

CDEMS

Chronic Disease
Electronic Management
System

Electronic Lab Interface User Guide



Version 0708

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ELECTRONIC LAB INTERFACE

Electronic lab downloads are an integral component of efficient, accurate, and successful CDEMS use. CDEMS is readily adaptable to read whatever data format your lab uses, and we'll work together with you and your lab company to make electronic file downloading possible at your clinic.

Setting Expectations

Electronic lab downloads result in less manual data entry with improved timeliness and greater accuracy. More information can be efficiently collected as more health conditions are tracked, providing a valuable resource for evaluating and planning patient care, as well as documenting program and grant activities.

At the same time, the lab download process requires continuous management and maintenance by the user clinic. The lab file, lab interface and patient registry must synchronize perfectly in order to accomplish the electronic download of lab results. Lab codes change. Microsoft regularly implements operating system and Access program changes. Modem and Internet service provider connections also change over time. All of these variables impact the successful operation of the electronic lab download.

Roles & Responsibilities

The lab company, the clinic, and DOH staff have interrelated and ongoing responsibilities to successfully download lab results into the CDEMS registry:

Lab Company Responsibilities

- Create and maintain the ordering system, file format, user accounts, and passwords
- Manage the lab results server and its communications linkages
- Complete laboratory work
- Return lab results directly to clinic and also pass the same results in electronic format to the lab server
- To a limited extent, on user request, reload previously downloaded results files

Clinic Responsibilities

- Acquire and safeguard the user account and password from the lab company to allow electronic downloading of results
- Acquire and maintain the modem, modem phone line, communication software (e.g. Hyperterm, NetTrm), and CDEMS programs
- Set up and maintain the lab account and patient identifiers/lab codes for matching lab results to patients in the registry.
- Manually oversee/undertake downloads from the lab company and manage the previous downloaded files
- Run the lab interface to download lab results into CDEMS
- Verify and monitor imported lab results.

WA Department of Health Support Responsibilities

- Assist users in contacting lab company to create accounts
- Create, maintain, and distribute the interface program which converts and appends the appropriate lab data for patients in the CDEMS registry
- Provide technical support and training to clinics for downloading and appending data to CDEMS from the lab company server

