

COMPONENTS OF SOFTWARE DEVELOPMENT:HOW TO WRITE QUICK-REPORTING-TABLE-GENERATING APPLICATIONS

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Yazılım Geliştirme Araçları: Nasıl Kolay Değişik Raporlama Üretebilen Yazılım Geliştirilir

Paket programlar veya isteğe bağlı olarak geliştirilen programlarda daha sonra programı kullanan kişiler tarafından ilaveler veya değişiklikler yapılması sık sık istenir. Bazen yeni bir raporlama türü veya olan bir raporun bir şikkına ilave veya çıkarılması isteği sıklıkla karşılaşılan sorunların başında gelmektedir. Yazılımcı firmalar çoğu zaman kasıtlı olarak bu gibi değişiklikleri veya ilaveleri kendi tekelinde tutmak üzere yazılım geliştirirler ve müşteriyi kendilerine bağımlı tutmak istemektedirler. Bu durum zaman içerisinde gerek kullanıcı gerekse yazılımcı firma açısından zor ve kullanıcı açısından hoş olmayan durumlara yol açmaktadır. Bu makalede kullanıcı tarafından ileriye dönük istendiği anda yeni bir raporlamayı kendilerinin yazılımı geliştiren firmaya bağlı olmaksızın ilave edebilmeleri veya değiştirebilmeleri için yazılımın nasıl geliştirilmesi ve programların nasıl yazılması konusu ele alınmaktadır.

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The custom-designed programs should be written as explained in this paper so that the end user can make the changes, add items to the reports or remove the unwanted items from the reports, or create a new report easily. The formats which are currently in use and be used in the future should be written and added to the system. These formats can be as many as needed and planned to be used in the future or the people in the laboratory or in other departments think that these formats should be in the system so that they can be used in the future if needed. Therefore

purchasing an application with the opinion and contribution of an experienced system administrator in this field and experienced people from the related departments is a must. Otherwise, the systems are very difficult to run and maintain and give lot of unnecessary headaches.

Introduction

Computers have been in use in hospitals for a long time 1-36. The first functional modules which must be working in any hospital information system are the laboratory information system, pharmacy system and order processing, and charge capture and billing system. Hospitals are a very dynamic places where procedures performed in the surgery, tests performed by the laboratory or result forms reported by the different laboratory equipments or antibiograms result reporting etc. are constantly changing. It is a very dynamic process and needs to be handled immediately. Any time a new test can be added in the laboratory and it needs to be reported in different format. A completely new blood cell count equipment can be purchased for the laboratory and its report format might be different from the existing similar equipments. And its reporting format should be added to the laboratory information system result reporting within minutes not in days or months. Or antibiotics used in the antibiogram kid might change or several antibiogram kids might be used at the same time, therefore, different antibiogram result reporting might be needed to report the result of different antibiograms.

Or within the same department different microbiologists want to report antibiograms in different formats such as using the diameter of the zone around the antibiotics or as "S" for sensitive and "R" for resistant antibiotics or different sets of antibiograms etc.

From different departments doctors carry out department specific studies, asking several questions to the patients and doing multiple choice type of examinations and putting down the answers first on the special paper forms, and later they want to enter the data to the computer and retrieve the information later. Or they want to do some query on the data later for research purposes. When we examine the forms created by different departments for different purposes what we see in common is that they are all doing the same thing and entering the results of surveys or examination sheets as one or two digit characters as the answer. They ask many questions and getting the answers as one or

two characters or numbers. Therefore, in the background they are all doing the same thing under different names and screen displays.

In the past ten years as a project leader I have been involved in the development of every modules of hospital information systems which have been in use in twelve hospitals, including university, state and private hospitals. Besides, I have had the opportunity to examine and worked in detail with other local applications developed by domestic software houses and universities as well as applications developed by the international companies that are currently used by the state, university and private hospitals in Turkey.

In this paper, I will give some technical information and make some recommendations for those who might be in charge of purchasing hospital information systems or system administrators of the MIS in the hospitals to ask the vendors to write programs or expect the existing programs for patient registration, order entry, result reporting and laboratory information system etc. to be in a way that new forms or result reporting forms can be added by end users without the need of intervention by the system administrators or the programmers who developed the applications.

I will give the examples from the laboratory information system which is the most dynamic part of any hospital information system, but not go into too much detail as far as programming aspect of laboratory result reporting is concerned. Whatever is explained in this article is also applicable to the other modules and components of the HIS. It is not the purpose of this paper to teach programming to the audience of this article.

Method and Result

The central laboratory's most important function is the timely and efficient dissemination of all information in a format that facilitates its use in the entire outpatient and inpatient clinical setting.

Laboratory Information System is usually comprised of three files, referred to as "format file", "reference file" and "data file". Format file is made up of the fixed part of the report-page headers, patient identification and location and so forth. Reference file contains test codes, test names, reference ranges, units of measure, prices and other related information about the tests. Data files contain the test result,

date, and time that the result is entered, operator code for auditing, test requesting doctor's code, time and date of test order entry and laboratory specimen received, status of the laboratory process (result entered but not checked yet, pending, specimen not sufficient, should be repeated, in process, etc.). The printing program merges the information from the files to produce the reports resulting in efficient disk usage due to minimum space required for data storage. Various reports in different formats can be produced from the same data by means of different programs.

Reference ranges for men and women are first included in the reference data file for each test. If a reference range to be modified this is done easily by simply entering the new range to the reference file. The reference value of each test varies for each age group for each sex and this combination tends to be too complex to maintain as a data base and every doctor has his/her own accepted reference value for each group. Therefore, these kinds of test results were reported in different formats. Each doctor interprets the laboratory result according to his/her accepted reference range for that group of patients. For example, one laboratory test result might be considered high for one doctor for one group of patients and within the normal range for another doctor.

I will try to explain the new technique of "format-reference file" to enable the end user to create as many forms as it is needed without the help of the system administrator or the programmers who developed the application. I will try to explain the technical part of writing laboratory test result reporting program using data structure of easy to understand and the most commonly used programming language, COBOL (Common Business Oriented Language). This does not mean that the programs should be written in COBOL, it is chosen since its data structure is easy to understand even for non-programmers. First I will make a format-reference file called "LABFORM" in "/USR/LAB" directory.

