Sutter Health
Sutter Roseville Medical Center

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Policy Area:	*Lab - Hematology*
References:	
Applicability:	*Sutter Roseville Medical Center*

Evaluating Flagged Patient Results from the XN-3200 Hematology Analyzer

Purpose

This procedure describes how to respond to the Abnormal and Suspect Flags on the Sysmex XN-3200 Hematology Analyzer.

Policy

- Evaluation of results will be performed only by Clinical Laboratory Scientists Medical Laboratory Technicians
- **Hold result** for any abnormal or suspect flag until further investigation resolves issue.
- CBCND orders on patients with NO previous history which display BLAST flag will have a smear review performed to verify the presence of blasts.

Categories Overview

Sysmex XN-3200 will separate results into one of four categories described in the table below. The category message displays at the top of the result printout.

Flag	Displays when...
NEGATIVE	Sample has no abnormal flags. Results are generally reported without review. Other conditions requiring follow-up are flagged in LIS (i.e. critical result, delta failure, etc.)
POSITIVE	Sample has one or more parameter indicator flags or Abnormal/Suspect IP flags requiring follow-up action.
ERROR	Sample analysis error occurred (i.e. sample aspiration error, etc.) These results should be reviewed carefully and may require further examination.
ACTION	Operator action is required.

Parameter Indicator Flags

The following **parameter indicator marks** may also appear after the data. Only one parameter indicator flag can append to a result. If multiple indicator flags apply, the indicator with highest priority displays.

Parameter	Priority	Description

Indicator	Order	
*	1st	Reliability of the data is suspect
@	2nd	Data exceeds the linearity limit
!	3rd	Data exceeds the upper acceptable background check value limit. Repeat background count.
+ or -	4th	Data exceeds the upper or lower reference range limits
----	N/A	Data cannot be displayed due to analysis error or a parsing error
++++	N/A	Data exceeds the display limit
[ ]	N/A	Indicates that the analysis order does not exist.
&	N/A	Corrected results (may be seen with WBC, Lymph, PLT-F)

WBC Abnormal / Suspect IP Messages

Message	Explanation	Action
WBC Abnormal Scattergram	Clustering in the WNR or WDF scattergrams is abnormal. NOTE: Asterisks (*) next to results or dashes (---) may **NOT** appear when this message is generated. NOTE: If the analyzer has reported the WBC from the WDF channel, the WBC result will have the "&D" indicator adjacent to it. The WBC result may still need to be verified.	Note: If WBC count is <0.5K/µL and the sample was run in closed mode, the analyzer automatically performs an extended WBC count time. If WBC count is <0.5K/µL and the sample was run in manual mode, re-run the sample in the Low WBC mode. 1. Perform smear review to verify WBC, NRBC, PLT and differential results. Assess for presence of abnormal cells or platelet clumping. • If WBC, NRBC, PLT, and DIFF confirmed and no abnormal WBCs or platelet clumps are seen, report instrument results. • Access the SCAN keyboard and order SLR1 after the differential is released, and enter comments from Scan keyboard if necessary • If dashes (---) in the place of NRBC or NRBC not confirmed on slide review, a dilution may be necessary to obtain valid NRBC and WBC counts. • If WBC is not confirmed by smear estimate, consider performing a dilution. Otherwise, if not confirmed after dilution, instrument WBC is not reportable. Result WBC field with free-text comment: "Unable to accurately determine WBC count". Result Absolute differential parameters with ETC comment NCAL (not calculated); percent differential parameters may still be reported. • If auto DIFF not confirmed, perform and report manual differential. • If PLT not confirmed, follow instructions for "PLT Clumps?" message.

