SUNQUEST Interface Definition.

This document describes the interface capabilities between SUNQUEST LIS system to EpiCenter.

The document is divided into 6 main sections

- **Driver Capabilities Overview**
  - **Demographic Download Capabilities:** this describes the actually download capabilities in more detail, specifying what fields are supported and any known issues or workflows that require special consideration.
  - **Result Capabilities:** This describes the ability of the driver to support result upload and posting.
- **Physical Architecture:** This section described the physical and low level mechanism for connecting the systems, and where relevant what tools can be used to test the low level communication is working.
- **LIS Driver:** This provides an overview of how the driver is installed and configured in the LIS system. It provides an insight into what is required in order to get the interface operational.
- **Expected Timelines:** This section gives an estimate of the ideal timeline required to install, configure and test this interface.
- **Driver Ordering Process:** This section describes the process and responsibilities for ordering this interface.

Demographic Download Capabilities

Driver able to multiplex multiple instrument type orders?	✓
Host Query supported?	✓
Unsolicited demographic only download supported?	✓
Unsolicited Test ordering supported?	✗
LIS result query?	✗
Able to order offline test?	✗
Able to download offline ID results to EpiCenter	✗
Able to download offline AST results to EpiCenter	✗
Able to write logic rules to change results	✓

Patient ASTM Field Mapping

EpiCenter Field Name	Sent By Sunquest	F	C	R	Sunquest Field Name
Patient ID	✓	4	1	1	Medical Record Number
Patient Last Name	✓	6	1	1	Person Last Name
Patient First Name	✓	6	2	1	Person First Name
Patient Middle Name	✓	6	3	1	
Patient Name Suffix	✓	6	4	1	
Patient Name Title	✓	6	5	1	
Date of Birth	✓	8	1	1	Date of Birth
Patient Sex Code	✓	9	1	1	Sex
Street Address	✗	11	1	1	
City Address	✗	11	2	1	
State Address	✗	11	3	1	
Zip Code Address	✗	11	4	1	
Country Address	✗	11	5	1	
Patient Phone Number	✗	13	1	1	
Admitting Physician Code	✗	14	1	1	
Patient User Field 1 Code	✓	15	1	1	
Patient User Field 2 Code	✓	15	1	2	
Patient User Field 3 Code	✓	15	1	3	
Patient User Field 4	✗	15	1	4	
Patient User Field 5	✗	15	1	5	
Patient Diagnosis	✗	19	1	1	
Patient Therapy 1	✗	20	1	1	
Patient Therapy 2	✗	20	1	2	
Patient Therapy 3	✗	20	1	3	
Patient Therapy 4	✗	20	1	4	
Patient Therapy 5	✗	20	1	5	
Admission Date/Time	✓	24	1	1	Admission Date/Time
Room Number	✓	26	1	1	Room Number
Hospital Service LIS Code	✓	33	1	1	Location Code/Nursing Unit
Client Code	✓	34	1	1	Client SUNQUEST is sending on Field 26?

Order ASTM Field Mapping

Field Name	Sent By SUNQUEST	F	C	R	Sunquest Field Name
Accession Number	✓	3	1	1	Accession Number
Isolate Number	✗	3	2	1	Isolate Number (#)
Organism LIS Code	✗	3	3	1	Organism
Test Code	✗	5	4	1	Panel
Test Sequence Number	✗	5	5	1	
Collect Date/Time	✓	8	1	1	Collection Date/Time
Collected By Code	✗	1	1	1	
Received By Code	✗	1	2	1	
Specimen Action Code	✗	1	1	1	
Isolate Source Test 1	✗	1	1	1	
Isolate Source Test 2	✗	1	1	2	
Isolate Source Test 3	✗	1	1	3	
Isol Source Test Start Time 1	✗	1	2	1	
Isol Source Test Start Time 2	✗	1	2	2	
Isol Source Test Start Time 3	✗	1	2	3	
Receipt Date/Time	✓	1	1	1	Specimen Receive Date/Time
Specimen Type Code	✓	1	1	1	Specimen Type
Body Site Code	✗	1	2	1	Body Site
Ordering Physician Code	✓	1	1	1	
Ordering Physician Phone	✗	1	1	1	
Ordering Physician Fax	✗	1	2	1	
Ordering Physician Pager	✗	1	3	1	
Specimen User Field 1 Code	✓	1	1	1	
Specimen User Field 2 Code	✓	1	1	2	
Specimen User Field 3 Code	✓	1	1	3	
Specimen User Field 4	✗	1	1	4	
Specimen User Field 5	✗	1	1	5	
Finalized Date/Time	✗	2	1	1	
Specimen Reimbursement	✗	2	1	1	
Test Reimbursement Value	✗	2	1	2	
Isolate Classification	✗	2	1	1	

Result Upload Capabilities

Capability	Supported	ASTM Reference
Driver able to multiplex multiple instrument type results? Untested	✗	8
Able to receive Isolate level ID/AST results?	✓	1
Able to handle multiple Isolates?	✓	2
Isolate Results use Test Source field?	✗	1
Able to receive Test level ID/AST results? From Mark's experience: The test and isolate level results for an ID test are nearly identical and Sunquest requires the ID component with an isolate LIS code to post as far as I've been able to determine. I have no idea why test level results for PID or NID post while isolate level do not. My guess is that Sunquest is expecting the panel codes attached to an antibiotic for isolate results assuming that isolate results are from an AST test. I have never seen Sunquest accept MGIT or BACTEC results and doubt that there would be any creative way to do so since these test results do not have the ID component.	✗	
Able to receive Preliminary results?	✗	
Able to receive Final results?	✓	1
Does retransmission of results update the LIS? Not, it would not update the LIS. The re-sent result will be posted as a second option to choose in the online menu. The user must know which result to chose. It is confusing so, it is recommended to "delete" the previous result if a new result is to be re-sent.	✗	1
Rapid Complete "C" results supported?	✗	
Non-numeric MIC values supported? Provided the value is added as a valid MIC result for that drug.	✓	1
Blank MIC values supported? If no value is sent for a drug Sunquest will not display that drug with the results. Only if you send an MIC (or interp) will Sunquest display the drug for the end user.	✗	4
MIC and SIR "X" supported? The X (and the N) need to be defined as interpretations in Sunquest. If you don't define them they will error. I think that it just errors the drug, not the whole panel result.	✗	
MIC and SIR "N" supported? **See above**	✗	
Variable number of result records supported?	✓	
Inferred results supported? Yes,	✓	4
MGIT AST supported?	✗	

Able to receive offline test-level results?	✗	
Able to receive offline Isolate results (Kirby Bauer, E-Test)?	✗	
Resistance markers treated as drug results?	✓	
Resistance markers treated as separate results?	✗	
Patient Comments supported?	✗	
Specimen Comments Supported?	✗	
Isolate comments supported?	✗	
Unrecognized LIS Code Behavior? Any unrecognized code will simply cause the result not to be posted. The user should go to the **ORP** function were errors will be listed by Accession number.		