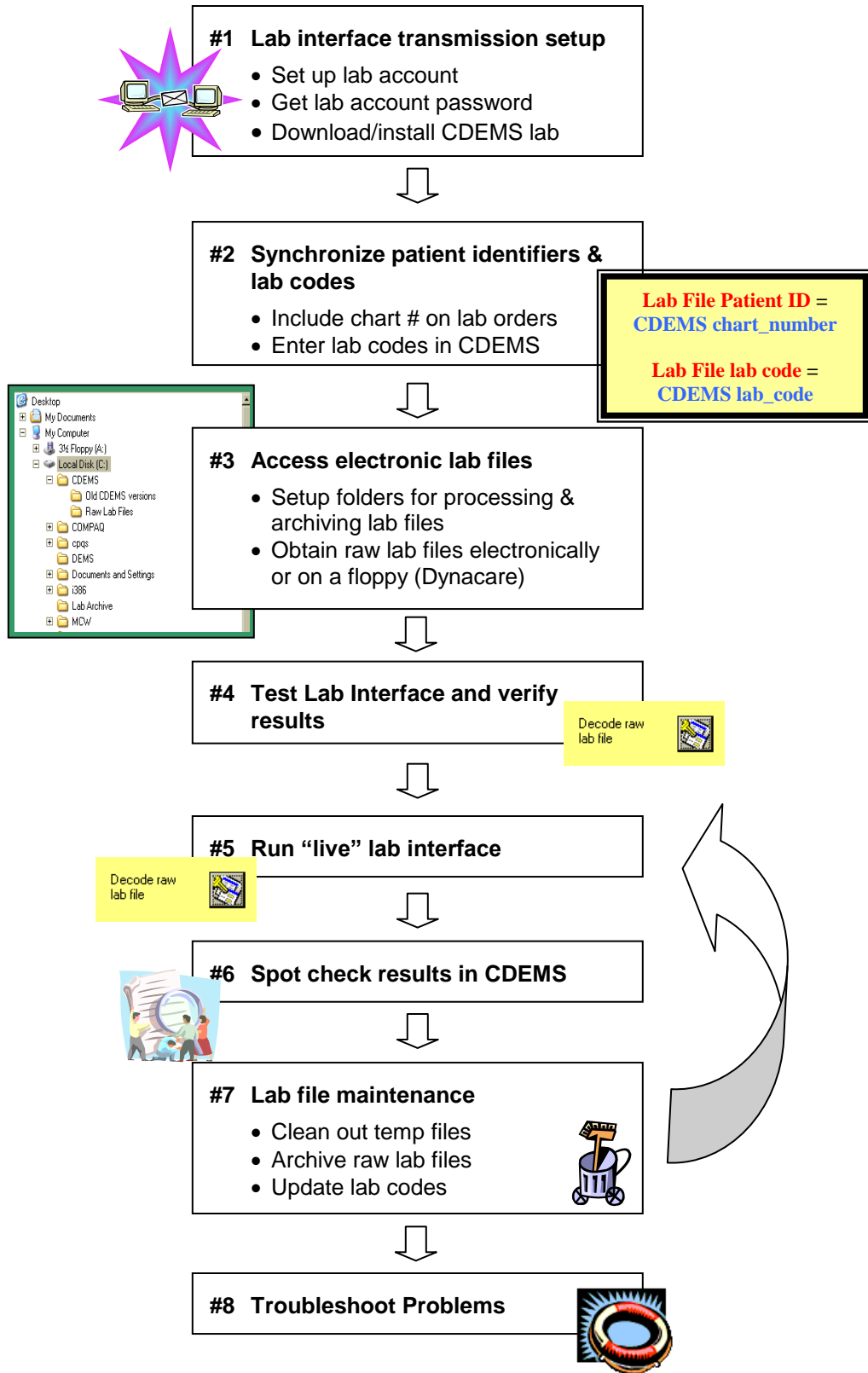
Lab Interface Summary

Steps 1-8 below summarize the process for setting up the interface between your lab company and CDEMS to electronically record lab results to patient records in the registry. Once you are set up to receive electronic lab files, repeat steps 5-8 regularly to post lab results to CDEMS and keep your system maintained for efficient processing.

1. Lab interface transmission setup
2. Synchronize patient identifiers & lab codes
3. Access electronic lab files
4. Test run lab interface/verify results
5. Run CDEMS lab interface
6. Spot check results in CDEMS
7. Maintain lab files
8. Troubleshoot Problems

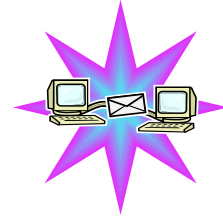
A flowsheet diagramming the cycle appears on the next page followed by detailed descriptions of each step.

CDEMS Electronic Lab Interface Setup & Processing Cycle



Set Up the Lab Interface

To initiate a lab interface at your clinic, first talk with your lab representative to set up an account, establish a password, and install transmission software, if needed.



Next download the CDEMS lab interface for your lab company from the www.cdems.com website. Download to your CDEMS folder the lab interface program that matches the version of Microsoft Access ('97 or 2k) that you are using. For detailed download instructions, refer to the Getting Started: Installation section of this User Guide. Lab interfaces are currently available for the following labs:

- QUEST
- PAML
- Dynacare
- LabCorps
- PacLab
- Dynacore

Additional laboratory interfaces are continually being developed. If you use a different laboratory, ask them to work with us to make your lab data available electronically.

Synchronization

The lab interface requires a match between the lab *Patient ID* and the CDEMS *chart number* AND laboratory *lab code* and CDEMS *lab code* in order to electronically record test results for patients in the registry. Discuss with your lab representative the format of the Patient ID and the appropriate lab codes to ensure a successful match.

Lab File Patient ID = CDEMS chart_number (tblDemo)

Lab File lab code = CDEMS lab_code (tlkpCrosswalk)

Matching Patient Identifiers

Work with your lab company to establish patient identifiers that will match up with patients in CDEMS. The best way to ensure matching identifiers is to include the patient chart number on lab orders. If the chart number is not identified in the lab record, CDEMS alternatively tries to match patients based on the combination of last name and date-of-birth.