NRBC Present	This message only appears when the NRBC result exceeds the programmed limit (>5 NRBC/100 WBC). Note: NRBC's are counted simultaneously while counting WBCs. No further correction of the WBC count is required. If NRBCs are >0.01/100WBC, the lymph counts are corrected.	1. Perform smear review to scan for malignant cells and confirm presence of NRBCs. • If malignant cells seen, perform manual diff. • If malignant cells not seen, and this is the only WBC flag, accept instrument results • Access the SCAN keyboard and order SLR1 after the differential is released, and enter comments from Scan as needed.
IG Present	Numerical based flag that occurs when >5% IGs are detected. Immature granulocyte %/# results include metamyelocytes, myelocytes and promyelocytes	1. Perform and report the **manual diff** and assess for presence of: • Immature granulocytes • Toxic granulation or vacuolation of neutrophils • or other abnormal cells 2. Access the SCAN keyboard and order SLR1 after the manual diff is reported. Enter comments from the Scan as needed. Note: When >5% IGs are detected by the analyzer, the automated differential will not add up to 100 cells in the LIS. Therefore, regardless of the presence of IGs upon review, a manual differential must be performed and reported in order for the cell count to equal 100.
IG with *	An asterisk (*) appears next to the IG %/# indicates these results maybe unreliable.	1. Perform smear review to verify DIFF and to assess for presence of: • Immature granulocytes • Toxic granulation or vacuolation of neutrophils • Other abnormal cells 2. If immature granulocytes or other abnormal WBCs are seen, perform and report manual differential. 3. If no immature granulocytes or other abnormal WBCs are seen, and no other flags present, report the Auto Diff 4. Access the SCAN keyboard and order SLR1 after the differential is released, and enter comments from Scan as needed.
Left Shift?	The instrument detected abnormal clustering in the region for left shift (bands) in the WDF scattergram. When bands are present, they are included in the neutrophil population.	1. If dashes (---) are present in place of data, perform manual differential. 2. Otherwise, if this is the only WBC flag, append ETC comment LSHFT (Left Shift) to Auto diff Neutrophil % result and accept instrument results. No action is required.

	An asterisk (*) appears next to Neutrophil & Eosinophil % and #. The IG % / # may also have an asterisk. **Note**: If the WBC is <0.50 x 10^3/µL in the Whole Blood mode or <0.20x10^3/µL in the Low WBC mode, the Left Shift IP flag will not be generated.	
Blast?/Abn Lympho?	The instrument has detected abnormal clustering in the region for blasts and abnormal lymphocytes in the WDF scattergram. An asterisk (*) appears next to the Neutrophil, Lymphocyte, Immature Granulocyte and Monocyte % and #. The asterisk (*) indicates these results may be unreliable and should be confirmed.	1. If dashes (---) are present in place of data, perform manual differential. 2. Perform smear review to verify DIFF and assess for presence of: • Blasts • Immature granulocytes • Atypical or immature lymphocytes • Other abnormal cells *Note*: Review feathered edge and sides of smear as blasts and other large cells may migrate to this area during smear preparation. 3. If abnormal WBCs are seen, perform and report manual differential. 4. If auto DIFF is not confirmed, perform and report manual differential. 5. If no abnormal WBCs are found and the auto DIFF is confirmed, report instrument results 6. Access the SCAN keyboard and order SLR1 after the differentail is released, and enter comments from Scan as needed.
Atypical Lympho?	The instrument detected significant clustering in the region for atypical lymphocytes in the upper left lymphocyte region on the WDF scattergram. An asterisk (*) appears next to the Neutrophil, Lymphocyte, Monocyte, Eosinophil and IG % and #. These results may be unreliable.	1. If dashes (---) are present in place of data, perform manual differential. 2. Perform smear review to confirm auto DIFF and assess for presence of: • Atypical/variant lymphocytes • Blasts • Abnormal/atypical/immature monocytes • Immature lymphocytes (as seen in ALL/CLL) • Smudge cells • Other abnormal cells 3. If abnormal WBCs are seen, perform and report manual differential. 4. If auto DIFF not confirmed, perform and report manual differential. ***5.*** Otherwise, report instrument results

		6. Access the SCAN keyboard and order SLR1 after the Auto diff is released, and enter comments from Scan as needed.
Eosinophilia	Absolute eosinophil count >2.0X10³	1. Perform smear review to verify instrument automated eosinophil count 2. If smear review does not correlate with automated eosinophil count then perform and report the manual diff 3. Otherwise, report instrument results 4. Access the SCAN keyboard and order SLR1 after the differental is released and enter comments from the Scan as needed.

