowing of displacement, speeds and acceleration.

Thus, in these cases the model of element can to recommend to computational nucleus to make a step of this value, in order to fall accurately into the beginning of event. Following step integration it will be selected, on the basis of this recommendation and other considerations (for example, accuracy in the integration), but not it will exceed the values of the step, [rekomendovannogo] by model. With to the installation variable STEPMD the model of element must bear in mind, that in the analyzed object there can be other models, which also they can make their recommendations. In order not to lose this information, is used this method. Let us assume the model of the element it assumes that the corresponding event will begin through time interval PROGTM. Then the installation variable STEPMD it is achieved by the operator

$$\text{STEPMD} = \text{OF MIN} (\text{STEPMD}, \text{PROGTM})$$

Library module can with the aid of variable CODE to transmit to computational nucleus signal about the appearance of that or another situation. Enumeration of the possible situations, processed by computational nucleus, and th codes e corresponding to them are given it is below. If the program of user establishes the variable CODE, then into variable NAME it must send its name (since in this case the name of the corresponding model of the element it is used in the communications of the computational nucleus of complex).

Variable CODE it is, generally speaking, controlled afterward the execution of any program of user. However, for the programs the calculation of output variables and programs - graphic means it should be not misused by use by this variable (it is better, if in the incorrect or not very correct situation the program of calculation by output variable or the graphic means they will select "reasonable line of behavior" and they will not interrupt the process of integration or to interfere in the course of computation).

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One should emphasize that this is not the requirement, superimposed on program by complex, and recommendation to user. It is simple, if any there [PRVP] takes to itself courage to interrupt calculation, being lasted sometimes by hours, on the trifle - this it irritates.

The possible situations, which appear in the course are described below, calculation inside the program of user and value of the variable CODE, which it is necessary to establish in this case:

- It is necessary to continue Newtonian iterations on the data the step of integration, even if convergence will be it is achieved. This need can arise only in the models of elements, since in [PRVP] and [PGO] the rotation it occurs only on the completion of the step of integration. If the value COMMON- variable CODE < shch, the model element are established BY CODE = shch (CODE = OF MAX (CODE, shch)); in COMMON variable NAME sends the name of the model element.

- It is necessary to decrease the step of integration.

If the value COMMON- variable CODE < 10, the program user establishes CODE = 10; in COMMON variable NAME sends the name of the program user. This need also can arise only in the models of elements, since in [PRVP] and [PGO] rotation occurs only on the completion of the step integration.

- It is necessary to complete the work of the current program integration with the retention of the data about the state of the calculation

If the value COMMON- variable CODE < 50, the program user establishes CODE = 50; in COMMON variable NAME sends the name of the program user.

- Arose the emergency, which makes the correct the continuation of calculations by impossible.

If the value COMMON- variable CODE < 75, the program user establishes CODE = 75; in COMMON variable NAME sends the name of the program user.

- The model of element attempts to [pereustanovit] the value by the potential variable of the unit, for which this value is already established. For [PRVP] and [PGO] this operation it is forbidden.

If the value COMMON- variable CODE < 90, the model element are established BY CODE = 90; in COMMON the variable NAME sends the name of this model of element.

- The parameters, transmitted into the program of user, lie out of the permissible range.

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2.4. Procedure of the start of the program of the user in the libraries of complex.

In the complex PRADIS are two objective libraries, the containing models of elements, program of the calculation of the output variables and the program of graphic means. This of the library BASIS.LIB and CURRENT.LIB.

BASIS.LIB contains major portion of objective modules, which is supplied with this configuration of the complex ("base libraries"). Library CURRENT.LIB serves for the start of the programs of user. Therefore it is desirable, in order to this library had small size, otherwise the procedure of the start objective module in this library each time will occupy significant time. If user is the large part of the time works with PRADIS it devotes to development and start of its programs into the libraries of complex, then is recommended time from time to control the size of library CURRENT.LIB. In the case, if it has essential size, modules, which it is not intended to more change, it is possible to transfer in BASIS.LIB. Transfer of objective modules from the library in library it is achieved by means of usual program LIB. User plans the list of the kept balance modules, excludes them from the library CURRENT.LIB (for example, with the aid of the operation * -, if the discussion deals with the packet MS-FORTRAN) and are included they in the library BASIS.LIB.