In this program the file LABFORM is a file that contains the information about field descriptions and reference ranges for the tests of several laboratory result reporting formats used in the laboratory. In other words reference file and format file are combined and made one multipurpose format-reference file which is updated easily by the end-users. LABCODE is the index field of this record. LAB-SEQUENCE-NUMBER is the field that indicates in which sequence should this

laboratory result appear in laboratory result reporting program, for example, all "01" LAB-SEQUENCE-NUMBER formats and related results will always appear first and then 02, 03 numbers in second and third sequence etc. This is taken care of by the program by simply indexing of the field (LAB-RESULT-SEQUENCE-NUM OF LAB-RESULT-CODE). In this kind of indexing any record with the patient identification number (LAB-RESULT-PATIENT), and LAB-RESULT-SEQUENCE-NUM of "001" will always appear first and "002" before "003" etc. This sequence number is very important because this number determines which forms appear in which sequence during laboratory test result reporting. By simply changing this number any laboratory can decide which result should appear in which sequence because this changes from laboratory to laboratory, from hospital to hospital.

I will make different result reporting using the format-1 style reporting. First, I will make a "checkup result reporting form." Every laboratory runs different tests for checkup and reports in different formats in twelve hospitals I got involved. In one of them they run the following tests and want to report it as shown below.

Let us create result reporting form called Format-1 using the LABFORMFILE which its format and reference data are kept in "/USR/LAB/LABFORM" data file on the hard disk of the computer. LABCODE is the indexed record key of this record. In the LABFORM-RECORD the fields LAB-INSTITUTE-TITLE corresponds to "Institute and/or Laboratory Title", LAB-SEQUENCE-NUMBER to "Sequence number:" in the form, LAB-STATUS to "Status:", LAB-TEST-CODE to "Lab-Test code :", LAB-PATIENT-ID to "Patient ID:", LAB-TEST-DATE to "Lab test date", LAB-CODE-EXPLANATION to "Labcode-explanation", LAB-TEST-EXPLANATION to "Test-explanation", LAB-UNITS to "Units", LAB-VALUE-FOUND to "Value-found", LAB-L-H to "L/H", LAB-MIN-VALUE to "min.value", LAB-MAX-VALUE to "max-value", from LAB-FIELD-01-EXPLANATION to LAB-FIELD-17-EXPLANATION to "field-01-explanation" to "field-17-explanation" correspondingly, LAB-FIELD-61-EXPLANATION to LAB-FIELD-63-EXPLANATION to "field-61" to "field-63" correspondingly, from LAB-01-UNITS to LAB-17-UNITS to from "01-units" to "17-units" (units measured) correspondingly, from LAB-COMMENT-1 to LAB-COMMENT-3 to from "Comment-1" to "Comment-3" correspondingly. The important thing about making

forms are how the values entered to the field in data files are to be treated in the form. If the value found is to be treated as numeric and when the value is at certain point lower than the minimum reference value or higher than the maximum reference value the letter "L" or "H" goes to the value indicator field of the data file (LAB-RESULT-FILE). When creating the format-1 for each field, for example LAB-FIELD-01-CNTRL is the control field of whether the reference value of LAB-FIELD-01 will be numeric or character. If this LAB-FIELD-01-CNTRL is, for example, "N" for numeric then LAB-FIELD-01-MIN-VALUE-NUM is displayed in "01-min-val", otherwise if LAB-FIELD-01-CNTRL is "C" for character then LAB-FIELD-01-MIN-VALUE-CHR is displayed. When the numeric evaluation of the field is chosen then LAB-FIELD-01-MIN-VALUE-PERCENT should also be entered in the form to evaluate the result entered in LAB-FIELD-01 of the LAB-RESULT-RECORD of LAB-RESULT-FILE. Then while entering the result the value in the field is arithmetically evaluated and if the value is lower than the LAB-FIELD-01-MIN-VALUE-PERCENT then "L" goes to LAB-FIELD-01-EVALUATION field of the corresponding LAB-RESULT-RECORD of the LAB-RESULT-FILE. The same thing is true for LAB-FIELD-01-MAX-VALUE-NUM or -CHR and LAB-FIELD-01-MAX-VALUE-CNTRL, "01-max-val" in the format-1 table. So deciding for how each field should be treated the LAB-FIELD-01-MIN-VALUE-NUM (numeric) or -CHR (for character) to LAB-FIELD-17-MIN-VALUE-NUM or -CHR and LAB-FIELD-01-MAX-VALUE-NUM or -CHR to LAB-FIELD-17-MAX-VALUE-NUM or -CHR go to form "01-min-val" to "17-max-val" fields in format-1. In all of the formats shown in this paper bold and underlined fields come from data file and the rest from format-reference file.

Let us make a checkup result reporting form called CHECKUP-K for female patient checkup result reporting as shown in Figure-1. In a separate form entering program let us enter the code CHECKUP-K to LABCODE of LABFORM-RECORD OF LABFORM-FILE, "Marmara Üniversitesi Hastanesi Merkez Laboratuvarı" to LAB-INSTITUTE-TITLE, "Status" to LAB-STATUS, "Hasta prot.no:" to LAB-PATIENT-ID, "Lab test tarih:" to LAB-TEST-DATE, "Lab sonuc tarih" to LAB-RESULT-DATE, "Isteyen Dr" to LAB-REQUESTING-DR, "CHECKUP LABORATUVAR NETICESİ" to LAB-CODE-EXPLANATION, "Test açıklama" to LAB-TEST-EXPLANATION, "birimi" to LAB-UNITS,