Example ASTM Messages	
1	
2	
3	
4	
5	

Isolate Result ASTM Field Mapping

Field Name	Accepted By Sunquest	Coded Field	F	C	R	Comments
Result Type	✓		3	4		
Antimicrobial Code	✓	✓	3	6		
Antimicrobial Conc.	✗		3	7		
Antimicrobial Conc. Units	✗		3	8		
MIC (AST)	✓		4	2		
Organism (ID)	✓	✓	4	2		
Final SIR (AST)	✓		4	3		
Organism Profile (ID)	✓		4	3		
Interpreted SIR (AST)	✗		4	4		
Resistance Marker 1 (ID)	✓		4	4		Posted as drug results **
Expert SIR (AST)	✗		4	5		
Resistance Marker 2 (ID)	✓		4	5		Posted as drug results
AST Test Source	✓		4	6		
Resistance Marker 3 (ID)	✓		4	6		Posted as drug results
Resistance Marker 4 (ID)	✓		4	7		Posted as drug results
Resistance Marker 5-10	✓		4	8		Posted as drug results

Comment Text	✓		4	1	1	
Comment Type	✓		5	1	1	

Test Result ASTM Field Mapping

Field Name	Coded Field	F	C	R	Phoenix	MGIT	BT9000	Comments
Result Type		3	4		✗	✗	✗	
Sequence Number		3	5		✗	✗	✗	
Antimicrobial Code	✓	3	6		✗	✗	✗	
Antimicrobial Conc.		3	7		✗	✗	✗	
Antimicrobial Conc. Units		3	8		✗	✗	✗	
Test Status Code	✓	4	1		✗	✗	✗	
Result Data Field 1	✓*	4	2		✗	✗	✗	
Result Data Field 2		4	3		✗	✗	✗	
Result Data Field 3		4	4		✗	✗	✗	
Result Data Field 4		4	5		✗	✗	✗	
Result Data Field 5		4	6		✗	✗	✗	
Preliminary/Final Status		9	1	1	✗	✗	✗	
Entry Date/Time		12	1	1	✗	✗	✗	
Test Result Date/Time		13	1	1	✗	✗	✗	
Test Complete Date/Time		13	2	1	✗			
Instrument Type		14	1	1	✗	✗	✗	
Media Type		14	2	1	✗	✗	✗	
Protocol Length		14	3	1	✗	✗	✗	
Instrument Number		14	4	1	✗	✗	✗	
Instrument Location		14	5	1	✗	✗	✗	
Additional Result Quantity 1		15	1	1	✗	✗	✗	
Additional Result 1		15	2	1	✗	✗	✗	
Additional Result Quantity 2		15	1	2	✗	✗	✗	
Additional Result 2		15	2	2	✗	✗	✗	
Additional Result Quantity 3		15	1	3	✗	✗	✗	
Additional Result 3		15	2	3	✗	✗	✗	
Additional Result Quantity 4		15	1	4	✗	✗	✗	
Additional Result 4		15	2	4	✗	✗	✗	
Additional Result Quantity 5		15	1	5	✗	✗	✗	
Additional Result 5		15	2	5	✗	✗	✗	

*Coded Organism field for ID tests only

Query ASTM Field Mapping

Field Name	Accepted By Epi	Sent By Epi	Coded Field	F	C	R	Comments
Request Start Patient ID	✓	✗		3	1	1	
Request Start Accession No	✓	✓		3	2	1	
Request Start Sequence No	✓	✗		3	3	1	
Request End Patient ID	✓	✗		4	1	1	
Request End Accession No	✓	✗		4	2	1	
Request End Sequence No	✓	✗		4	3	1	
Request Test ID	✓	✗		5	1	1	
Request Test Status Code	✓	✗		5	2	1	
Request Instrument Type	✓	✗		5	3	1	
Request Instrument Number	✓	✗		5	4	1	
Request Result Qualifier	✓	✗		5	5	1	
Request Time Qualifier	✓	✗		6	1	1	
Request Starting Date/Time	✓	✗		7	1	1	
Request Ending Date/Time	✓	✗		8	1	1	
Request Information Status	✓	✓		1	1	1	

Comment ASTM Field Mapping

Field Name	Accepted By Epi	Sent By Epi	F	C	R	Comments
Comment Text	✗	✓	4	1	1	
Comment Type	✗	✓	5	1	1	

Physical Architecture

Term Server:
The serial connection from the EpiCenter is converted from 9-pin serial to CAT5 network cable using a 9-pin serial to RJ45 converted attached to the serial port of the EpiCenter. The CAT5 network cable is connected to a port on the terminal server. The terminal server typically has a number of input ports for connecting multiple serial devices. This port must be enabled for communication by logging on to the term server and using the onboard configuration software to achieve this
The single output or network port on the term server connects to the server over standard TCP/IP. ✓

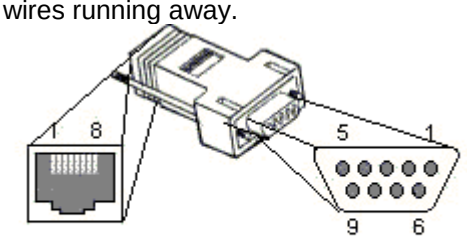
Known Term Servers Supported

- Xyplex

Serial to RJ45 Wiring.
The wiring of the 9-pin serial to RJ45 converter is typically terminal server dependant. The wiring for the Xyplex term server is defined below.

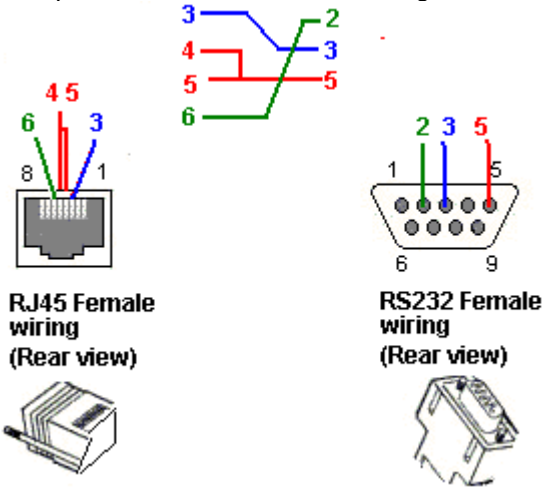
Standard RJ45 to 9-pin RS232 per Xyplex documentation
This connector only connects three pins on the serial side to 3 pins on the RJ45 side. Two pins on the RJ45 side are bridged. Please note the wire colors in the explanation are example only to easily differentiate the diagram. They will probably not be the same as your connectors so you need to do this based on pin count. Pins not mentioned below can be left disconnected.

The first diagram shows the view from the front/outside of each side of the connector with the wires running away.



RJ45 Female (Front view) **RS232 Female (Front view)**

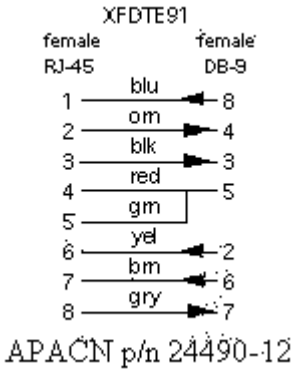
The second diagram is of the same connector, but from the inside viewpoint of the connector with wires facing towards you. Use this for pin counting to identify the correct pictures. On the RJ45 side, pins 4 & 5 must be soldered together and joined to the single pin 5 on the RS232 side.



RJ45 Female wiring (Rear view) **RS232 Female wiring (Rear view)**

RJ45 to 9-pin RS232 per Xyplex documentation

I have no reason to doubt the previous ones will work, as EpiCenter is only making use of the three pins described. However, I found another pin diagram where all the ancillary wiring is connected between the two sides of the connector. If the first one does not work you can try this too. I believe the XFDTE91 code is actually a catalogue number for ordering the connector from Xyplex.



Physical Communication Logging

The logging of physical communication is possible for both incoming and outgoing streams. Logging can typically only be seen by the Sunquest MDI with access to the backend.