RBC Abnormal / Suspect IP Messages

Message	Explanation	Action
RBC Abn Distribution	The RBC histogram pattern from the RBC channel is abnormal or RBC <0.5 x 10^6/µL. Dashes (---) appear in place of affected results. For example, if there are multiple peaks present on the RBC histogram, there would be dashes in place of results for RDW-SD and CV. The RDW-SD and CV results may also be marked with an asterisk (*).	1. Review blood count results. If MCHC is abnormal (<30.0 or >37.5) an interfering substance may be present. Refer to RBC agglutination or HGB interference flags 2. Review blood smear for the presence of abnormal RBC morphology such as rouleaux or RBC agglutination, multiple RBC populations, fragmented RBC, and report RBC morphology 3. If this is the only flag, accept instrument results. No action is required. 4. If a smear review was performed then after accepting the instrument results and releasing the differentail, access the SCAN keyboard and order the SLR1. Enter comments from the SCAN as needed. *Note*: If dashes (---) or asterisks (*) appear in place of data for the RDW-CV, result as ETC comment UTD (Unable to determine).
Dimorphic Population	Multiple peaks in RBC histogram pattern. Dashes (---) appear in place of affected results for RDW-SD and CV.	1. If this is the only flag, accept instrument results. No action is required. *Note*: If dashes (---) appear in place of data for the RDW-CV, result as ETC comment UTD (Unable to determine).
RET Abn Scattergram	Retic abnormal scattergram (occurs only if RETIC is ordered). NOTE: Asterisks (*) may **NOT** appear when this message is generated. Increased activity in the RET-THR	1. Prepare and run sample dilution - see Sample Dilution Procedure section. Do NOT use dilutions greater than 1:5. 2. Check that the RBC (x5) on the diluted sample matches the original RBC count within 10% to ensure dilution errors have not occurred. Also, verify that the diluted RBC count is not < 0.50. If

	(threshold) area of the RET scattergram or increased activity in the RET-UPP (Upper Particle Plateau) area of the RET-EXT scattergram. RET-EXT Scattergram: The RET-UPP area(green area past reticulocytes) is abnormal due NRBCs, Howell-Jolly bodies, parasites, or stress reticulocytes. These are not included in the reticulocyte count. Asterisks (*) appear next to the RET% / #, IRF and RET-He. The (*) indicates these results may be unreliable.	<0.50, make a lower dilution (i.e., 1:2 or 1:3) to increase the RBC count and ensure that adequate particles are present for accurate gating to occur. 3. If the RET Abn Scattergram flag resolves, multiply the absolute Retic count by the dilution factor and report result. The Retic % and IRF do not need to be multiplied by the dilution factor since these percentages / ratios should remain the same upon dilution. 4. If flag persists, or the RBC count is <0.50, perform smear review looking for polychromasia, parasites, Howell-Jolly bodies, NRBCs, or basophilic stippling. • If present, report results with a free-text comment on the RET stating "Results may be affected by the presence of *(specify interfering substance)*". • If not present, Retic is not reportable. Specimen may be sent to reference laboratory if needed after consultation with ordering physician.
RBC Agglutination?	Determined by calculation and size comparison of certain RBC parameters (MCHC, MCH, RBC, RU%*) Asterisk (*) appear next to the RBC, HGB, HCT, MCV, MCH MCHC and RET# parameters, indicating that these results may be unreliable. *The RU% is the upper RBC histogram discriminator. This is not a reportable parameter, but it is used in the RBC Agglutination algorithm. Consider MCHC and MCV together when evaluating the results and the reason for interference. If MCHC and MCV are increased likely RBC agglutination or rouleaux is cause of interference	*Note*: If neonate and MCHC is <40, no action needed, result may be released. 1. Warm sample at 37°C for 15-30 minutes. Reanalyze warmed sample in the manual mode after mixing by manual inversion 10 times. 2. If flag resolves, report warmed results with appended ETC comment R37 (37C result, possible cold agglutinin) to the MCHC. 3. If flag persists, perform plasma replacement using *warm* CELLPACK DCL. Refer to Plasma Replacement Procedure section. *Note*: In rare cases where a warm-reacting antibody has caused agglutination, a plasma replacement with *room temperature* CELLPACK DCL may be used to replace the plasma. 4. If flag still persists after plasma replacement, and MCHC <40, release result with comment, R37.
Turbidity / HGB	Occurs when the MCHC is >37.5 g/dL. Indicates interference with HGB	*Note*: If neonate and MCHC is <40, no action needed, result may be released.