"bulunan deg." to LAB-VALUE-FOUND, "L/H" to LAB-L-H, "min.deger" to LAB-MIN-VALUE, "max.deger" to LAB-MAX-VALUE, "Kreatinin", "Seker", "Ure", "A.urik kadın", "Trigiliserid", "HDL-Kolesterol kadın", "Alkali Fosfataz", "GOT", "GPT", "LDH", "GGT", "T.protein", "Albumin", A/G, "Sedimantasyon", "Kan grubu", to from LAB-FIELD-01-EXPLANATION to LAB-FIELD-16-EXPLANATION fields correspondingly, "mg/dl" to from LAB-01-UNITS to LAB-06-UNITS, "IU/L" to LAB-07-UNITS, "U/lt" to LAB-08-UNITS, "IU/lt" to LAB-09-UNITS, "IU/dl" to LAB-10-UNITS, "IU/ml" to LAB-11-UNITS, "g/dl" to from LAB-12-UNITS to LAB-14-UNITS, "mm/st" to LAB-15-UNITS for the unit description of the fields. Since we want from LAB-FIELD-01 to LAB-FIELD-13 and LAB-FIELD-15 to be evaluated numerically "N" goes to from LAB-FIELD-01-CNTRL to LAB-FIELD-13-CNTRL and LAB-FIELD-15-CNTRL fields. The values ".60", "70.", "10.", "2.5", "50.", "35.", "98.", "37.10", "40.", "230", "10", "6.60", "3.50" go to from LAB-FIELD-01-MIN-VALUE-NUM to LAB-FIELD-13-MIN-VALUE-NUM fields correspondingly and "10." to LAB-FIELD-15-MIN-VALUE-NUM field. The values "1.20", "110.", "50.", "5.7", "175.", "80.", "279.", "100.", "100.", "460.", "50.", "8.70", "5.", to from LAB-FIELD-01-MAX-VALUE-NUM to LAB-FIELD-13-MAX-VALUE-NUM fields correspondingly and "100." to LAB-FIELD-15-MAX-VALUE-NUM. When we want to enter the laboratory result for a patient the screen will look like in Figure-1 when we call this form entering the CHECKUP-K code and calling the form in Format-1 style.

If the values found are as follows; Kreatinin:1, Seker:86, Ure:47, A.urik kadın:2, Trigiliserid:189, HDL-Kolesterol kadın:86, Alkali fosfataz:146, GOT:87, GPT:46, LDH:320, GGT:39, T.protein:7.8, Albumin:4.2, Sedimantasyon:58, Kan grubu:0 Rh (+). These values go to from LAB-RESULT-FIELD-01-VALUE-NUM to LAB-RESULT-FIELD-01-VALUE-NUM and LAB-RESULT-FIELD-15-VALUE-CHR fields of data file (LAB-RESULT-FILE) respectively. And the comment goes to LAB-RESULT-COMMENT-1. Requesting doctor has been entered during order entry and doctor name and patient names and last names come from master file and finally report will look like in Report-1. The program receives the LAB-REQUEST-DAY and TIME and LAB-RESULT-DATE and TIME from the system.

Let us make a form to report the result of Complete Blood Count of 22 parameters or more and the clinical pathologist wants it to be reported in figure-4 format. The fields in LABFORM-RECORD of LAB-FIELD-01-EXPLANATION to LAB-FIELD-60-EXPLANATION are displayed in from f-01-d to f-60-d fields correspondingly, LAB-01-UNITS to LAB-60-UNITS (units measured) to from 01-unit to 60-unit fields respectively, from LAB-COMMENT-1 to LAB-COMMENT-3 to fields to Comment-1 to Comment-3 fields respectively. To make the form for "Tam kan sayımı (22 parametrelî)(CBS with 22 parameters) "Tam kan sayımı (22 parametrelî)" to LAB-CODE-EXPLANATION, "Acıklm. b.deger L/H birimi Acıklm. b.deger L/H birimi Acıklm. b.deger L/H birim" to LAB-SUBCODE-EXPLANATION, "WBC" to LAB-FIELD-01-EXPLANATION, "NE", "LY", "MO", "EO", "BA", "NE", "LY", "MO", "EO", "BA" to from LAB-FIELD-03-EXPLANATION to LAB-FIELD-12-EXPLANATION fields respectively, "RBC", "HGB", "HCT", "MCV", "MCH", "MCHC", and "RDW" to LAB-FIELD-21-EXPLANATION to LAB-FIELD-27-EXPLANATION fields respectively, "RET%" and "RET#" to LAB-FIELD-29-EXPLANATION and LAB-FIELD-30-EXPLANATION fields correspondingly. The values " $10^3/uL$ " to LAB-01-UNITS, and from LAB-08-UNITS to LAB-12-UNITS and LAB-41-UNITS, "%" to from LAB-03-UNITS to LAB-07-UNITS, and LAB-23-UNITS, LAB-27-UNITS, LAB-29-UNITS fields, " $10^6/uL$ " to LAB-21-UNITS, LAB-30-UNITS fields, "g/dl" to LAB-22-UNITS, "fL" LAB-24-UNITS and LAB-41-UNITS, "pg" to LAB-25-UNITS, "g/dL" to LAB-26-UNITS, "Yorum" to LAB-COMMENT-1 fields.

Even though the minimum and maximum values are not displayed in the screen, minimum and maximum values are entered for each field during entering of this information to make Figure-4 in a separate program. When we call the format-4 with CBS-22 code the screen will look like in Figure-4. After entering the laboratory result to the respective fields the report will look like in Report-4. By simply changing the codes the same format-4 can be used for, for example, antibiogram result reporting as shown in Report-4-ant.

Figure-1 format can be used for reporting different laboratory test result in different format. For example, as in figure 1-a laboratory result for FSH is reported in one field and the other fields are given only

for reference information for different group of patients. Or the values are entered without minimum or maximum values just as characters in many fields as shown in figure-3 which in this case is used for semen analysis reporting, and format-2 style Figure-2 which in this case used for allergen test reporting.

Discussion

Format-reference file is the most important file that can be incorporated into the laboratory information system and hospital information system as well. The vendors or the programmers have kept the customers dependent on themselves for creating new formats e.g. for result reporting. This type of the programming makes every customer dependent on the vendor or the programmer and makes the maintenance of the modules very difficult. And the customer does not know whether it is possible to ask the vendor or the programmer to write a multipurpose program so that they can take care of themselves without asking the programmers to write a new program for some changes or adding new laboratory test result reporting to the existing system. The customers do not even know what to ask for from the programmers because of their lack of experience in programming, therefore, the applications have been developed by the vendors giving the customer as little as possible. Because customer might have no previous programming experience and do not know how to ask the programmer to develop an application with many different formats for e.g. result reporting or for registration. The new forms for registration or laboratory result reporting can be created even without the help of the system administrator. When I asked the programmers of some of the applications that I have studied in detail why they have not developed the applications as explained in this paper, the most common response I have gotten so far was "then the customers do not need us anymore and do not sign maintenance contract, what we are going to do for living?".