A word of caution: Be aware that an *exact* match of lab file and CDEMS patient identifiers is required to record a lab result in the registry. This means that extra characters, numbers or spaces in the identifiers will prevent a successful match. For example, 231-50-9999 and 231509999 are viewed as distinct identifiers and are not an exact match.

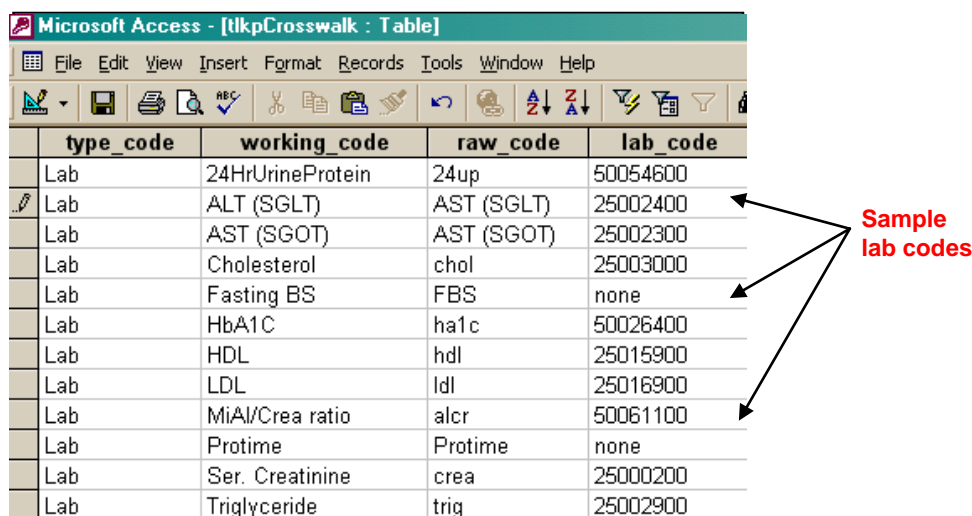
Matching Lab Codes

Lab codes in the electronic lab file identify the tests and results performed by the lab company. Obtain the lab codes used by your laboratory for the tests being tracked in CDEMS; then configure the CDEMS Crosswalk table to match the codes specific to your lab company. Follow the steps below from the opening screen of the CDEMS data entry program to enter lab codes into the CDEMS Crosswalk table:

1. Press the **F11** function key on your keyboard to work in database mode
2. Click on **Tables** > double-click on **tlkpCrosswalk**
3. Scroll to the “Lab” type_code rows of the table and enter appropriate values in the lab_code cells for each lab matching the codes used by your lab company.
4. Type “none” in lab code cells for labs that are not being tracked. This deletes any lab code entries in Crosswalk that may not belong to your lab company.
5. Changes to tlkpCrosswalk are saved automatically as an entry is typed.
6. Click on the inner “X” in upper right corner to close the Crosswalk table.

The Crosswalk table will require periodic updating to reflect lab code changes and additions. Laboratories may change their codes from time to time, and codes must be added to the Crosswalk table when new labs are added for tracking in CDEMS.

A Crosswalk table with sample Quest lab code entries is shown at Fig. 28 below.



	type_code	working_code	raw_code	lab_code
	Lab	24HrUrineProtein	24up	50054600
	Lab	ALT (SGLT)	AST (SGLT)	25002400
	Lab	AST (SGOT)	AST (SGOT)	25002300
	Lab	Cholesterol	chol	25003000
	Lab	Fasting BS	FBS	none
	Lab	HbA1C	ha1c	50026400
	Lab	HDL	hdl	25015900
	Lab	LDL	ldl	25016900
	Lab	MiAl/Crea ratio	alcr	50061100
	Lab	Prottime	Prottime	none
	Lab	Ser. Creatinine	crea	25000200
	Lab	Triglyceride	trig	25002900

Fig. 28 – CDEMS Crosswalk Table with lab_codes

Access Electronic Lab Files

Electronic lab files should be placed in a “Raw Lab Files” folder *within* the CDEMS folder on your computer or network server. Note that some laboratories (Dynacare) may deliver lab data on a floppy disk. In this case the lab interface will automatically look for raw lab files to download on the A: drive.