Interference?	and/or HCT analysis. Asterisks (*) appear next to HGB, MCH and MCHC indicating these results may be unreliable. Consider MCHC and MCV together when evaluating results and reason for interference • If MCHC ↑ and MCV ↑, likely RBC agglutination or rouleaux. • If MCHC ↑ and MCV ↓ or normal, likely due to: hemolysis, electrolyte abnormality (i.e. low Na), severe lipemia, icterus, severe leukocytosis, and/or abnormal protein precipitation	1. If RBC Agglutination suspected, follow actions for "RBC Agglutination?" message. Otherwise, proceed with Step 2. 2. Prepare and run sample dilution - see Sample Dilution Procedure section. 3. Check that the RBC (x5) on the diluted sample matches the original RBC count within 10% to ensure dilution errors have not occurred. Also, verify that the diluted RBC count is not < 0.50. If <0.50, make a lower dilution (i.e., 1:2 or 1:3) to increase the RBC count and ensure that adequate particles are present for accurate gating to occur. • If flag resolves, then correct HGB, MCH, and MCHC results for dilution factor and report. • If flag persists, proceed to Step 4. 4. Examine the plasma for gross lipemia, hemolysis, or icterus. • If sample is grossly lipemic or icteric, perform plasma replacement using CELLPACK DCL. Refer to Plasma Replacement Procedure section. • If sample is grossly hemolyzed, request recollection. If recollection is not possible, report analyzer results EXCEPT RBC, HCT, MCV, MCH and MCHC - result as ETC comment UGH (Unable to measure due to gross hemolysis. Re-draw is recommended).
Hypochromia	Occurs when MCHC <25 g/dL	1. Review all RBC parameters for hypochromic anemia correlation (i.e. typically ↓ HGB, ↓ HCT, ↓ MCV). Review available chemistry results for possible interfering condition (i.e. electrolyte abnormality, hyperglycemia, etc.). 2. Perform scan to verify hypochromic RBC morphology. • If hypochromic RBC morphology confirmed and/or interfering condition excluded, then report results. Order SLR1 after the results are released, and enter comments from Scan as needed. • If hypochromic RBC morphology NOT confirmed or unable to exclude possible interference, proceed to Step 3. 3. If smear review was performed and after

		releasing the differential, access the SCAN keyboard and order SLR1 and enter comments form the Scan if needed. 4. Prepare and run sample dilution - see Sample Dilution Procedure section • If results from dilution significantly differ from original results, correct RBC, HGB, HCT for dilution factor. MCV, MCH, MCHC do not require dilution factor correction. Report WBC, PLT and DIFF from original (undiluted) sample. • If results from dilution NOT significantly different form original results, then report original results.
Fragments?	Possibility of fragmented RBCs (schistocytes). *RBC lower discriminator, PLT upper discriminator, % of the PLT upper discriminator. These parameters are not reportable, and are used only in the algorithm for this flag.	1. If the sample was run in manual mode, re-run the sample to include PLT-F. If the sample was run in closed mode, the analyzer automatically performs a reflex PLT-F count. 2. The PLT-F will have "&F" to the left of the result indicating that result was obtained in the PLT-F channel. 3. Report instrument PLT-F result. See below if PLT is flagged. 4. Perform smear review to verify presence of RBC fragments • after reporting the differential, access the SCAN keyboard to order SLR1 and enter comments from the Scan if needed

PLT Abnormal / Suspect IP Messages

Message	Explanation	Action
PLT - Abn Distribution	Generated by calculation and size comparison of PDW*, % of PLT lower discriminator [PL%]*, % of upper discriminator [PU%]*, platelet mean-frequent volume [PMFV]*, platelet large cell ratio, PLCR*, MPV, and platelet upper discriminator [PU]*. *These are non-reportable parameters used as part of the flagging algorithm.	Note: If dashes (---) appear in the place of data for MPV, result as ETC comment HIDE. No action needed for MPV data marked with an asterisk. Note: If a citrate tube was used to obtain the platelet count, append the PLT result with ETC comment CITRAT (Drawn in citrate, platelets clumped in EDTA). • When using citrate tubes, only the PLT is multiplied by 1.1 to compensate for the dilution factor. All other parameters are reported from the EDTA specimen. 1. If the sample was run in manual mode, re-run the sample to include PLT-F after checking for