There can be different formats for laboratory test result reporting. And the screen display and definition of the fields should be kept in a format-reference file. The end user in the laboratory should be able to create new laboratory result report form based on one of the templates (I called it format) already exists in the program. All the end user has to do is to choose one of the formats that is most appropriate for

that result reporting and give a new code and enter the screen definitions and values (minimum, maximum, units measured etc.) of the fields into the format-reference file in any language. When the end user enters the code the new reporting format appears in the screen and result is entered. Even though the new report is one of the formats already exists in the system it will look like a new result reporting program. One single test should not be tied to single reporting format as I have seen in most applications. The end user should be able to choose which format to be used for reporting that single test. For example, complete blood cell count reporting might be different even within the same laboratory depending on which equipment the test is run. One equipment might run twelve parameters and the other twenty two parameters on the same sample. Test result can be entered choosing the appropriate result reporting format. One laboratory might want to give result of FSH test in a simple form such as date, value found and one reference value for the test, the other laboratory might want to give the reference value in several categories as shown in Figure-2 so that the physician can interpret the result according to the patient group the patient falls in.

One important aspect of result reporting is sorting of the data reported in different formats. For example, if the data needs to be reported in time sequence as five or six day results on a single screen or page, or all the test results should be reported in groups and groups and time, such as all sodium and potassium etc. reported in groups from the date requested up to today. Therefore, sorting programs for every formats should be added to the system as shown in Report-4-sort as an example.

In any laboratory information system which is an integrated part of a hospital information system the order entry process is begun with identification of the patient and checking all of the procedures that are to be performed on the laboratory test request form or ancillary departments' request forms. There are some output documents (such as test reports, specimen collection lists, work lists, result control lists etc.) required everyday at any time needed. Like the reporting module, separate file structure are designed for the rapid production of each of the required output documents. These files are updated at the time of data entry (order entry, result entry etc.) so that they are always current and available for immediate report production. This made some of the programs more complicated. The specimen labels are printed in the

laboratory using the same data entered during order entry. Even though several files contain the same information, any of the output can be generated with great efficiency. Moreover, the cost in disk space is not high. The ancillary files are generally small and stable in size. Most of the data can be kept for several years because of the incredible declining cost of hard disks today.

A complex linkage between components of a system is difficult to design, implement, and operate but may be similar to the linkages in other systems. The order-entry result reporting backbone embedded in all HMIS (Hospital Management Information System) software that supports each of the ancillary departmental modules is an example of such a complex linkage. The most important part of laboratory information system is the transfer of the data from the laboratory equipments to the central computer system. I have had very little success because of no help from the laboratory equipment selling vendors. They even did not understand what I wanted or what I asked them to do. All I wanted was to get the data produced by that laboratory equipment in ASCII format and its data structure. For example there are several CBS coulter counter equipments in the laboratory and they are connected to a local PC and their data is kept on the hard disk of the PC in a data file created by a program written in DBASE programming language. I could not get help from the vendor to transfer the data to ASCII format so that I can directly transfer the data to the central database with an interface program. Therefore, anybody who is in charge of purchasing laboratory equipments should talk to the people with MIS and there should be an agreement between the MIS people and the vendor about the transfer of the data from the equipment to ASCII format and later to the central database. After purchasing the equipment this kind of cooperative work becomes almost impossible. If this cooperation becomes possible the transfer of the ASCII data to several different data formats is a subject of another paper, therefore, I will not go into too much detail in this article.

Conclusion

After many years working with doctors with their special examination forms they all have come to me and asked me to write special programs for their department specific studies. I wrote some general formats similar to explained in format-1 with more fields and

chose the most appropriate one and asked them "Is it what you want?" after entering their requested screen definitions into one of these formats and making the most appropriate forms to enter and retrieve data, most of them said "yes" and what a smart programmer I was to them. (I wrote the most difficult programs ! including data entry, inquiry, sorting, searching etc. for them in just a few seconds. I was a genius! not just a computer programmer to them.) This type of approach in developing application made the hospital's that are using the application developed by our programmers as well as the programmer's life much easier then the approach of other applications of different vendors. Absolutely nothing in screen displays or definition of the fields should be hard-coded in the applications. With less and qualified programmers we could develop and maintain more applications for less and become very competitive in the market.

The system administrator with experience in hospital information system or laboratory information system should ask the vendors to write the program as explained in this paper. The formats which are currently in use and be used in the future should be written and added to the system. These formats can be as many as needed and planned to be used in the future or the people in the laboratory or in other departments think that these formats should be in the system so that they can be used in the future if needed. Therefore purchasing a HIS with the opinion and contribution of an experienced system administrator in this field and experienced people from the related departments such as laboratory, pharmacy, admission and discharge, laboratory equipment selling vendors etc. is a must. Otherwise, the systems are very difficult to run and maintain and give lot of unnecessary headaches.

Key words: Hospital Information System, Laboratory Information System, Software development

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Institute and/or Laboratory Title

```
[Lab-Test code : ] [labcode ] [ Sequence number: ____ ] [ Status: ][sts ]
[Patient ID: ][patient-ID][patient-name-surname] [Lab result date:][./../..]
[Requesting Dr:][requesting-DR][req.dr.name&surname][Lab req. date:][./../..]
[
labcode-explanation
]
[ Test explanation      units      value-found L/H min.value max.value ]
[
_____
]
[field-01-explanation][01-units] [fld-01-val][?] [01-min-val]   [01-max-val]
[field-02-explanation:][02-units] [fld-02-val][?] [02-min-val]   [02-max-val]
[field-03-explanation:][03-units] [fld-03-val][?] [03-min-val]   [03-max-val]
[field-04-explanation:][04-units] [fld-04-val][?] [04-min-val]   [04-max-val]
[field-05-explanation:][05-units] [fld-05-val][?] [05-min-val]   [05-max-val]
[field-06-explanation:][06-units] [fld-06-val][?] [06-min-val]   [06-max-val]
[field-07-explanation:][07-units] [fld-07-val][?] [07-min-val]   [07-max-val]
[field-08-explanation:][08-units] [fld-08-val][?] [08-min-val]   [08-max-val]
[field-09-explanation:][09-units] [fld-09-val][?] [09-min-val]   [09-max-val]
[field-10-explanation][10-units] [fld-10-val][?] [10-min-val]   [10-max-val]
[field-11-explanation:][11-units] [fld-11-val][?] [11-min-val]   [11-max-val]
[field-12-explanation:][12-units] [fld-12-val][?] [12-min-val]   [12-max-val]
[field-13-explanation:][13-units] [fld-13-val][?] [13-min-val]   [13-max-val]
[field-14-explanation:][14-units ] [fld-14-val][?] [14-min-val]   [14-max-val]
[field-15-explanation :][15-units ] [fld-15-val][?] [15-min-val]   [15-max-val]
[field-16-explanation :][16-units ] [fld-16-val][?] [16-min-val]   [16-max-val]
[field-17-explanation :][17-units ] [fld-17-val][?] [17-min-val]   [17-max-val]
[field-61 :][
Field-61-value ]
[field-62 :][
Field-62-value ]
```

[field-63 :][Field-63-value]
 [Comment-1:][Comment-1-value]
 [Comment-2:][Comment-2-value]
 [Comment-3:][Comment-1-value]

Format-1 .