The log displayed in the interface can be exported to text file. The same log file is used for both incoming and outgoing queues to the LIS.
The log displays both communication control characters with date and timestamps, as well as the logical message content within the low level frames. The log also contains comments relevant to processing states in the Sunquest system, such as available data fields. ✓

Each interface has its own log file created, created new every regular interval.

An example of the download ASTM in the log file for EpiCenter is embedded in this document below.

SUNQUEST Driver

Each SUNQUEST Account should be provided with documents entitled:

- Instrument Interface Installation Guide"
  - > Becton Dickinson Phoenix
  - > EpiCenter with Phoenix
- Instrument Interface User Guideline – Instrument Interface Implementation Guideline

Driver Name Confirmation

As many LIS vendors have multiple drivers that support BD instrument direct connections as well as connections of the instruments through EpiCenter, it is useful to confirm that the correct driver has been installed.

The driver program name for SUNQUEST connection to EpiCenter is:

??

Driver Installation

Driver installation is performed by the SUNQUEST installer.

Driver Configuration:

Configuration of the driver is done through backend tools and can typically only be performed by the SUNQUEST programmer.

1. **Driver Flag Configuration**
2. **MDI Install Tool Configuration**
3. **Instrument-Specific Maintenance:**

The **METHOD** Code should be defined for the Instrument under function **MA**

ADD Instrument to Instrument Table using function IX (^IX3)

Follow the **Instrument Interface Installation Guide** to set up the Instrument correctly before starting with the Application definition.

The **DEVICE CODE** in SUNQUEST definition Table under **MIM*** function for **EpiCenter** is **13**

*MIM = **M**icrobiology **I**nstrument **M**aintenance.

TEXT CODE :	EPICEN
TRANSLATION:	EPICENTER
GLOSSARY:	YES
ACTIVE:	YES
TYPE CODE:	METHOD
LEVEL:	ORDER

SUNQUEST Application Configuration:

The configuration activities described in this section typically refer to configuration settings that can be done by the Lab LIS administrator, or by the Microbiology Supervisor. This configuration covers translation tables and procedures.

The following functions will be used in the following sections to create/define translation Tables in SUNQUEST:

MIM = Microbiology Instrument Maintenance

MMA = Microbiology Maintenance

Ø = "Leave empty" symbol

Definition of PANELS:

Function: MIM

1. **General Parameters**
2. **Instrument Control Parameters**
3. **User defined Record/Card type Maintenance**
4. **User customized Record/Card type maintenance**

Select → 4 **User customized Record/Card Type**

Type in : ??

Previously defined for this device = Ø (If nothing has been defined)

Then Type In Panel Type: In the following example the definition of card : NMIC/ID-113

1. **Card description:** **NMIC/ID-113**
2. **Card Code:** **GN Combo 113**
3. **Autofiling: (Y/N)** **N**
4. **Combo/suscep:** **Y**
5. **Susceptibility Method:** **MIC or (Epic MIC)**
6. **Alter:** **Ø**
7. **QC Item::** **Ø**

Susceptibility Result Creation:

Function: MMA.

1. Susceptibility Code
2. Sensitivity battery Inquiry

Sensitivity type: MIC

To Add Link codes from Sunquest with Panels

FUNCTION : MIM

Select **13** → EpiCenter

Then Select: **option →** **3** **User defined Record/Card type maintenance**

Enter : Ø Tables will be listed

Select "Q" to Quit and go to the end

Then "M" to Modify

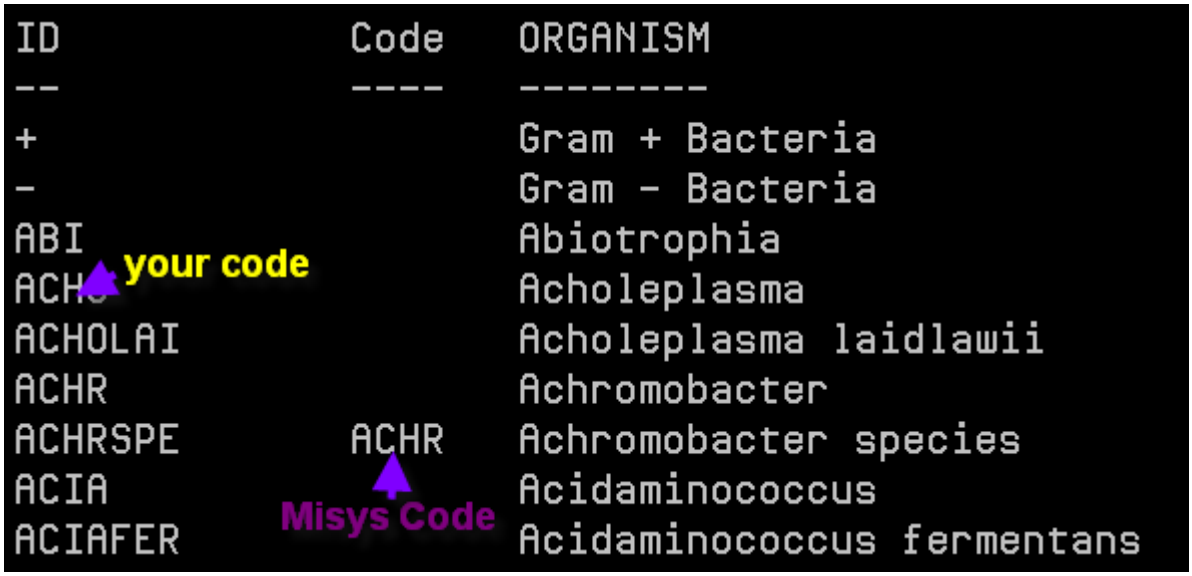
Field ID: Epicenter Code

Code: Customer Code (currently in Sunquest)

It will show in columns as shown:

EpiCenter ID	**Sunquest Code**	**Organism Name**
ESCCOL	(*Current Sunquest code*)	Escherichia coli
STAAUR	(**)	Staphylococcus aureus

It is best to scroll → print the list and then take them to do all the codes at once. This is how it would look:



Function ORP

This is very useful to troubleshoot problems of transmission. This function will list errors during the daily period per accession number.

3. Inferred Results

Inferred results can be handled simply by adding the antibiotic name to be inferred.

4. Resistance Markers

Resistance Markers are handled by the SUNQUEST driver as additional drug results. For each resistance marker code that will be reported, the following must occur in SUNQUEST.