During the electronic download of lab results, the interface program opens every lab file located within the CDEMS folder and searches for matches of lab types identified for tracking in the Crosswalk table.

After the electronic download of lab results has successfully completed, the processed lab files should be moved to a “Lab Archive” folder located *outside* of the CDEMS folder. Lab files on a floppy disk may also be copied to the “Lab Archive” folder or can be labeled and stored on the floppy. Lab files can be retrieved and re-processed at any time if they have been carefully archived. See the Lab File Maintenance section of this Guide for detailed housekeeping instructions for handling processed lab files.

Test Interface

If you are a single user of CDEMS or can completely lock other users from the data file during your first live run of the electronic interface, simply make a backup copy of the `cdem_dta.mdb` file and run the interface in your live environment. The backup data file provides the option of reverting back to the original file if the test run is not successful and you wish to undo data changes made during the first electronic lab download.

However, if the data file cannot be isolated, you may wish to create a test environment for the first run of your electronic lab interface. Three elements are required to quarantine data in a testing environment: a copy of the CDEMS data file, the CDEMS lab interface program, and a lab file. Follow the steps below to set up a separate test area until you’re comfortable that the lab interface is functioning properly:


1. Create a new folder outside your CDEMS directory called **CDEMS Lab Test**
2. Make a **copy of the `cdem_dta.mdb`** file in your CDEMS folder > paste it into the Lab Test folder > **rename the copied file to `cdem_dta.mdb`**
3. Make a **copy of several lab files** (or a single file is fine if it contains results for an active patient in CDEMS) > paste into the Lab Test folder
4. Make a **copy of the lab interface program file** (for example `quest-cdems.mdb`) in your CDEMS folder > paste it into the Lab Test folder

IMPORTANT! RELINK THE DATA FILE TO ENSURE CHANGES ARE MADE TO THE *TEST* DATA FILE AND NOT THE *ACTUAL* DATA FILE:

- Double-click on the **lab interface file** (e.g. `quest-cdems.mdb`) in the Lab Test folder
- Click on **Tools** in the menu bar > **Database Utilities** > **Linked Table Manager**
- Click on the “**Always Prompt for New Location**” checkbox
- Click **Select All** > **OK**
- Navigate to the location of the CDEMS Lab Test folder and **double-click on the `cdem_dta.mdb` file within the Lab Test folder**. This re-directs the *test* interface program to append records to the *test* `cdem_dta` file.

WARNING: *Failure to re-link the lab interface in the test environment to the test data file, will result in changes to the ACTUAL data file!*

5. Once the interface program has been re-linked, click on the **Decode Raw Lab File** button to run the electronic lab download.

6. Verify that results shown in the last temp table were accurately appended to CDEMS Lab table. Both tables are accessible by clicking on the database view window behind the lab interface program opening screen (press F11 key if you can't see or click on this window).
 - Double-click on the last tblLabs temp file (the one which includes a date and version number – e.g., tblLabs 12/31/03_3) > minimize the temp file table
 - Double-click on tblLabs
 - Display both tables on your computer screen at once or navigate between the two tables to compare lab results in the temp lab file with results posted in the tblLabs file.
 
 - √ Check for lab results for patients in the temp table that were not written to tblLabs. For missing lab results, correct errors caused by mismatches between CDEMS chart_number and lab patient identifier.
 - √ Check for results for a test type present in the temp table that were not appended for any patient in CDEMS tblLabs. For missing lab types, look for omitted lab codes or invalid entries in the tlkpCrosswalk that do not match the code used by your lab company.
7. Make appropriate corrections in tlkpCrosswalk or with your lab company file format. See the Troubleshoot Problems section of this Guide for more details on making corrections.
8. When satisfied with the accuracy of the download, make these same modifications in the LIVE CDEMS data file (not in the test area).
9. Run the lab interface in your LIVE CDEMS environment.