Marmara Üniversitesi Hastanesi Merkez Laboratuvarı

Lab-Test kodu : CHECKUP-K sıralama numara:12 Status: status
 Hasta prof.no: patient-ID patient-name-surname Lab sonuc tarih: dd/mm/yy
 [Isteyen Dr:][requesting-DR][req.dr.name&surname] [Lab istek tarih:][dd/mm/yy]

CEKUP LABORATUVAR NETİCESİ

Test açıklama birimi bulunan deg. L/H min.deger max.deger

[Kreatinin	:[mg/dl] [.....] [?]	[.60]	[1.20]
[Seker	:[mg/dl] [.....] [?]	[70.]	[110.]
[Ure	:[mg/dl] [.....] [?]	[10.]	[50.]
[A.urik kadın	:[mg/dl] [.....] [?]	[2.5]	[5.7]
[Trigiliserid	:[mg/dl] [.....] [?]	[50.]	[175.]
[HDL-Kolesterol			
kadın	:[mg/dl] [.....] [?]	[35.]	[80.]
[Alkali Fosfataz:][	[ IU/L] [.....] [?]	[98.]	[279.]
[GOT	:[U/lt] [.....] [?]	[37.10]	[100.]
[GPT	:[IU/lt] [.....] [?]	[40.]	[100.]
[LDH	:[IU/dl] [.....] [?]	[230.]	[460.]
[GGT	:[IU/ml] [.....] [?]	[10.]	[50.]
[T.protein	:[g/dl] [.....] [?]	[6.60]	[8.70]
[Albumin	:[g/dl] [.....] [?]	[3.50]	[5.]
[A/G	:[g/dl] [.....] [?]	[]	[]
[Sedimantasyon	:[mm/st] [.....] [?]	[10.]	[100.]
[Kan grubu	:[] [.....] [?]	[]	[]
[:[] [.....] [?]	[]	[]
[yorum1.:][_____]		
[	2.:][_____]		

Figure 1.

Marmara Üniversitesi Hastanesi Merkez Laboratuvarı

Lab-Test kodu : CHECKUP-K sıralama numara:12 Status: O.K
Hasta prot.no: 350-55-1967 Sennur Yagma Lab sonuc tarih: 19/08/00
[İsteyen Dr:][99HHO][Dr. H. Hami Oz][Lab istek tarih:][18/08/00]

CEKUP LABORATUVAR NETİCESİ

Test açıklama birimi bulunan deg. L/H min.deger max.deger

[Kreatinin	:][mg/dl]	[1.]	[] [.60]	[1.20]
[Seker	:][mg/dl]	[86.]	[] [70.]	[110.]
[Ure	:][mg/dl]	[47.]	[] [10.]	[50.]
[A.urik kadın	:][mg/dl]	[2.]	[L] [2.5]	[5.7]
[Trigiliserid	:][mg/dl]	[189.]	[H] [50.]	[175.]
[HDL-Kolesterol				
kadın	:][mg/dl]	[86.]	[H] [35.]	[80.]
[Alkali Fosfata	:][IU/L]	[146.]	[] [98.]	[279.]
[GOT	:][U/lt]	[87.]	[] [37.10]	[100.]
[GPT	:][IU/lt]	[46.]	[] [40.]	[100.]
[LDH	:][IU/dl]	[320.]	[] [230.]	[460.]
[GGT	:][IU/ml]	[39.]	[] [10.]	[50.]
[T.protein	:][g/dl]	[7.8]	[] [6.60]	[8.70]
[Albumin	:][g/dl]	[4.2]	[] [3.50]	[5.]
[A/G	:][g/dl]	[]	[] []	[]
[Sedimantasyon	:][mm/st]	[58.]	[] [10.]	[100.]
[Kan grubu	:][]	[0 Rh (+)]	[] []	[]
[:][]	[]	[] []	[]
[:][]	[]	[] []	[]

[Yorum 1.:][Trigiliserid ve kolesterol yüksek seviyede bulunmuştur.]
Report 1.


```
[ Marmara Üniversitesi Hastanesi Allerji Laboratuvarı Neticesi ]
[Lab-Test kodu: ] [ALLERGY-1] [ Sıra numara: ____ ] [ Status: ] [sts__ ]
[Hasta prot.no: ] {patient-ID} {patient-name-surname}[ Lab sonuc tarih:][././..]
[İsteyen Dr:][requesting-DR][req.dr.name&surname] [Lab istek tarih:][././..]
[
    Allerji Testi Neticesi
]
[Allergenin ismi   Test neticesi Allergenin ismi   Test neticesi]
[
]
[D.Pteronyssinus   :] [.....] [Fındık           :] [.....]
[D.Fatines         :] [.....] [Kayın           :] [.....]
[Köpek Tüyü       :] [.....] [Dış budak      :] [.....]
[Kedi Tüyü        :] [.....] [Çam ağacı     :] [.....]
[Kümes hayvanları :] [.....] [Kavak ağacı   :] [.....]
[At tüyü          :] [.....] [Kızıl meşe    :] [.....]
[Tavşan tüyü     :] [.....] [Söğüt         :] [.....]
[İnek tüyü       :] [.....] [Mürver ağacı  :] [.....]
[Alternaria       :] [.....] [Zeytin ağacı  :] [.....]
[Aspergillus mix  :] [.....] [12 ot karışımı] [.....]
[Botrytis Cinecea :] [.....] [Yulaf         :] [.....]
[Candida Albicans :] [.....] [Çayır yumağı  :] [.....]
[Cladosporium    :] [.....] [Arpa poleni   :] [.....]
[M. Racemosus     :] [.....] [Çavdar poleni :] [.....]
[Penicillum mix   :] [.....] [Buğday poleni :] [.....]
[Rhizopus nigricans] [.....] [Pelin otu     :] [.....]
[Ağaç karışımı   :] [.....] [Akkazayağı otu] [.....]
[Kızıl ağaç      :] [.....] [Sinir otu     :] [.....]
[Huş ağacı       :] [.....] [Kuzu kulağı   :] [.....]
[Gürgen          :] [.....] [Dik çam otu   :] [.....]
[
:] [.....]
[
:] [.....]
[
:] [.....]