ATTENTION! User must itself worry about that,
so that the library CURRENT.LIB at any moment of time would be
it is accessible for the program LIB, i.e., it cannot be allowed to situation,
so that it entire would be transferred in BASIS.LIB. Otherwise command on
start in CURRENT.LIB of new objective module, issued
by procedure ARM, it can be incorrect.

The search for libraries is achieved by procedures of complex on
to the rules, accepted for the utilized packet FORTRAN.

Start of the program of user in the libraries of the complex
it is achieved by procedure ARM. For obtaining the objective

module, its start in library CURRENT.LIB and starts reference information into the system catalog of the complex is used command "ARM +". For example:

> ARM + OF MODEL

It is necessary to focus attention, that for that, in order to this command was correct, in the current catalog it must to be present file MODEL.FOR, which contains the program user, designed in accordance with the rules, given in the present document.

On this command the procedure ARM initiates compiler FORTRAN[a]. of if syntactic errors is not discovered, obtained object code is included in library CURRENT.LIB by program- librarian from the utilized packet FORTRAN.

After this, is set in operation the utility PRADIS, the analyzing information part of program and including it in system catalog. In the file SYSPRINT.TXT falls the listing the information part of program with the appropriate communications. If in the system catalog information on this module it was absent, then reveals communication, that the passport of the program it is added into the system catalog. Otherwise the communication he indicates that the passport of program is replaced in the the system catalog.

Library program, as a rule, contains the reference information, intended for the start in system catalog. If the start of this information is passed successfully, utility issues the communication:

M (the I of 001) is processed and introduced into the system catalog reference information on the switch oned module.

In the case of the absence in the workable module of the reference of information on the included module, in SYSPRINT.TXT it falls the communication:

M (I 002) the included in system catalog module does not contain reference information.

Normal completion of the utility of the start of module in system catalog is accompanied by communication about the the successful the completion of program.

If the objective module of the program does not be required to obtain and to include it in CURRENT.LIB, and it is necessary only to include or to replace the information part of program in the the system catalog (for example, arose the situation, when it was erroneously assigned the passport of program), is used command "ARM!":

> ARM! MODEL

In this case the procedure will not cause compiler language FORTRAN, and it immediately initiates the utility of the start of module in system catalog.

Finally, if it does not be necessary to include the information the part of program into the system catalog, and must be obtained and to include objective module in objective library, is used command "ARM #":

> ARM # OF MODEL

In this case after the call of compiler and librarian the utility of the start of module in system catalog will not be caused.

Exception of reference to the library program from system catalog is achieved by a command "ARM -":

> ARM - MODEL

On this command the procedure of servicing the system catalog it will cause the utility of the removal of reference to appropriate module from the system catalog and program- librarian for the removal of this objective module from the objective library.

Each of the commands described above can be used for fulfilling the similar operation simultaneously for several modules, for example:

> ARM + OF MODEL PRVP TEST

After the completion of the operations of including/the exception of the module one should verify the correctness of the made work, having consistently carried out the commands of obtaining by the reference information. Upon command

> ARM *

th list of all themes e sorted out alphabetically reveals, on which in the system catalog there is a reference information. The name of the switch oned library program must be present in this list.

Upon command

> ARM?

contents of the catalogs of the expansible components is printed out complex. If everything was made correctly, then reference to that switch oned library program it must be present in one of these catalogs. It must be printed out opposite the name of this model the first line of reference information.

Upon command

> ARM? MODEL

reveals the extended reference information about to library program (all reference information, except the first line).

For the operational information about the possibilities of command ARM (for example, user forgot, to what keys correspond!, # and +), it is possible to give command ARM without the parameters. In this the case on the display screen will be given out brief information about the possibilities of the procedure of the maintenance system catalog.