	Dashes (---) in place of data for MPV or MPV data with an asterisk (*) indicates these results may be unreliable.	clots if not already done. If the sample was run in closed mode, the analyzer automatically performs a reflex PLT-F count. 2. The PLT-F will have "&F" to the left of the result indicating that result was obtained in the PLT-F channel. • If flag resolves and no other flags are present, report the PLT-F result. • If other flags or an asterisk (*) is present on the PLT-F result, proceed to Step 3. 3. Check sample for clots/fibrin strands if not previously done. • If clot/fibrin strands present, request recollection. ◦ Note: If patient cannot be recollected (i.e. premature neonate, hard stick, etc), clinical correlation of specimen results and decision to recollect should be obtained with consultation of patient caregiver. • If clot/fibrin strands not present, proceed to Step 4. 4. Perform smear review to estimate PLT count and assess for presence of abnormal RBC and/or PLT morphology (i.e. large or giant platelets, small platelets, platelet clumps, fragmented RBCs, microcytic RBCs, parasites). *5.* Review feathered edge and sides of smear as platelet clumps and fibrin strands may migrate to this area during slide preparation • If PLT-F is confirmed by smear estimate, report PLT-F. Order SLR1 after results are released, and enter comments from Scan as needed. • If PLT-F is not confirmed by smear estimate, proceed to Step 6. 6. Vortex sample (1-2 minutes) and re-run with PLT-F (Note: Must program sample with "/" in manual mode to prevent auto-filing.) *Note*: Ensure a slide has been made and all other non-PLT flags have been resolved prior to vortexing the sample as vortexing may cause WBC distortion/destruction. Only the PLT may be reported from a vortexed sample. • If flag resolves, report PLT-F count. • If flag persists, proceed to Step 7.

		7. Perform smear review on new slide made from vortexed sample. • If PLT-F is confirmed by smear estimate, report PLT-F. Order SLR1 after results are released, and enter comments from Scan as needed. • If PLT-F not confirmed by smear estimate **and** significant platelet clumping observed on smear, instrument PLT result is not reportable. Result PLT field with one of the appropriate ETCs: ◦ PLTCN: "Platelet clumps noted on smear but count appears normal." (i.e. within normal range) ◦ PLTCI: "Platelet clumps noted on smear but count appears increased." (i.e. above normal range) ◦ PFD: "Platelet count may be falsely decreased due to platelet clumping. Suggest redraw in citrate tube." (i.e. below normal range) ◦ Note: If a citrate tube was used, and still unable to confirm PLT, result PLT as NOPLT (Unable to obtain accurate platelet count due to platelet clumping).
PLT Abn Scattergram	Generated only when a PLT-F is performed. Occurs when clustering in the platelet and IPF area on the PLT-F Scattergram is abnormal. PLF-F, IPF% and IPF # are reported with an asterisk (*). Dashes (---) may appear in place of data for MPV or MPV may be reported with an asterisk (*). The asterisk (*) indicates these results may be unreliable.	Follow action required for "PLT Abn Distribution" flag
PLT Clumps?	Determined by abnormal clustering in the WNR, WDF or PLT-F scattergrams. In the WDF and PLT-F scattergrams the FSC-W measurement is also used to identify platelet	Note: If dashes (---) appear in the place of data for MPV, result as ETC comment HIDE. No action needed for MPV data marked with an asterisk. Note: If a citrate tube was used to obtain the platelet count, append the PLT result with ETC comment CITRAT (Drawn in citrate, platelets

	clumps. Asterisks (*) will appear next to the PLT, MPV and IPF indicating that results may be unreliable and action is required prior to reporting results	clumped in EDTA). • When using citrate tubes, only the PLT is multiplied by 1.1 to compensate for the dilution factor. All other parameters are reported from the EDTA specimen. 1. If the sample was run in manual mode, re-run the sample to include PLT-F after checking for clots if not already done. If the sample was run in closed mode, the analyzer automatically performs a reflex PLT-F count. The PLT-F will have "&F" to the left of the result indicating that result was obtained in the PLT-F channel. • If flag resolves and no other flags are present, report the PLT-F result. • If other flags or an asterisk (*) is present on the PLT-F result, proceed to Step 2. 2. Check sample for clots/fibrin strands if not previously done. • If clot/fibrin strands present, request recollection. ◦ Note: If patient cannot be recollected (i.e. premature neonate, hard stick, etc), clinical correlation of specimen results and decision to recollect should be obtained with consultation of patient caregiver. • If clot/fibrin strands not present, proceed to Step 3. 3. Perform smear review to assess for presence of platelet clumps and fibrin strands (check feathered edge). *Note:* Review feathered edge and sides of smear as platelet clumps and fibrin strands may migrate to this area during slide preparation • If fibrin strands or platelet clumps are NOT seen, report instrument results. • Access the SCAN keyboard and order SLR1 and enter comments from the Scan as needed • If fibrin strands or platelet clumps are seen, proceed to Step 4. 4. Perform smear review to estimate PLT and WBC count. • If the WBC and PLT estimates are