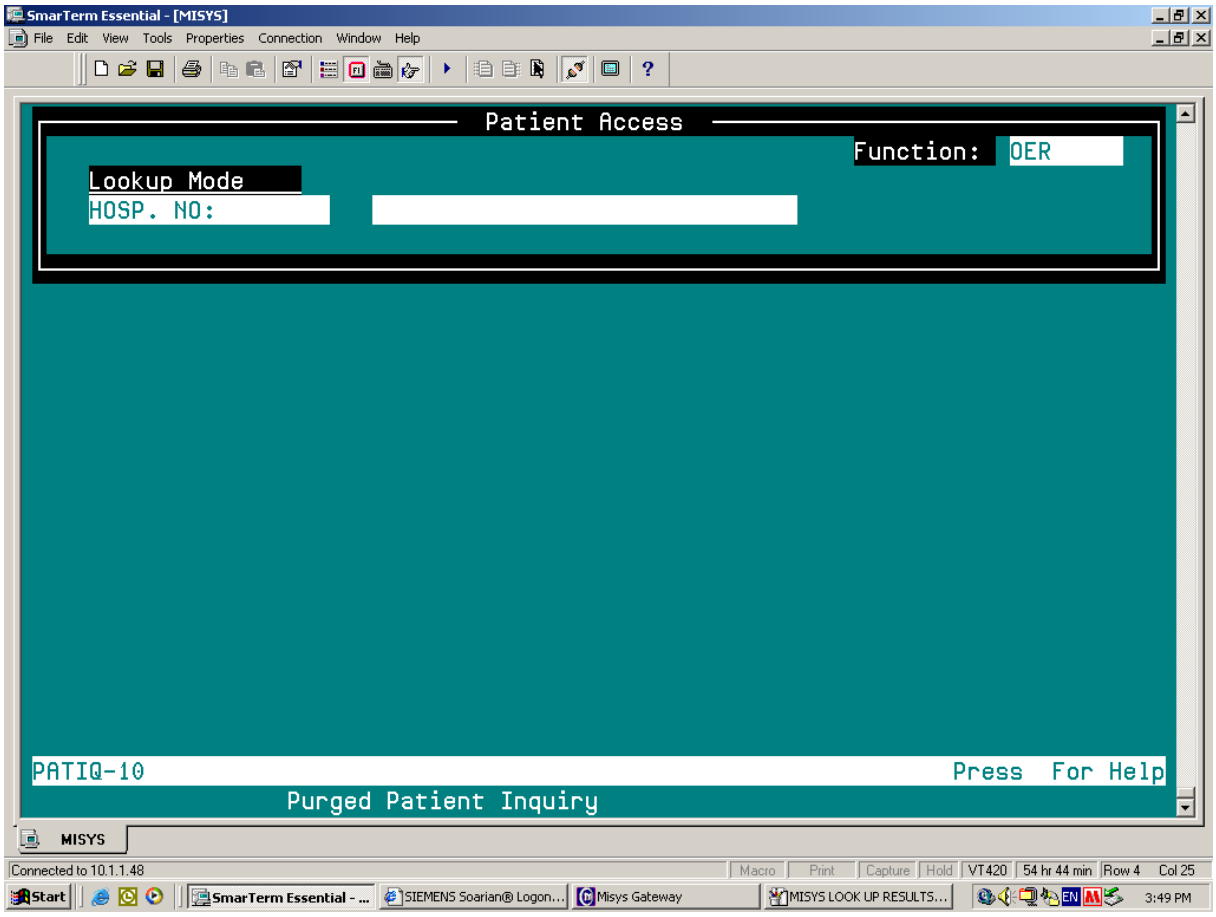
- Create a custom antibiotic with the name that matches the resistance marker drug code.
- Create a susceptibility result definition with a value that matches the resistance marker code that will be sent from EpiCenter. The result must be created as an 'alpha' result that will appear in the "MIC" column of the results screen
- Add the result definition as a valid result for the desired Organism/Antibiotic combination.
- In the Results screen it should be possible to see the resistance marker code as a valid result.
-

NOTE:
Other options for handling Resistance markers could include the following.

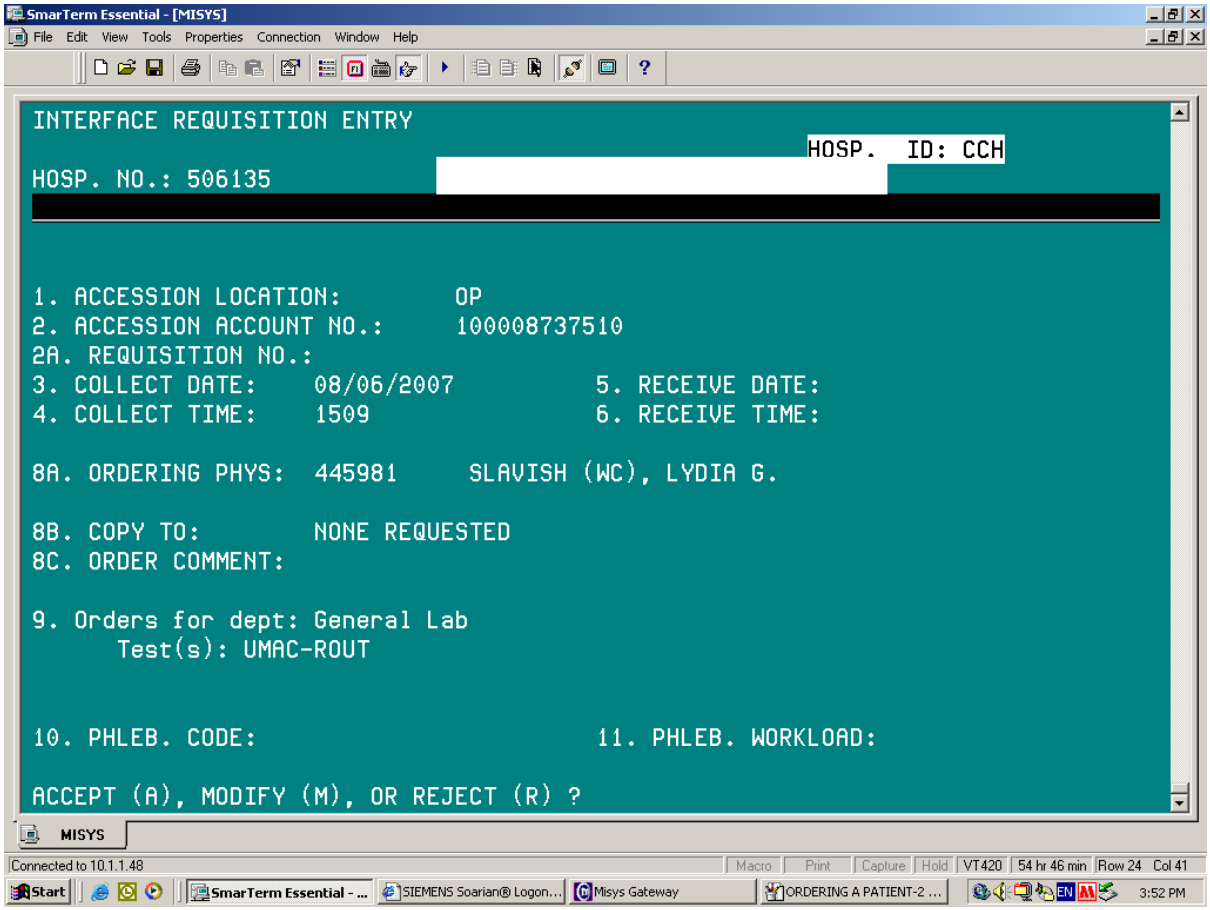
1. Create a custom antibiotic in EpiCenter to represent a resistance marker. Write an EpiCARE rule to infer this drug result (setting it to R for example) in the presence of a resistance marker in EpiCenter. This custom drug will then be reported to the LIS as an inferred drug result. A corresponding custom drug bust exist in Sunquest
2. After V5.5, the Organism Resistance marker mapping feature can be used to report an organism code to Sunquest for a custom organism that reflects the presence of the RM in the organism name. E.g. instead of reporting STAAU as the LIS code, report STAAUMR which could represent a Methicillin Resistant Staph Aureus in the LSI. This assumes the custom organism name exists in the LIS.