Run the “Live” Interface

To run the live interface, double-click on the lab interface program (for example quest-cdems.mdb) in the CDEMS directory. Click the “**Decode raw lab file**” button (shown in the sample Quest Lab Interface screen at Fig. 29a to start the import of data from the temp table to the CDEMS labs table.

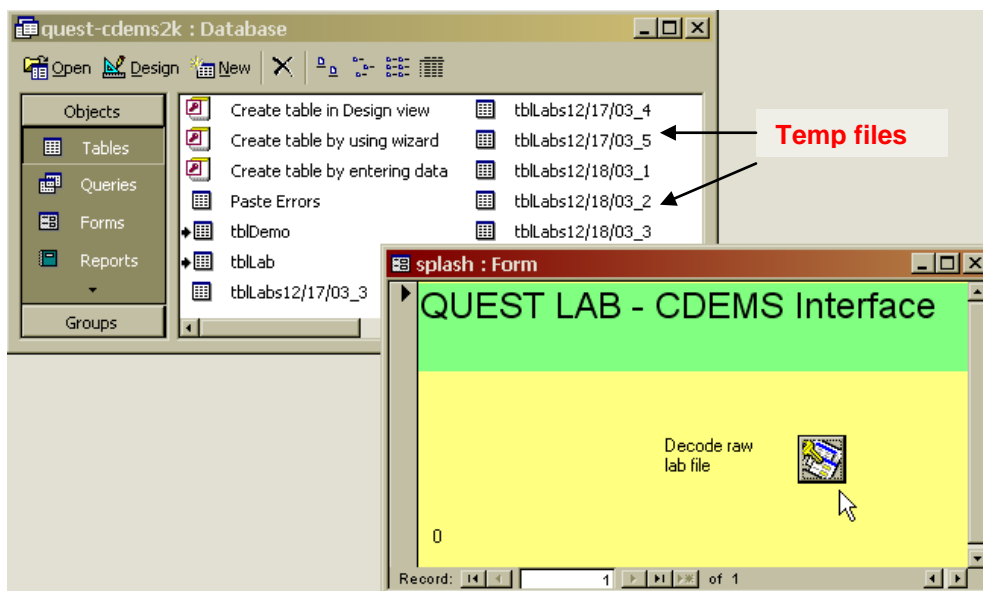


Fig. 29a – Sample Lab Interface Screen with Tables in Database mode

The lab interface program searches for matching patient identifiers and lab codes between the lab file and patients in the CDEMS registry. The program opens every lab file located within the CDEMS folder and sequentially searches line by line for matches of lab types identified for tracking in the Crosswalk table. Data is written to a temporary file with a name like tblLabs_12/18/03_1 when a match is found. (Note: the temp file name changes depending on the date and how many times you try to run it – for example, tblLabs_12/18/03_1, tblLabs_12/18/03_2, tblLabs_12/18/03_3, etc.). Lab results in the temp table are then appended to corresponding patient records in CDEMS based on a successful match between chart number or a combination of last name and date-of-birth. Once appended, duplicate labs cannot be re-appended. So, running the interface program multiple times creates a new temp table containing all lab results that match lab types in CDEMS, but only *new* records are appended to CDEMS tblLab.

Lab File Maintenance



To keep files manageable and processing time efficient, two housekeeping tasks should be performed after successfully completing the electronic download.

Delete the temp files whenever the data looks like it has passed through the interface with no errors. The files to delete are the temporary tblLabs_12/18/03_# files located in the lab interface program database view shown at Fig. 29a above. Press F11 function key > Tables if this window is not visible from the lab interface opening screen

Save the raw lab files in an archive file for as long as you are doing this registry work. The cost of maintaining the data in storage is very small, but the usefulness of these archived files is potentially very large. These files are a valuable electronic copy of every lab conducted at the clinic. If your clinic starts tracking a new health condition, it is possible to backfill historical results for your patients by re-processing these lab files. If the clinic wants to do a grant, the data can be used to ascertain baselines. If you ever move to an EMR, the historical data is already gathered.