```

Figure-2.

Marmara Üniversitesi Hastanesi Merkez Laboratuvarı

Lab-Test kodu : SEM-ANALIZ sıralama numara:14 Status: status

Hasta prof.no: patient-ID patient-name-surname Lab test tarih: dd/mm/yy

[Isteyen Dr:][requesting-DR][req.dr.name&surname] [Lab istek tarih:][dd/mm/yy]

SEMEN ANALIZİ LABORATUVAR NETİCESİ

[Test açıklaması	birimi	bulunan deger]
[Miktar	:] [3-5 ml]	[.....]
[pH	:] [7.2-7.6]	[.....]
[Likefikasyon Süresi	:] [<20 dk.]	[.....]
[Viskozite	:] [normal]	[.....]
[Görünüm	:] [opak]	[.....]
[1.saat hareketli sperm	:] [%]	[.....]
[2.saat hareketli sperm	:] [%]	[.....]
[Hareketin tipi Cogunlugu	:] [08-units]	[.....]
[Sperm sayısı (1000000 /ml)	:] [60-120]	[.....]
[Normal morfolojik sperm yüzdesi (%):]	[%80-%90]	[.....]
[Spermatozit harici hücre	:] []	[.....]
[Vital inceleme canlı sperm	:] [%]	[.....]
[Semende fruktoz (kantitatif)	:] []	[.....]
[1.saat canlı sperm	:] [%]	[.....]
[1.saat hareketli sperm	:] [%70-%90]	[.....]
[3.saat hareketli sperm	:] [%60-%70]	[.....]
[5.saat hareketli sperm	:] [%]	[.....]
[Sexuel perhiz ?	:] [gun]	[.....]
[.saat hareketli sperm	:] []	[.....]
[:] []	[.....]
[:] []	[.....]
[Yorum 1:][.....		
[Yorum 2:][.....		

Figure-3.

```
[
    Institute and/or Laboratory Title ][ Sequence number: ][seqno ]
[Test code:][LABCODE ][Patient ID:][patient-ID] [p-name-surname] [test date:][././..]
[Requesting Dr:][requesting-DR][req.dr.name&sumame] [Lab req. date:][././..]
[
    labcode-explanation
]
[Test e. value L/H units Test e. value L/H units Test e. value L/H units ]
[
    _____
    [f-01-d:][FLD-01][?] ][01-unit] [f-21-d:][FLD-21][?] ][21-unit] [f-41-d:][FLD-41][?] ][41-unit]
    [f-02-d:][FLD-02][?] ][02-unit] [f-22-d:][FLD-22][?] ][22-unit] [f-42-d:][FLD-42][?] ][42-unit]
    [f-03-d:][FLD-03][?] ][03-unit] [f-23-d:][FLD-23][?] ][23-unit] [f-43-d:][FLD-43][?] ][43-unit]
    [f-04-d:][FLD-04][?] ][04-unit] [f-24-d:][FLD-24][?] ][24-unit] [f-44-d:][FLD-44][?] ][44-unit]
    [f-05-d:][FLD-05][?] ][05-unit] [f-25-d:][FLD-25][?] ][25-unit] [f-45-d:][FLD-45][?] ][45-unit]
    [f-06-d:][FLD-06][?] ][06-unit] [f-26-d:][FLD-26][?] ][26-unit] [f-46-d:][FLD-46][?] ][46-unit]
    [f-07-d:][FLD-07][?] ][07-unit] [f-27-d:][FLD-27][?] ][27-unit] [f-47-d:][FLD-47][?] ][47-unit]
    [f-08-d:][FLD-08][?] ][08-unit] [f-28-d:][FLD-28][?] ][28-unit] [f-48-d:][FLD-48][?] ][48-unit]
    [f-09-d:][FLD-09][?] ][09-unit] [f-29-d:][FLD-29][?] ][29-unit] [f-49-d:][FLD-49][?] ][49-unit]
    [f-10-d:][FLD-10][?] ][10-unit] [f-30-d:][FLD-30][?] ][30-unit] [f-50-d:][FLD-50][?] ][50-unit]
    [f-11-d:][FLD-11][?] ][11-unit] [f-31-d:][FLD-31][?] ][31-unit] [f-51-d:][FLD-51][?] ][51-unit]
    [f-12-d:][FLD-12][?] ][12-unit] [f-32-d:][FLD-32][?] ][32-unit] [f-52-d:][FLD-52][?] ][52-unit]
    [f-13-d:][FLD-13][?] ][13-unit] [f-33-d:][FLD-33][?] ][33-unit] [f-53-d:][FLD-53][?] ][53-unit]
    [f-14-d:][FLD-14][?] ][14-unit] [f-34-d:][FLD-34][?] ][34-unit] [f-54-d:][FLD-54][?] ][54-unit]
    [f-15-d:][FLD-15][?] ][15-unit] [f-35-d:][FLD-35][?] ][35-unit] [f-55-d:][FLD-55][?] ][55-unit]
    [f-16-d:][FLD-16][?] ][16-unit] [f-36-d:][FLD-36][?] ][36-unit] [f-56-d:][FLD-56][?] ][56-unit]
    [f-17-d:][FLD-17][?] ][17-unit] [f-37-d:][FLD-37][?] ][37-unit] [f-57-d:][FLD-57][?] ][57-unit]
    [f-18-d:][FLD-18][?] ][18-unit] [f-38-d:][FLD-38][?] ][38-unit] [f-58-d:][FLD-58][?] ][58-unit]
    [f-19-d:][FLD-19][?] ][19-unit] [f-39-d:][FLD-39][?] ][39-unit] [f-59-d:][FLD-59][?] ][59-unit]
    [f-20-d:][FLD-20][?] ][20-unit] [f-40-d:][FLD-40][?] ][40-unit] [f-60-d:][FLD-60][?] ][60-unit]
    [Comment-1:][ Comment-1-value _____ ]
    [Comment-2:][ Comment-2-value _____ ]
    [Comment-3:][ Comment-3-value _____ ]
]
Format-4.
```