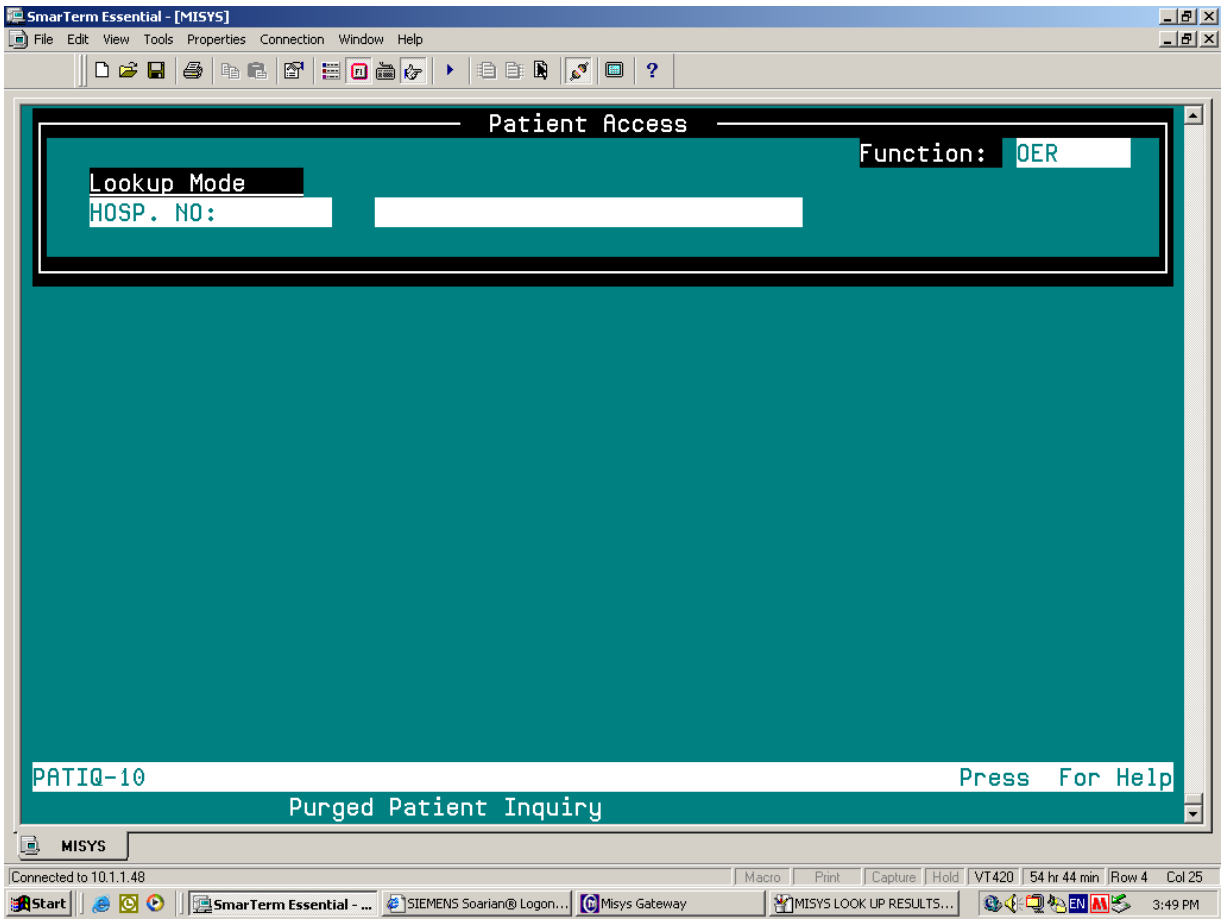
Ordering Process in the LIS

1. In Sunquest under OER Function this is how to order a new Test:



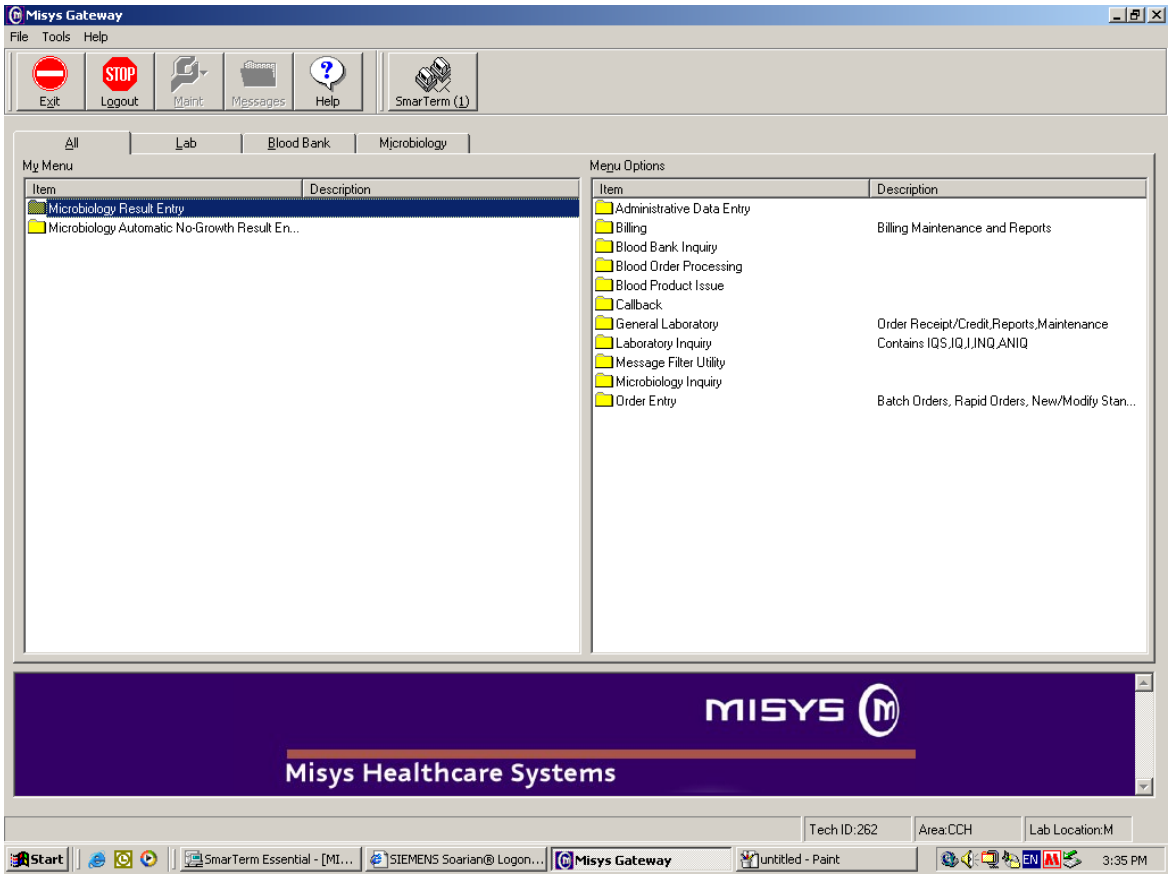
2. Type in Corresponding Accession number:
3. Accept order.