The files to archive are the raw lab files, not the temp files inside the interface program with names like tblLabs12/18/03_1. To save these raw data files without compromising processing time, create a “Lab Archive” folder *outside* the CDEMS folder where raw data files can be moved from the CDEMS/Raw Lab File after processing. Fig. 29b below illustrates the file structure for a Lab Archive folder with an external location OUTSIDE the CDEMS folder on the C: hard drive. Remember that the lab interface program looks for raw lab files to process in every folder and sub-folder within the main CDEMS folder on your computer. Setting up the Lab Archive as a sub-folder within CDEMS will quickly result in those raw files clogging the lab interface function.

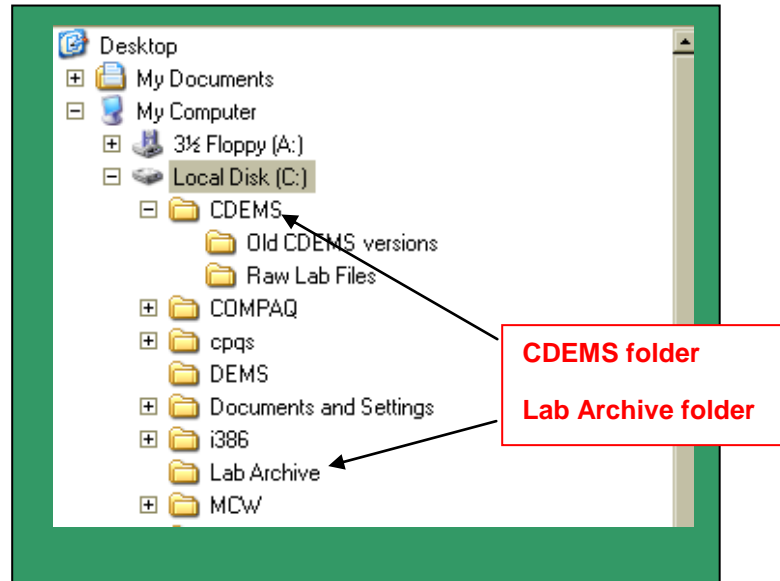


Fig. 29b – Sample C: directory with Lab Archive folder

Troubleshoot Problems

Generally difficulties encountered in running the electronic lab interface occur in three areas:

- Failed patient identifier matches
- Failed lab code matches
- Processing errors

Verifying Patient Identifiers

An *exact* match of lab file and CDEMS patient identifiers is required to record a lab result in the registry. If a chart number is not found in the lab file, the interface alternatively tries to match on patient last name and date-of-birth. Verify patient identifiers by double-clicking on a raw lab file; open the file using Notepad. Compare the lab file identifiers to the CDEMS chart numbers or last name, date-of-birth to discover potential processing errors. For assistance in reading the HL7 file, see the “Deciphering the HL7 Lab File” diagram at Fig. 29c.

Verifying Lab Codes

Verify that lab codes entered into the CDEMS Crosswalk table match those in the raw lab file. Sometimes new or modified lab codes can be discovered by investigating the lab codes in the raw lab data file. To manually verify lab codes, double-click on a raw lab file; open the file using Notepad. On the OBX lines in the file you’ll see text descriptions of lab tests and just to the left of the description is a number representing the lab code for the named test. The lab_code entered into CDEMS tlkpCrosswalk must match the lab code identified for the test in the lab file. For assistance in reading the HL7 file, see the “Deciphering the HL7 Lab File” diagram at Fig. 29c.

Resolving “Run Time” Errors

It is extremely important to physically manage the location of the raw lab files to minimize electronic download processing time. If processed lab files are never cleaned out, the program buffer will be unable to hold all the data for lab records that must be appended to CDEMS. Un-archived raw lab files quickly slow down processing time and eventually clog the entire electronic lab download process resulting in a “Run-Time” error.

It’s best to avoid this problem altogether by creating a Lab Archive folder outside your CDEMS folder and periodically moving processed lab files into this folder. See the “Lab File Maintenance” section of this Guide for detailed lab archiving instructions.