[Marmara Üniversitesi Hastanesi Merkez Laboratuvarı][Sıra numarası:][01]

[Test kodu:][CBS-22][Patient ID:][patient-ID] [p-name-surname] [test tarih:][dd/mm/yy]
[Isteyen Dr:][requesting-DR][req.dr.name&sumame] [Lab istek tarihi:][dd/mm/yy]

[Tam Kan Sayımı (22 parametrelî)]
[Acıklm b.deger L/H birimi Acıklm. b.deger L/H birimi Acıklm. b.deger L/H birim]
[

```
[WBC:][.....][.] [10^3/uL] [RBC :][.....][.] [10^6/uL] [PLT :][.....][.] [10^3/uL]
[ :][.....][.] [ ] [HGB :][.....][.] [g/dl] [MPV :][.....][.] [fL ]
[NE :][.....][.] [ % ] [HCT :][.....][.] [ % ] [ :][.....][.] [ ]
[LY :][.....][.] [ % ] [MCV :][.....][.] [ fL ] [ :][.....][.] [ ]
[MO :][.....][.] [ % ] [MCH :][.....][.] [ pg ] [ :][.....][.] [ ]
[EO :][.....][.] [ % ] [MCHC :][.....][.] [ g/dL ] [ :][.....][.] [ ]
[BA :][.....][.] [ % ] [RDW :][.....][.] [ % ] [ :][.....][.] [ ]
[NE :][.....][.] [10^3/uL] [ :][.....][.] [ ] [ :][.....][.] [ ]
```

*İLETİŞİM FAKÜLTESİ DERGİSİ Components of Software Development:
How To Write Quick-Reporting-Table-Generating applications*

```
[LY :][.....][.] [10^3/uL] [RET% :][.....][.] [ % [ [ [ :][.....][.] [ ] ]
[MO :][.....][.] [10^3/uL][RET# :][.....][.] [10^6/uL] [ [ :][.....][.] [ ] ]
[EO :][.....][.] [10^3/uL] [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[BA :][.....][.] [10^3/uL] [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[ :][.....][.] [ [ [ [ :][.....][.] [ [ [ [ :][.....][.] [ ] ]
[Yorum :][.....]
[ :][.....]
[ :][.....]
```

Figure-4.

Marmara Üniversitesi Hastanesi Merkez Laboratuvarı
Lab-Test kodu : CBS-22 sıralama numara:01 Status: O.K
Hasta prot.no: 350-55-1967 Sennur Yagma Lab sonuc tarihi: 19/08/00
[Isteyen Dr:][99HHO][Dr. H. Hami Oz][Lab istek tarihi:][18/08/00]
{ Tam Kan Sayımı (22 parametrelili) }

[Acıklm b.deger L/H birimi	Acıklm. b.deger L/H birimi	Acıklm. b.deger L/H birim]
[WBC :][4.5][] [10^3/uL] [RBC :][3.39][L] [10^6/uL] [PLT :][19][RL][10^3/uL]	[HGB :][10.5][L] [g/dl] [MPV :][8.3][R] [fL]	
[NE :][15.1][L] [%] [HCT :][31.6][L] [%] [MCV :][93.1][fL]	[MCH :][31.0][pg]	
[LY :][74.0][H] [%] [MCV :][93.1][fL]	[MCHC :][33.3][g/dL]	
[MO :][8.2][] [%] [MCHC :][33.3][g/dL]	[RDW :][15.4][H] [%]	
[EO :][1.0][] [%] [RDW :][15.4][H] [%]		
[BA :][1.7][] [%]		
[NE :][0.7][L] [10^3/uL] [RET% :][3.3][] [%]		
[LY :][3.3][] [10^3/uL] [RET# :][0.4][] [10^6/uL]		
[MO :][0.4][] [10^3/uL] [RET# :][0.0][] [10^3/uL]		
[EO :][0.0][] [10^3/uL] [RET# :][0.1][] [10^3/uL]		
[BA :][0.1][] [10^3/uL]		

```
{Yorum :}{Suspected flags: Blasts, variant lymphs }  
[ :]{Definitive flags:Anemia, Thrombocytopenia }  
[ :]{Neutropenia, Lymphocytosis }
```

Report-4.

Marmara Üniversitesi Hastanesi Merkez Laboratuvarı
Lab-Test kodu : ANT-01 sıralama numara:21 Status: O.K
Hasta prot.no: 350-55-1967 Sennur Yagma Lab sonuc tarih: 19/08/00
[Isteyen Dr:][99HHO][Dr. H. Hami Oz][Lab istek tarih:][18/08/00]
[Antibiogram Neticesi]
{Antibiot. zone R/S refer. antibiot. zone R/S refer. antibiot. zone R/S refer.
[

[Amikac:]	[.....][.][]	[Ampici:]	[.....][.][]	[Cefota:]	[.....][.][]
[Aztreo:]	[.....][.][]	[Cefop:]	[.....][.][]	[Cefuro:]	[.....][.][]
[Cefote:]	[.....][.][]	[Ceftri:]	[.....][.][]	[Nitrof:]	[.....][.][]
[Ciprof:]	[.....][.][]	[Imipen:]	[.....][.][]	[Cefoxi:]	[.....][.][]
[Ofloxa:]	[.....][.][]	[Tetrac:]	[.....][.][]		
[Tobram:]	[.....][.][]				
[Amoxic:]	[.....][.][]				
[Cefazo:]	[.....][.][]				
[Ceftaz:]	[.....][.][]				
[Gentam:]	[.....][.][]				
[Pipera:]	[.....][.][]				
[Trimet:]	[.....][.][]				
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]
[:][.....][.][]	[:][.....][.][]	[:][.....][.][]

Report-4-ant.