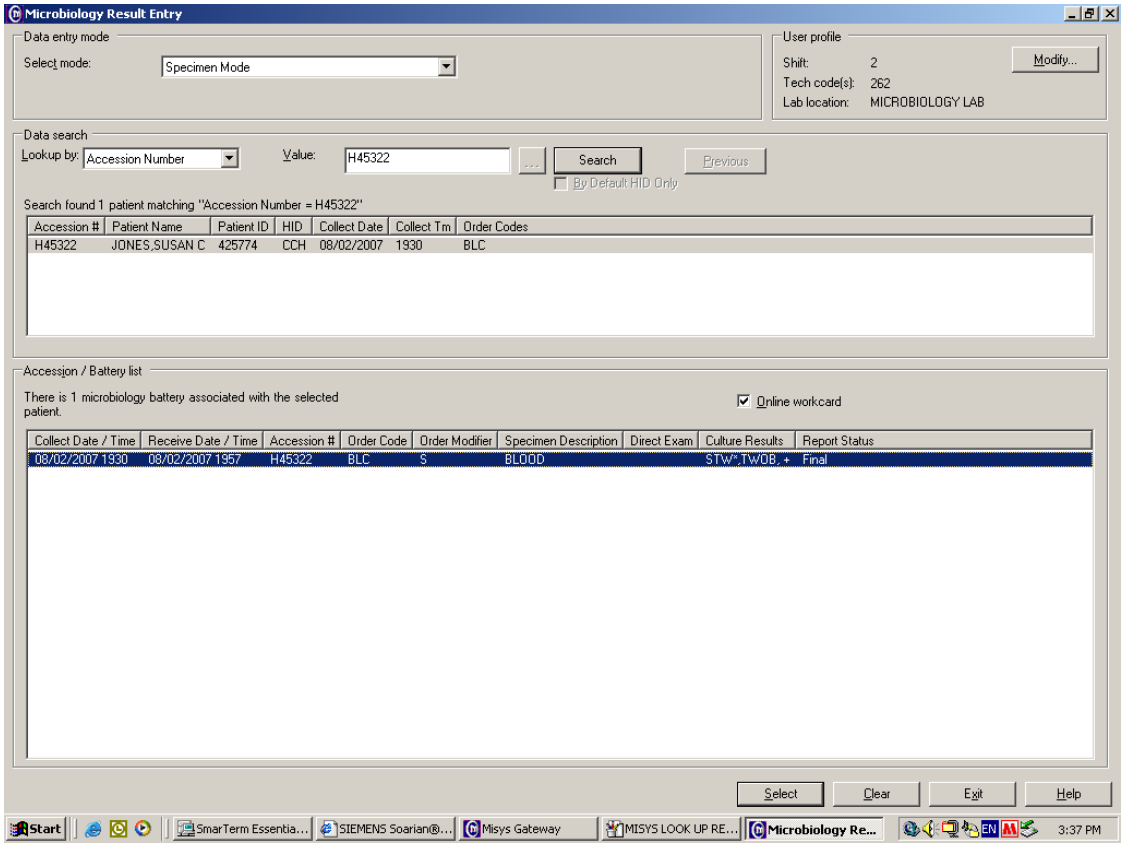

SmarTerm Essential - [MISYS]
File Edit View Tools Properties Connection Window Help
Patient Access
Function: OER
Lookup Mode
HOSP. NO:
PATIQ-10
Press For Help
Purged Patient Inquiry
MISYS
Connected to 10.1.1.48
Macro Print Capture Hold VT420 54 hr 44 min Row 4 Col 25
Start
SmarTerm Essential - ...
SIEMENS Soarian® Logon...
Misys Gateway
MISYS LOOK UP RESULTS...
3:49 PM