To resolve a “Run Time” error in the situation where you don’t know which files have been processed, you’ll need to re-run the lab interface and re-process all lab files in small batches. Remember, duplicate information will not be recorded in CDEMS so if the file was already processed, the results will not be written again to the registry. To re-process all lab files in smaller batches, create a temporary lab holding folder outside your CDEMS folder. Also create a “Lab Archive” folder outside your CDEMS folder if one does not already exist. Then follow the steps below:

1. Move about half the lab files (Batch #2) into the “C: Lab Holding” folder
2. Re-run the lab interface for the remaining lab files (Batch #1) in the CDEMS “Raw Lab Files” folder
3. Move the Batch #1 processed lab files from the CDEMS/Lab Files folder to the “Lab Archive” folder.
4. Move the remaining lab files (Batch #2) from the C: Lab Holding folder into the CDEMS “Raw Lab Files” folder
5. Run the lab interface for this batch of lab files
6. Move Batch #2 of processed lab files from the CDEMS Raw Lab Files folder to the “Lab Archive” folder
7. Delete the C: Lab Holding folder which should now contain no lab files

If the “Run Time” error persists, divide the lab files into smaller batches for processing.

Deciphering the Raw HL7 Lab File

Most laboratories have adopted the HL7 official standardized format approved by HIPAA to ensure confidentiality and data exchange standards. Still, you can expect to see exceptions and slight variations in lab formats. The HL7 lab file has a complex but decipherable structure with key elements identified in the sample file shown at Fig. 29b.

It may be helpful to understand the processing logic and/or content of the lab file to investigate mismatched patient identifiers, lab code discrepancies, or processing errors. The first important line in the lab file is the patient identifier (PID), followed by the orders (OBR) sent to the lab for that patient, then the results (OBX) line for each test completed. When a patient identifier is found, everything after it is associated with that patient until the next PID is read. Reaching the end of a file, the interface opens any other lab files with the same naming pattern in the current folder or in sub-folders in the CDEMS directory until all are processed.

Clinic Chart #
Lab Code
Last Name, First Name
Date of Birth

```

MSH|^~\&|TSE||98134680|200112111533|TOPNET2NEON|ORUAR01||P|2.3|||||
PID|1|123456|NW007952T|DUCCKADONALDA|19350215|M|||||
NTE|1|R|CDEMS INTERFACE TESTING
ORC|RE||NW007952T||CM|||||AAAA|
OBR|1||NW007952T|AAA7600ALIPID PANEL
A||200111150900||1500/24||||200111151629|F|||||
OBX|1|TX|AAA25002900ATRIGLYCERIDES^||120|MG/DL|<150|N||F||20011120150
0|Nw||
OBR|2||NW007952T|AAA7600ALIPID PANEL
A||200111150900||1500/24||||200111151629|F|||||
OBX|1|TX|AAA25003000CHOLESTEROL^||205|MG/DL|<200|H||F||200111201500|Nw||
TOTALA||205|MG/DL|<200|H||F||200111201500|Nw||
OBR|3||NW007952T|AAA7600ALIPID PANEL
A||200111150900||1500/24||||200111151629|F|||||
OBX|1|TX|AAA25015900AHDL
CHOLESTEROLA||30|MG/DL|>59|L||F||200111201500|Nw||
OBF|T|AAA7600ALIPID PANEL
A||0||1500/24||||200111151629|F|||||
OBX|1|TX|AAA25016900ALDL-CHOLESTEROLA||151|MG/DL
(CALC)|<100|H||F||200111201500|Nw|
  
```

MSH = Message Header
PID = Patient Identifier
OBR = Order Record
OBX = Order Result

Lab Test
Test Date/Time
 11/12/2001; 1500 hours

Lab Result

Fig. 29c – Deciphering the HL7Lab File

Technical Support

Because so many aspects of the electronic lab interface are unique to each clinic and laboratory, additional assistance may be needed from time to time. For individualized technical support of the lab interface, contact:



- Jackie Gianunzio**
 CDEMS Technical Support Specialist
 email: jackie@cdems.com
 1-800-478-3563 (toll-free in WA)
 or 916-817-1401