*İLETİŞİM FAKÜLTESİ DERGİSİ Components of Software Development:
How To Write Quick-Reporting-Table-Generating applications*

Hasta prot.no: 350-55-1967 Sennur Yagma Lab sonuc tarih: 00/00/00

[Tam Kan Sayımı (22 parametrelî)]
[Açıklm tarih L/H tarih L/H tarih L/H tarih L/H tarih L/H tarih L/H tarih L/H]
[[19/08/00] [20/08/00] [21/08/00] [22/08/00] [23/08/00] [24/08/00] [25/08/00]]

[WBC	]:[ 4.5	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[NE	]:[ 15.1	[[L] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[LY	]:[ 74.0	[[H] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[MO	]:[ 8.2	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[EO	]:[ 1.0	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[BA	]:[ 1.7	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[NE	]:[ 0.7	[[L] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[LY	]:[ 3.3	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[MO	]:[ 0.4	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[EO	]:[ 0.0	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[BA	]:[ 0.1	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[RBC	]:[ 3.39	[[L] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[HCT	]:[ 31.6	[[L] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[MCV	]:[ 93.1	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[MCH	]:[ 31.0	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[MCHC	]:[ 33.3	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[RDW	]:[ 15.4	[[H] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[RET%]:[]	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]
[RET#]:[]	[[] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.] [.....][.]]

Report-4-sort.

APPENDIX 1.

IDENTIFICATION DIVISION.
PROGRAM-ID. LABFORM.
ENVIRONMENT DIVISION.
CONFIGURATION SECTION.
SOURCE-COMPUTER. IBM.
OBJECT-COMPUTER. IBM.
FILE-CONTROL.
SELECT LABFORMFILE
ASSIGN TO RANDOM, "/USER/LAB/LABFORM"
;ORGANIZATOPN IS INDEXED
;ACCESS MODE IS DYNAMIC
;RECORD KEY IS LABCODE OF LABFORM-RECORD
OF LABFORM-FILE.

DATA DIVISION.
FILE SECTION.
FD LABFORM-FILE.
01 LABFORM-RECORD.
02 LABCODE PIC X(15).
02 LAB-SEQUENCE-NUMBER PIC 9(3).
02 LAB-STATUS PIC X(5).
02 LAB-PATIENT-ID PIC X(15).
02 LAB-TEST-DATE PIC X(15).
02 LAB-INSTITUTE-TITLE PIC X(73).
02 LAB-CODE-EXPLANATION PIC X(73).
02 LAB-SUBCODE-EXPLANATION PIC X(136).
02 LAB-TEST-EXPLANATION PIC X(21).
02 LAB-UNITS PIC X(9).
02 LAB-VALUE-FOUND PIC X(10).
02 LAB-L-H PIC XX.
02 LAB-MIN-VALUE PIC X(10).
02 LAB-MAX-VALUE PIC X(10).
02 LAB-FIELD-01-EXPLANATION PIC X(40).
02 LAB-FIELD-63-EXPLANATION PIC X(40).
02 LAB-01-UNITS PIC X(10).

02 LAB-60-UNITS PIC X(10).
02 LAB-FIELD-01-CNTRL PIC X.
02 LAB-FIELD-60-CNTRL PIC X.
02 LAB-FIELD-01-MIN-VALUE-PERCENT PIC 9(3).
02 LAB-FIELD-60-MIN-VALUE-PERCENT PIC 9(3).
02 LAB-FIELD-01-MAX-VALUE-PERCENT PIC 9(3).
02 LAB-FIELD-60-MAX-VALUE-PERCENT PIC 9(3).
02 LAB-FIELD-01-MIN-VALUE-CHR PIC X(10).
02 LAB-FIELD-60-MIN-VALUE-CHR PIC X(10).
02 LAB-FIELD-01-MAX-VALUE-CHR PIC X(10).
02 LAB-FIELD-60-MAX-VALUE-CHR PIC X(10).
02 LAB-FIELD-01-MIN-VALUE-NUM PIC 9(7)V999.
02 LAB-FIELD-60-MIN-VALUE-NUM PIC 9(7)V999.
02 LAB-FIELD-01-MAX-VALUE-NUM PIC 9(7)V999.
02 LAB-FIELD-60-MAX-VALUE-NUM PIC 9(7)V999.
02 LAB-COMMENT-1 PIC X(21).
02 LAB-COMMENT-4 PIC X(11).

APPENDIX 2.

IDENTIFICATION DIVISION.
PROGRAM-ID. LAB-RESULT-FORM.
ENVIRONMENT DIVISION.
CONFIGURATION SECTION.
SOURCE-COMPUTER. IBM.
OBJECT-COMPUTER. IBM.
FILE-CONTROL.
SELECT LAB-RESULT-FILE
ASSIGN TO RANDOM, "/USER/LAB/LABRESULT"
;ORGANIZATOPN IS INDEXED
;ACCESS MODE IS DYNAMIC
;RECORD KEY IS LAB-RESULT-CODE OF
LAB-RESULT-RECORD OF LAB-RESULT-FILE.
DATA DIVISION.
FILE SECTION.
FD LAB-RESULT-FILE.
01 LAB-RESULT-RECORD.
02 LAB-RESULT-CODE.

03 LAB-RESULT-PATIENT-ID PIC X(9).
03 LAB-RESULT-SEQUENCE-NUM PIC 9(3).
03 LAB-RESULT-FORM-CODE PIC X(15).
03 LAB-TEST-REQUEST-DATE PIC 9(6).
03 LAB-TEST-REQUEST-TIME PIC X(8).
02 LAB-REQUEST-ACCESSING-NUM PIC 9(7).
02 LAB-RESULT-REPORTING-DATE PIC 9(6).
02 LAB-RESULT-REPORTING-TIME PIC X(8).
02 LAB-TEST-REQUESTING-DR-CODE PIC X(5).
02 LAB-RESULT-APPROVING-DR-CODE PIC X(5).
02 LAB-TECHNICIAN-CODE PIC 9(2).
02 LAB-REPORT-ENTERING-TECH-CODE PIC 9(2).
02 LAB-RESULT-STATUS PIC X(5).
02 LAB-RESULT-FIELD-01-VALUE-LH PIC X(2).
02 LAB-RESULT-FIELD-60-VALUE-LH PIC X(2).
02 LAB-RESULT-FIELD-01-VALUE-CHR PIC X(25).
02 LAB-RESULT-FIELD-60-VALUE-CHR PIC X(25).
02 LAB-RESULT-FIELD-61-VALUE-CHR PIC X(50).
02 LAB-RESULT-FIELD-62-VALUE-CHR PIC X(50).
02 LAB-RESULT-FIELD-63-VALUE-CHR PIC X(50).
02 LAB-RESULT-FIELD-01-VALUE-NUM PIC 9(7)V999.
02 LAB-RESULT-FIELD-60-VALUE-NUM PIC 9(7)V999.
02 LAB-RESULT-COMMENT-1 PIC X(65).
02 LAB-RESULT-COMMENT-2 PIC X(65).