LOOK UP RESULTS

1. Start at the Microbiology Result Entry:

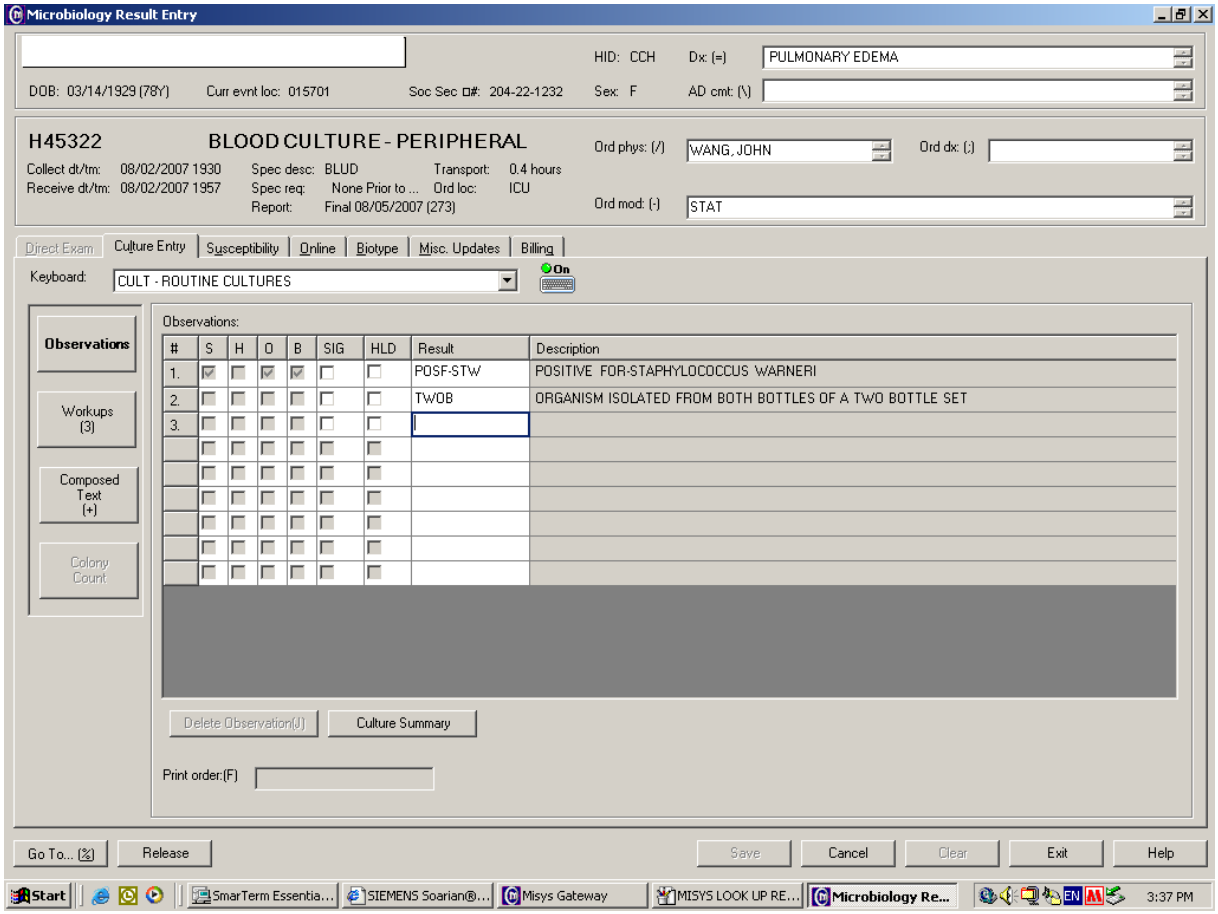


2.
Then Select Specimen mode
Lookup by Accession Number:

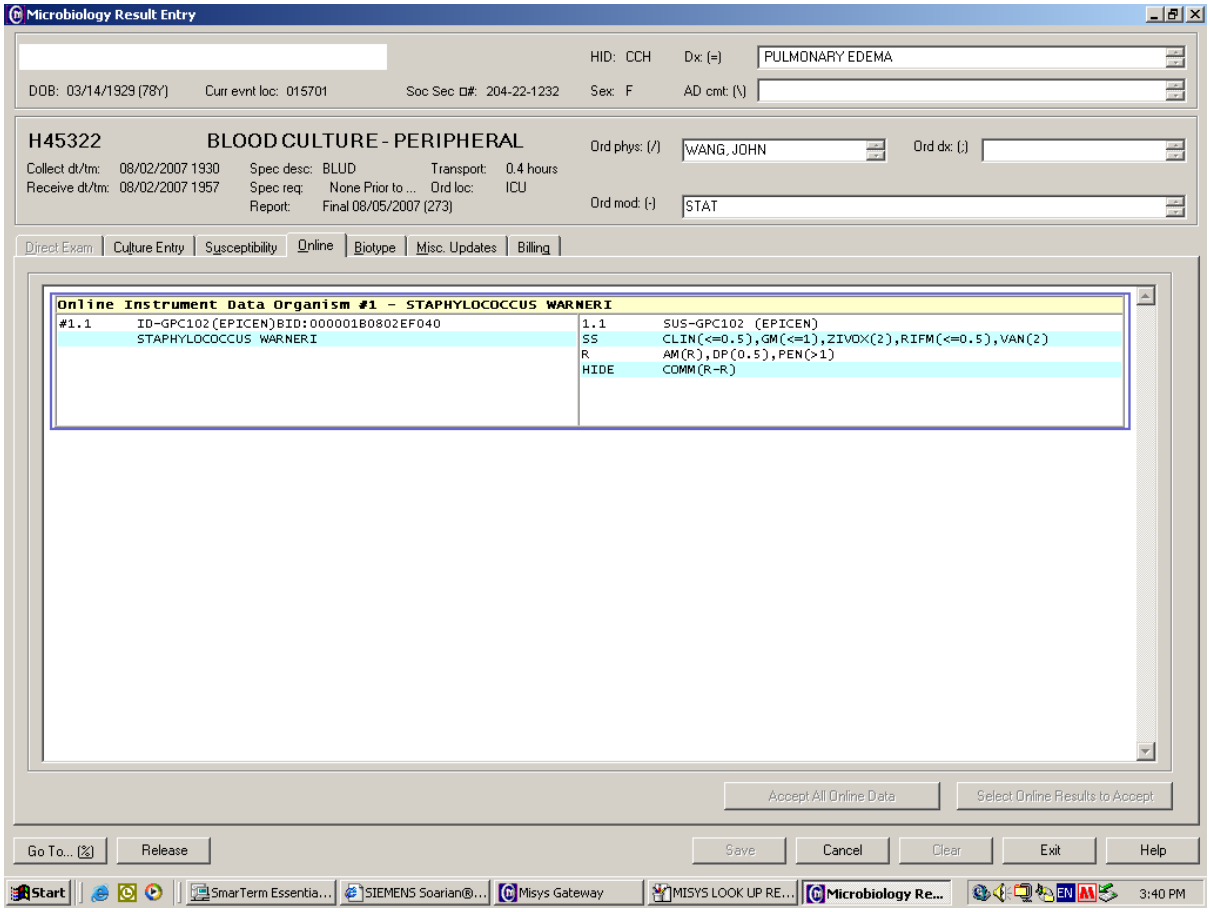


3.

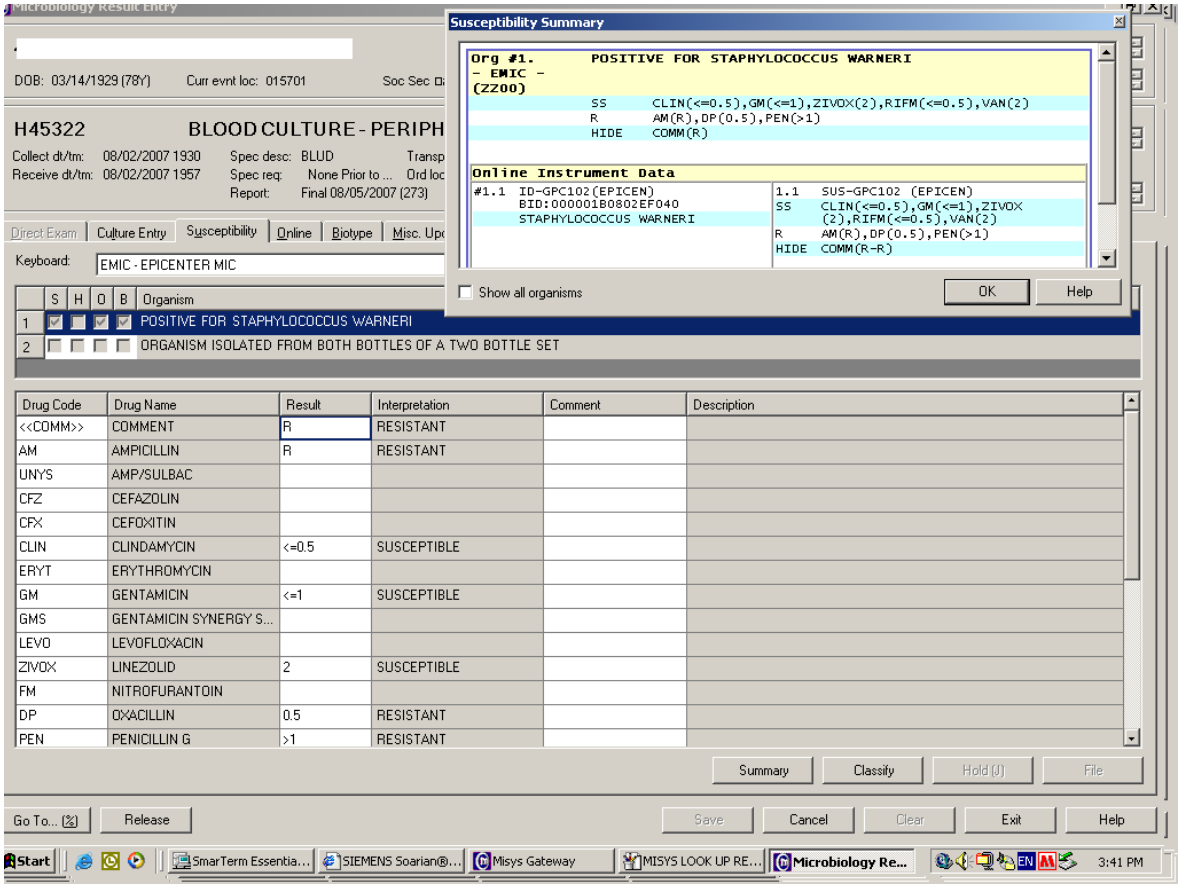
After finding the particular Acc number a list of the c



Press Alt-O to see Online-data:



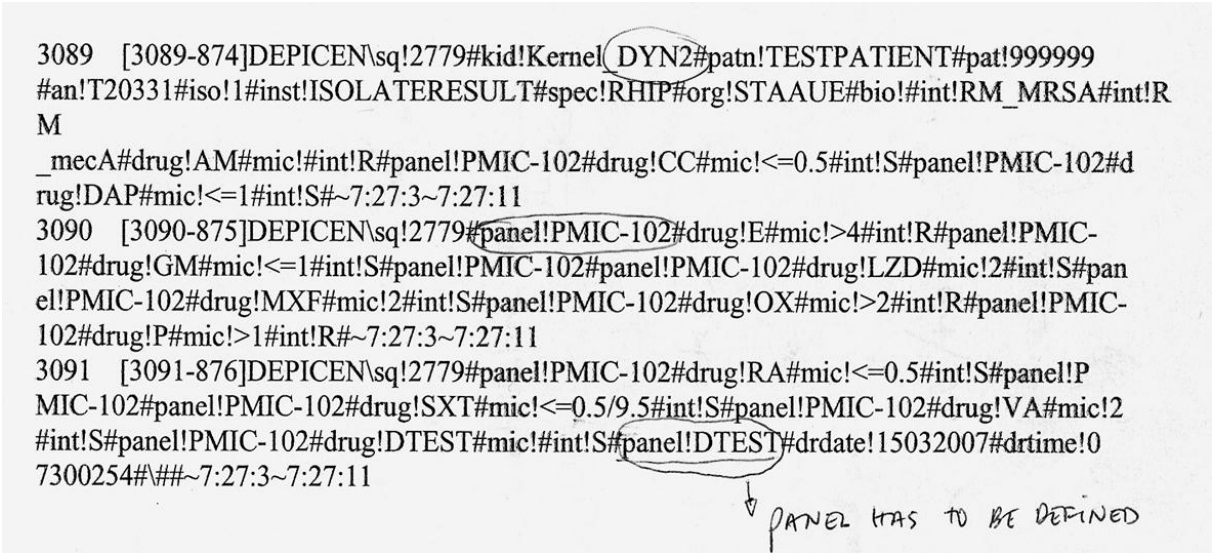
This is how the Susceptibility Tab should look:



Sunquest LIS - Log View:

Scan IX Function,

This is the Sunquest LIS Log and it is the correct and last way this should look like:



3089 [3089-874]DEPICEN\sq!2779#kid!Kernel_DYN2#patn!TESTPATIENT#pat!999999
#an!T20331#iso!1#inst!ISOLATERESULT#spec!RHIP#org!STAAUE#bio!#int!RM_MRSA#int!R
M
_mecA#drug!AM#mic!#int!R#panel!PMIC-102#drug!CC#mic!<=0.5#int!S#panel!PMIC-102#d
rug!DAP#mic!<=1#int!S#~7:27:3~7:27:11
3090 [3090-875]DEPICEN\sq!2779#panel!PMIC-102#drug!E#mic!>4#int!R#panel!PMIC-
102#drug!GM#mic!<=1#int!S#panel!PMIC-102#panel!PMIC-102#drug!LZD#mic!2#int!S#pan
el!PMIC-102#drug!MXF#mic!2#int!S#panel!PMIC-102#drug!OX#mic!>2#int!R#panel!PMIC-
102#drug!P#mic!>1#int!R#~7:27:3~7:27:11
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MIC-102#panel!PMIC-102#drug!SXT#mic!<=0.5/9.5#int!S#panel!PMIC-102#drug!VA#mic!2
#int!S#panel!PMIC-102#drug!DTEST#mic!#int!S#panel!DTEST#drdate!15032007#drtime!0
7300254#\##~7:27:3~7:27:11

PANEL HAS TO BE DEFINED

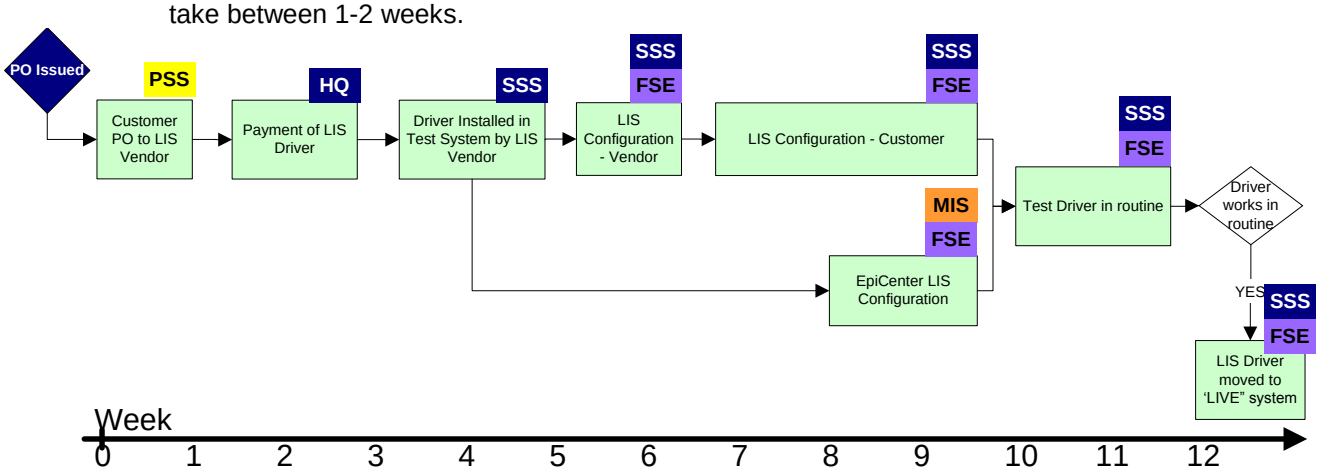
Expected Timelines

A Sunquest interface project can be expected to complete within 3 months. The following points highlight activities in the process, how long each activity should take and the potential risks for delay. This timeline should be used as a guide only and assumes:

- A completed driver with no additional requirements needed for development.
- A Sunquest MDI is assigned to the account
- A dedicated resource from the customer is available to configure the Sunquest system, and they have some experience in preparing instrument interfaces.

Interface Ordering

1. **Interface quotation:** The interface quotation should normally be requested by BD. The response to an interface quotation request is normally prompt. This is done during the sales process so does not impact the timeline. Allow 1 week.
2. **Customer PO to Sunquest** Once the PO has been placed with BD for the instrument, the PO should be placed with Sunquest for the interface. See the driver ordering process description in the following section. Allow 1 week for receipt and processing.
3. **Driver Payment:** Once the PO has been received, payment should be made. Depending on the sales agreement, the PO Invoice should normally be settled by BD. Typically the driver is not installed until payment is received. Allow 2 weeks for processing and confirmation of receipt.
4. **Driver installed in Customer Test System:** After payment of the driver, driver installation is based on (MDI schedule?). Allow 2 weeks.
5. **Sunquest Configuration – MDI**: The basic configuration of the driver done by the MDI. While the MDI may continue to do configuration with the customer, typically they have to do theirs first before the customer can begin. Note that while the activity is performed by the LIS vendor, someone from BD is accountable for ensuring the activity takes place. Allow 1 week
6. **Sunquest Configuration – Customer**: Configuration by the customer using the User interface tools. Resource availability and skills impact the duration of the activity, but it should be possible to complete in 4 weeks. Note that the activity is performed by the customer, but a BD associate is accountable for monitoring progress.
7. **EpiCenter Configuration:** Configuration of LIS based on Audit, loading of coded lists. The customer providing the coded lists and reformatting is often related to their configuration effort in the LIS, so while it can be done quickly in EpiCenter, can only be completed over an extended period of time. Allow 2 weeks.
8. **Driver Testing**: There will normally be an element of testing during the configuration process, but once all configuration is completed, final testing of all aspects should be done using a normal routine workflow, covering as many variations as possible. Note that some customers may elect to do their configuration and testing directly in to the "Live" environment. This is often done as a result of time pressures, or where the test environment differs so much from the live environment that testing there would not provide significant benefit. In such cases the last step is not required. Duration is variable based on customer protocols, but allow 2 weeks.
9. **Configuration Transport to Live Sunquest**: This final step copies the setup in the test environment to the live environment and may involve some limited testing again. This could take between 1-2 weeks.



Driver Ordering Process

The process for ordering a Sunquest Interface driver is described below.

1. Send request for interface ordering to Roger Nicolson. This should only be done once the PO has been received by BD with all signatures. Detailed information about the interface needs to be included in the request:
    a. Listing all the instruments that will be connected.
    b. Indicate whether the connection is via EpiCenter or a direct instrument-LIS connection.

2. Sunquest Regional sales associate or regional team leader is contacted, requesting Interface quotation and Interface invoice. The request for quotation should indicate the detailed connection requirements, and include the Sunquest specific interface codes.

3. Sunquest will respond with a quotation and invoice that should be reviewed for correctness of the driver and charges.

4. If correct and no invoice correction is needed, the invoice will be paid by BD.