consistent with the analyzer counts, report instrument results. Order SLR1 after results are released, and enter comments from Scan as needed.
- If the WBC and PLT estimates are not consistent, proceed to Step 5.

5. Vortex sample (1-2 minutes) and re-run with PLT-F (Note: Must program sample with "/" in manual mode to prevent auto-filing.)
Note: Ensure a slide has been made and all other non-PLT flags have been resolved prior to vortexing the sample as vortexing may cause WBC distortion/destruction. Only the PLT may be reported from a vortexed sample.
- If flag/asterisks resolves, report PLT-F count.
- If flag or asterisks persists, proceed to Step 6.

6. Perform smear review to estimate PLT count on a new slide made from vortexed sample.
- If PLT-F is confirmed by smear estimate, report results.
- Access the SCAN keyboard and order SLR1 after results are released, and enter comments from Scan as needed.
- If PLT-F not confirmed by smear estimate, instrument PLT result is not reportable. Result PLT field with one of the appropriate ETCs:
  - PLTCN: "Platelet clumps noted on smear but count appears normal." (i.e. within normal range)
  - PLTCI: "Platelet clumps noted on smear but count appears increased." (i.e. above normal range)
  - PFD: "Platelet count may be falsely decreased due to platelet clumping. Suggest redraw in citrate tube." (i.e. below normal range)
  - Note: If a citrate tube was used, and still unable to confirm PLT, result PLT as NOPLT (Unable to obtain accurate platelet count due to platelet clumping).
- If WBC is not confirmed by smear estimate (from pre-vortexed smear), instrument WBC is not reportable. Result WBC field with free-text comment: "Unable to accurately

		determine WBC count" **AND** request re-draw in citrate if not already done. Result Absolute differential parameters with ETC comment NCAL (not calculated); percent differential parameters may still be reported.
Thrombocytopenia	PLT count <50 K/uL	1. If patient has history of Thrombocytopenia, no further action is necessary and report PLT count 2. If Patient's initial PLT testing or PLT has dropped from Normal PLT count to ≤ 50 K/uL (critical result) then check sample for clots and review blood smear for PLT clumps or satellitism • If specimen is not clotted and platelet satellitism or platelet clumps are Not seen, report instrument results • Access the SCAN keyboard and order SLR1 and enter comments from the Scan as needed 3. If specimen is not clotted and platelet satellitism or platelet clumps are present in smear review • If inpatient, recollect in citrate tube • If outpatient, do not report the platelet count append the ETC "NOPLT" to the PLT test code PDF • Access the SCAN keyboard and order SLR1 and enter comments from the Scan as needed

Action Messages

Message	Explanation	Action
Difference between WNR and WDF . Check the results.	Generated based on the ratio of the Total Nucleated Count in the WDF channel (TNC-D) to the Total Nucleated Count in the WNR Channel (TNC-N). The ratio is calculated as (TNC-D/TNC-N). The message is generated when the ratio is >1.3 or <0.77.	1. Rerun sample, consider re-running on another analyzer 2. Follow action steps for WBC Abnormal Scattergram
Difference between RBC and RET. Check the results.	Generated based on the ratio of the RBC result from the RET channel (RBC-O) and the RBC result from the impedance channel. The ratio is calculated as: (RBC-O/RBC). The message is generated when the ratio is >1.2 or <0.8.	1. Rerun sample, consider re-running on another analyzer 2. Perform smear review to verify the presence of abnormal RBC morphology. If rouleaux or RBC agglutination present, follow action steps for RBC Agglutination. 3. Access the SCAN keyboard and

		order SLR1 4. Resolve RET flagging as needed.
Difference between PLT and PLT-F. Check the results.	Generated based on the ratio of the PLT-F result to PLT result from the impedance channel. The ratio is calculated as (PLT-F/PLT). The message is generated when the ratio is >2.0.	1. Rerun sample, consider re-running on another analyzer. 2. Follow action steps for PLT - Abn Distribution
Suspect sample, check the sample	Generated based on an algorithm using RBC results and particle counts from the WNR Scattergram.	1. Remix and rerun the sample, consider re-running on another analyzer. 2. If the message is resolved, report the results. 3. If the message is not resolved: • Assess sample for insufficient or non-mixing in manual mode, an overfilled tube, or a clotted or fibrinous sample. Reject or recollect the sample as-needed based upon the findings. • If no specimen quality issues found, resolve any other flagging. Review smear and report as appropriate.
Insufficient blood volume (short sample)	Generated by the sample aspiration sensor based on the absorbance of the diluted sample. Results are suppressed when this error message is generated.	1. Check the sample for clots and that the minimum volume requirements have been met. Remix and rerun the sample. 2. If the message is resolved, report the results. 3. If the message is not resolved and the sample is suspected of having a low hemoglobin, remix and rerun the sample in the manual mode with the aspiration sensor off. • If this error message is occurring on multiple samples, refer to the analyzer Instructions for Use for troubleshooting information.
PLT test result may have low reliability		1. Refer to the action steps for PLT Clumps
Confirm	Generated by the presence of eosinophil	1. Follow action steps for WBC

eosinophil and neutrophil count by other methods	abnormalities which may interfere with scattergram interpretation leading to falsely high or low eosinophil counts.	Abnormal Scattergram

Calculations

- MCV = (HCT/RBC) x10
- MCH = (HGB/RBC) x10
- MCHC = (HGB/HCT) x100
- Note: To report results obtained from a sample dilution, the following parameters must be corrected by multiplying the dilution factor: WBC, RBC, HGB, HCT, PLT (PLT-F), Absolute DIFF, Absolute RET.
  - Example: If RBC result from 1:5 dilution is 0.725, calculate correct RBC result by multiplying dilution result by 5: 0.725 x 5 = 3.625 ($x10^6/\mu L$)

Plasma Replacement Procedure

Follow the steps below to perform a Plasma Replacement as indicated.

Step	Action
1.	Place an aliquot of whole blood into a secondary tube.
2.	Centrifuge tube to separate cells from plasma.
3.	Using an MLA pipette, remove a measured amount of plasma from the tube. Remove as much plasma as possible without disturbing the buffy coat.
4.	Replace the volume of plasma removed with an equal volume of CELLPACK DCL. Example: If 200 µL plasma removed, add 200 µL CELLPACK DCL back into tube.
5.	Cap the tube and mix by inversion until RBCs are fully re-suspended. • Note: steps 2 through 5 may need to be repeated for strong cold agglutinins
6.	Analyze the plasma replaced aliquot in manual mode.

Sample Dilution Procedure

Follow the steps below to perform a Sample Dilution as indicated.

Step	Action
1.	Prepare a 1:5 dilution of the sample using CELLPACK DCL into a secondary tube.
2.	Allow the dilution to equilibrate for 10-15 minutes prior to running.
3.	Mix tube by inversion 10 times prior to analysis. Refer to *Running Whole Blood Samples on the XN-3200 Hematology Analyzer* procedure, Manual Analysis (Open) Mode section. Note: Do **NOT** use the analyzer's Pre-Dilution mode.
4.	Correct indicated parameter by multiplying by the dilution factor prior to reporting result. • Parameters that need to be corrected for dilution include: WBC, RBC, HGB, HCT, PLT, Absolute DIFF, and/or Absolute RET.

- Parameters that generally do not need correcting for the dilution are MCV, MCH, MCHC, DIFF %, RET %, and RDW.

References

- Sysmex XN series (XN-3200) Instructions for Use, March 2017
- Sysmex XN-Series Automated Hematology Systems, Flagging Interpretation Guide, February 2019

All revision dates:

Attachments

No Attachments

Approval Signatures

Step Description	Approver	Date
Laboratory Director	Lindsey Westerbeck: Dir, Lab	pending